ಮಂಗಳೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ
MANGALORE UNIVERSITY

(Accredited by NAAC with 'A' Grade)

ಕ್ರಮಾಂಕ/ No. : MU/ACC/CR.16/PGDES/2016-17/A2

ಕುಲಸಚಿವರ ಕಛೇರಿ
ಮಂಗಳಗಂಗೋತ್ರಿ – 574 199
Office of the Registrar
Mangalagangothri – 574 199

ದಿನಾಂಕ/Date: 5.02.2018

NOTIFICATION

Sub: Regulation and Syllabus governing P.G. Diploma in Embedded System
Ref: 1) Decision of the Academic Council meeting held on 3.02.2017
2) Government letter No. ED 9 UDS 2017, dated 16.12.2017

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The Regulation governing Post Graduate Diploma in Embedded System assented by the Chancellor on 24.11.2017 as communicated in Government letter referred to (2) above and the Syllabus thereon approved by the Academic council as referred to (1) above are hereby notified for implementation with effect from the academic year 2018-19.

Prakash
3/2/18
REGISTRAR.
KH.

To:

1) The Chairman, Dept. of Electronics, Mangalore University.
2) The Registrar (Evaluation), Mangalore University.
3) The Chairman, PG BOS in Electronics, Mangalore University.
4) The Dean, Faculty of Science and Technology, Mangalore University.
5) The Deputy Registrar (Independent Charge), Mangalore University.
6) The Superintendent (ACC), O/o the Registrar, Mangalore University.
7) Guard File.
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MANAGALORE UNIVERSITY

Regulations Governing the Post Graduate Diploma Programme in Embedded System

(Framed under section 44(1) of the KSU Act 2000)

Preamble:

PG Diploma in Embedded System is designed to suit the needs of the electronics engineers in the IT industry. Students are trained in the latest technologies and practical skills required to design embedded systems. The course is designed in consultation with the industry experts and conducted and updated accordingly as per the industry needs. The live projects taken from the industry for the second semester major project, increases the chance of employability of graduates and post graduates in the disciplines related to IT industry.

1. **Title and Commencement:** These regulations shall be called as Regulations governing the Post Graduate Diploma Programme in Embedded System.

2. **Eligibility for Admisssion:** Candidates who have passed the three years B.Sc.(Physical sciences), B.C.A. degree of Mangalore University or any other University considered as equivalent thereto are eligible for admission. The candidates who have passed B. E. / M.C.A. degree are also eligible for admission.

3. **Duration of the Programme:** The duration of the programme shall extend over two semesters (one academic year) each of a minimum of 16 weeks of instruction and two weeks examination and preparation.

4. **Medium of Instruction:** The medium of instruction is English only.

5. **Hours of Instructions per week:** There are 32 hours of instructions per week. These hours are distributed for lectures, seminars, tutorials, practicals, project work and other modes of instruction.

6. **ATTENDANCE**: Each paper (theory/practical) shall be treated as an independent unit for the purpose of attendance. A student shall attend a minimum of 75% of the total instruction hours in a paper (theory/practical) including tutorials and seminars. There shall be no provision for condonation of shortage of attendance and a student who fails to secure 75% attendance shall be required to repeat that year.

7. **Maximum period for completion of the programme:** The candidate shall complete the programme within three years from the date of admission to the programme.

8. **Subjects of Study:** The subjects of study is comprising (1). Variety of microcontrollers/ microprocessors including 8051, PIC, ARM, ATMEL/ATMEGA, MSP430 (2). Computer languages like C/C++/ Java / Python /OpenCV /Linux Shell /MATLAB, (3). Open Source hardware platforms like Arduino / Raspberry Pi / Beagle Bone Black(BBB), (4). working with various kinds of sensors (5) Communication protocols like UART, USART, I2C, CAN, WiFi, ZigBee, SPI, RF, etc. (6). Real Time Operating System(RTOS) (7). Working with signals like image , audio and video.

9. **INTERNAL ASSESSMENT:**

9.1 Marks for internal assessment shall be awarded on the basis of seminars, tests, assignments etc. as determined by the Board of Studies from time to time. The internal assessment marks shall be notified on the department / college notice board for information of the students and it shall be communicated to the Registrar (Evaluation) 10 days before the commencement of the University examinations and the Registrar (Evaluation) shall have access to the records of such internal assessment evaluations.

9.2 Internal assessment marks shall be shown separately in the marks card. A candidate who has rejected the result or who, having failed, takes the examination again or who has appeared for improvement shall retain the internal assessment marks already obtained.

10. REGISTERING FOR THE EXAMINATIONS:

A candidate shall register for all the papers in the subject of a semester when he/she appears for the examination of that semester for the first time.

11. VALUATION OF ANSWER SCRIPTS / DISSERTATION:

Each theory paper / dissertation shall be evaluated by eligible examiners. Dissertation shall be valued by internal guide and the external examiner (other than the faculty member of the institution) attending viva board. Each practical examination shall be conducted and evaluated by one internal and one external examiner or two external examiners if there are no internal examiners but not by two internal examiners.

12. MINIMUM FOR A PASS:

12.1 No candidate shall be declared to have passed in a semester examination unless he/she obtains not less than 40% marks in the University Examination in each unit such as theory papers/practicals and 40% marks in theory / practicals and internal assessment marks put together. In case of project work / dissertation / viva-voce the candidate has to secure a minimum of 40% marks for pass.

12.2 There shall be no minimum in respect of internal assessment.

12.3 A Candidate who fails in any of the unit/project work/Project Report/ dissertation/viva-voce shall reappear in that unit/project work/Project Report/ dissertation/ viva-voce and pass the examination subsequently.

13. CARRY OVER PROVISION:

Candidates who fails in a lower semester examinations may go to the higher semesters and take the examinations in that failed subject only at a subsequent semester examination.

14. CLASSIFICATION OF SUCCESSFUL CANDIDATES:

i) The results of successful candidates at the end of II semester shall be classified on the basis of aggregate marks obtained in both the semesters.

ii) The candidates who pass both the semester examinations in the first attempt are eligible for ranks provided they secure 60% and above marks.

iii) The results of the candidates who have passed the II semester examination but not passed the first semester examinations shall be declared as NCL (not completed lower semester examinations). Such candidates shall be eligible for the degree only after completion of all the first semester examinations.

Percentage of marks for declaring class:

First Class with Distinction	70% and above
First Class	60% and above but less than 70%
High Second Class	55% and above but less than 60%
Second Class	50% and above but less than 55%
Pass Class	40% and above but less than 50%

15. REJECTION OF RESULTS:

15.1 A candidate may be permitted to reject the result of the whole examination of any semester. Rejection of result paper-wise/subject-wise shall not be permitted. A candidate who has rejected the result shall appear for the immediately following regular examination.

15.2 The rejection shall be exercised only once in each semester and the rejection once exercised cannot be revoked.

15.3 Application for rejection along with the payment of the prescribed fee shall be submitted to the Registrar (Evaluation) through the College of study together with the original statement of marks within 30 days from the date of publication of the result.

15.4 A candidate who has rejected the result is eligible for only class and not for ranking.

SYLLABUS

Title of the papers	Hard Core(H) / Soft Core(S)	Credits
I semester		
Theory papers		
Embedded systems with PIC microcontrollers	H	4
Introduction to Arduino, Raspberry Pi and BeagleBoneBlack(BBB)	H	4
Linux Shell Programming	S	3
8051 microcontroller and Interfacing	S	3
Digital Design	S	3
Sensors and Actuators	S	3
Low power Design with MSP430	S	3
Computer vision using OpenCV	S	3
Practicals		
PIC microcontroller programming using Assembly and C	H	2
Working with Arduino / Raspberry Pi / BBB	H	2
Linux Shell Programming lab	S	2
8051 microcontroller lab	S	2
Digital Design lab	S	2
Working with sensors lab	S	2
Low power Design with MSP430 lab	S	2
Computer vision using OpenCV lab	S	2
Note: Any two soft core papers to be chosen.		

II semester		
Theory Papers	**Hard Core(H) / Soft** Core(S)	Credits
ARM Microprocessors	H	4
Real Time Digital Signal Processing	S	3
3 Real Time Operating Systems(RTOS	S	3
3 Internet Of Things(IOT)	S	3
Practicals		
High Performance system design using ARM	H	2
Note: Any one soft core paper to be chosen.		

9. Scheme of Examinations and Instructions: The scheme of examinations and instructions are as below

Semester	Subjects	Instruction hrs per paper/week	Duration of Exam(hrs)	Marks			Credits
				IA	Exam	Total	
I	4T (2H+2S)	4x4	4x3	4x30	4x70	4x100	2x4+2x3=14
	4P (2H+2S)	4x4	4x4	4x15	4x35	4x50	4x2=08
				Total		600	22
II	2T (1H+1S)	2x4	2x3	2x70		2x100	4+3=07
	1P (1H)	4	4	15	35	50	03
	Project work with dissertation	20	-	50	250	300	10
	Viva –Voce	-	-	-	50	50	02
Total						**600**	**22**
Grand Total						**1200**	**44**

Note: Project work can start from the I semester and end in II semester. But, marks and credits are counted for the II semester only.

Embedded System with PIC Microcontrollers

Unit-I

Getting Started with Embedded Systems, Tiny computers, hidden control, Introducing the PIC mid-range family and the 16F84A, Parallel ports, power supply and the clock oscillator, An introduction to Assembler, Building Assembler programs :16 hours

UNIT II

Working with time: interrupts, counters and timers, Larger Systems and the PIC 16F873A, The human and physical interfaces, Taking timing further,16 hours

Unit-III

Smarter systems and the PIC 18F2420, PIC programming in C, C and the embedded environment, Acquiring and using data with C, More C and the wider C environment
16 Hours

Text books:

1)."Designing Embeddd Systems using PIC microcontrollers- Principles and Applications"- Tim Wilmshurst, Elseveir, 2010

Reference Books:

2)"Pic Microcontroller And Embedded Systems: Using Assembly And C For Pic 18", mazid Pearson Education

3) J. B. Preatman, "Design with PIC Microcontrollers"1st Ed, Prentice Hall

4)."Microprocessor - From Assembly language to C using PIC18Fxx2"- Robert B Reese

INTRODUCTION TO ARDUINO, RASPBERRY PI AND BEAGLE BONE BLACK

UNIT I

Home Automation using Raspberry Pi and Arduino: An Introduction to the Raspberry Pi, Arduino, and Home Automation, Setting up Raspberry Pi, Setting up Raspberry Pi to Arduino Bridge Shield, First Project – A Basic Thermometer, From Thermometer to Thermostat.(14hrs)

UNIT II

Home Automation using Raspberry Pi and Arduino: Building upon the First Project, Temperature Storage – Setting up a Database to Store Your Results, Curtain Automation – Open and Close the Curtains Based on the Ambient Light, The future of home automation
(14 hrs)

UNIT III

Programming the Beagle Bone Black: JavaScript Basics, JavaScript Functions and Timers, Arrays, Objects, and Modules, BoneScript, Hardware Interfacing, Using Capes and Modules, Web Interfaces, A Roving Robot, E-mail Notifier (14 hrs)

TextBooks:

1. "Raspberry Pi Home Automation with Arduino" - Andrew K. Dennis, Packt, 2013

2. "Programming the BeagleBone Black-Getting Started with JavaScript and BoneScript"- Simon Monk, McGraw Hill, 2014

References:

1. "Bad to the Bone - Crafting Electronic Systemsvwith BeagleBone and BeagleBone Black" - Steven F. Barrett , Jason Kridner, Morgan and Claypool Publishers, 2013

2. "Exploring Beagle Bone Tools and Techniques for Building with Embeddded Linux" – Derek Molloy, Wiley, 2015

3. "The official raspberry pi projects book"- from the makers of magpi, the official Raspberry Pi

4. Magazine

5. "Raspberry Pi Cookbook" - Simon Monk, Oreilly , 2013

LINUX SHELL PROGRAMMING

UNIT I

Part 1 – Learning The Shell: Introduction, What Is The Shell, Navigation, Exploring TheSystem, Manipulating Files AndDirectories, Working With Commands,Redirection,Seeing The World As The Shell Sees It,Advanced Keyboard Tricks, Permissions, Processes,(10hrs)

UNIT II

Part 2 – Configuration, The Environment, **Common Tasks And Essential Tools**

The Environment, A Gentle Introduction To vi, Customizing The Prompt, Common Tasks And Essential Tools, Package Management, Storage Media, Networking, Searching For Files, Archiving And Backup, Regular Expressions, Text Processing, Formatting Output, Printing, Compiling Programs (10hrs)

UNIT III

Part 3 – Writing Shell Scripts: Writing Your First Script,Starting A Project,Top-Down Design,Flow Control: Branching With if,Reading Keyboard Input,Flow Control: Looping With while / until, Troubleshooting, Flow Control: Branching With case, Positional Parameters, Flow Control: Looping With for,Strings And Numbers, Arrays, Exotica.(10hrs)

Textbook:

(1). "The Linux Command Line-A complete Introduction" -William E. Shotts, Jr, Second Edition,A LinuxCommand.org Book, 2013

References:

(1). "Advanced Bash-Scripting Guide-An in-depth exploration of the art of shell scripting"- Mendel Cooper, 2014

(2). "Mastering Linux Shell Scripting" -Andrew Mallett, Packt Publishing, 2015

(3). "Sams Teach Yourself Shell Programming in 24 Hours" - Sams Publishing, 1999

8051 Microcontroller and Interfacing

UNIT-I

Introduction to microcontroller, the 8051 microcontrollers; Microcontrollers and embedded processors, Overview of the 8051 family, 8051assembly language programming, Jump, loop, and call instructions, I/O port programming, 8051 addressing modes. Arithmetic & logic instructions and programs, 8051 programming in C.

UNIT-II

8051 hardware connection and intel hex file, 8051 timer programming in assembly and c, 8051 serial port programming in assembly and c, interrupts programming in assembly and c.

UNIT-III

An 8051 Microcontroller Design; Introduction, specification and design, testing the design, timing subroutines, lookup tables for the 8051,serial data transmission.
Applications; Key boards, display, pulse measurement, D/A and A/D Convertors and sensor interfacing, interfacing with external memory.

Reference:

1. The 8051 micro controller and embedded systems using assembly and c, Second Edition, M A Mazidi, J G Mazidi, Rolin D and D McKinlay, Pearson Prentice Hall Publication.

2. The 8051 Microcontroller, Kennneth J. Ayala, West Publishing Company.

Digital Design:

Unit – I

Boolean Algebra and Logic Gates: Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Canonical Forma and Standard Forms, Other Logic Operations, Digital Logic Gates, Boolean Analysis of Logic Circuits, Boolean Logic Simplification Using Karnaugh Map for SOP and POS Terms with Four and Five Variables.
Combinational Logic Analysis: Basic Combinational Logic Circuits, Implementing Combinational Logic, Basic Adders, Comparators, Decoders, Encoders, Code Converters, Multiplexers, Demultiplexers, Parity Circuits. (**16 Hours**)

Unit – II

Synchronous Sequential Logic: Latches, Flip Flops, Flip Flop Applications, Timers, State Reduction and Assignment, Asynchronous Counters, Synchronous Counters, Cascaded Counters, Design of Counters, Counter Applications. Registers, Shift Registers, Bidirectional Shift Registers, Ripple Counters, Shift Register Applications
Memory: Basics of Semiconductor Memory, RAM, ROM, PROM, Flash Memory, Memory

Expansion, Special Types of Memory, Magnetic and Optical Storage Elements. **(16 Hours)**

Unit – III

Algorithmic State Machines: Introduction, ASM Chart, Timing Considerations, Control Implementation, Designs with Multiplexers, PLA, Control.
Programmable Logics: SPLDs and CPLDs, Altera CPLDs, Xilinx CPLDs, Macrocells, FPGAs, Programmable Logic Software, Boundary Scan Logic. **(16 Hours)**

Text Books:

Digital Design, Morris Mano, Third Edition, Pearson Prentice Hall Publication. ISBN: 9780130621214,

Digital Fundamentals, T.L. Floyd, Ninth Edition, Pearson Prentice Hall Publications, ISBN: 0-13-197255-3.

Sensors and Actuators

UNIT I

SENSOR FUNDAMENTALS : What are Sensors/ Transducers, Principles, Classification, Parameters, Characterization. SENSOR SIGNAL CONDITIONING: Conditioning bridge Circuits, Amplifiers for signal conditioning, Analog to digital converters for signal conditioning, signal conditioning high impedance sensors.

UNIT II

DIFFERENT TYPES OF SENSORS: Mechanical and Electrochemical sensors, acceleration sensors, vibration sensors, pressure sensors, humidity sensors, thermal sensors, chemical sensors,gas sensors, biosensors, magnetic sensors, smart sensors. RECENT TRENDS IN SENSOR TECHNOLOGIES: Introduction, film sensors, Semiconductor IC Technology.

UNIT III

Micro electromechanical systems (MEMS), Nanosensors, SENSORS AND THEIR APPLICATIONS: Introduction, Automotive sensors, Home Appliance sensors, Aerospace sensors, sensors for manufacturing, Medical diagnostic sensors, Sensors for environmental pollution.

Text Books:

(1)."Sensors and Transducers", D Patranabis

(2). "Sensor Technology Handbook", Jon S Wilson

Low Power Design with MSP430

UNIT-I

Embedded Electronic Systems and Microcontrollers; introduction, embedded system and small microcontroller and its anatomy, memory, software. *The Texas Instruments MSP430*; outside and inside view pin out, functional block diagram, CPU, memory mapped input and output, clock generator, interrupts and reset. Development; development environment, C and assembly programming languages, *A Simple Tour of the MSP430*; Program on a Conventional Desktop Computer, light LED in C and assembly language, Automatic Control: Flashing Light by Software Delay, Use of Subroutines, Flashing Light by Polling Timer_A, Header Files and Issues Brushed under the Carpet. *Architecture of the MSP430 Processor*; CPU, addressing modes, Constant Generator and Emulated

Instructions, instruction set, examples, Reflections on the CPU and Instruction Set, resets, Clock System.

UNIT-II

Functions, Interrupts, and Low-Power Modes; Functions and Subroutines, Storage for Local Variables, Passing Parameters to a Subroutine and Returning a Result, Mixing C and Assembly Language, interrupts and its issues, Interrupt Service Routines, LPM operation.

Digital Input; Digital Input and Output: Parallel Ports, Switch Debounce, Digital Inputs and outputs Interface between 3V and 5V Systems, Driving Heavier Loads, Liquid Crystal Displays, Driving an LCD from an MSP430x4xx, Simple Applications of the LCD.

Output, and Displays, Timers; Watchdog Timer, Basic Timer1, Timer_A, Measurement in the Capture Mode, Output in the Continuous Mode, and Output in the Up Mode: Edge-Aligned Pulse-Width Modulation, Output in the Up/Down Mode: Centered Pulse-Width Modulation, Operation of Timer_A in the Sampling Mode, Timer_B, Setting the Real-Time Clock: State Machines.

UNIT-III

Mixed-Signal Systems: Analog Input and Output; Comparator_A, Analog-to-Digital Conversion: General Issues, Analog-to-Digital Conversion: Successive Approximation, The ADC10 Successive-Approximation ADC, Basic Operation of the ADC10, More Advanced Operation of the ADC10, The ADC12 Successive-Approximation ADC, Analog-to-Digital Conversion:Sigma–Delta, The SD16_A Sigma–Delta ADC, Operation of SD16_A, Signal Conditioning and Operational Amplifiers, Digital-to-Analog Conversion.

Communication; Communication Peripherals in the MSP430, Serial Peripheral Interface, SPI with the USI and USCI, AThermometer Using SPI in Mode 3 with the F2013 as Master and Mode 0 with the FG4618 as Master, Inter-integrated Circuit Bus, A Simple I^{2}C Master wit the USCI_B0 on a FG4618 and USI on a F2013, State Machines for I^{2}C Communication, AThermometer Using I^{2}C with the F2013 as Master, Asynchronous Serial Communication and Asynchronous Communication with the USCI_A, A Software UART Using Timer_A, Other Types of Communication.

The Future: Architecture of the MSP430X, Instruction Set of the MSP430X. Where Next?, Conclusion *MSP430X, Kickstarting the MSP430*; Introduction to EW430, Developing a Project in C, Debugging with the Simulator, Debugging with the Emulator, Developing a Project in Assembly Language, Tips for Using EW430, Tips for Specific Development Kits.

Text Book:

1. MSP430 Microcontroller Basics, John H. Davies, ELSEVIER, 2008.

Computer vision using OpenCV

UNIT I

Introduction to OpenCV, Getting to Know OpenCV, HighGUI, Image Processing.

UNIT II

Image Transforms, Histograms and Matching, Contours, Image Parts and Segmentation.

UNIT III

Tracking and Motion, Camera Models and Calibration, Projection and 3D Vision, Machine Learning.

Textbook:

(1)."Learning OpenCV"-Gary Bradski and Adrian Kaehler,O'Reilly Media,2008

Referencces:

(1). "A PRACTICAL INTRODUCTION TO COMPUTER VISION WITH OPENCV" – Kenneth Dawson-Howe, John Wiley & Sons Ltd, 2014

(2). "Learning Image Processing with OpenCV" - PACKT publishing

(3). "The OpenCV Tutorials" - Release 2.4.9.0

ARM microprocessors

Unit I 14 Hours

Introduction to ARM, Architecture of ARM Cortex M3, Memory system, Programming ARM Cortex M3, Nested Vector Interrupt Controller. Interrupt behaviour of ARM Cortex M3, Exceptions programming

Unit II 14 Hours

Advanced programming features and system behaviour, Memory Protection, Debug Architecture, Starting Cortex-M3 development using the GNU tool chain, getting started with the KEIL RealView microcontroller development kit Introduction to mbed, digital input and output, analog input and output

Unit III 14 Hours

Starting with serial communication, LCD (liquid crystal display), Interrupts timers and tasks, Introduction to digital signal processing, advanced serial communications, Introduction to control systems, extension projects.

Text Books:

1) "Definitive Guide to the Arm Cortex M3",Joseph Yiu, Newness, 2008

2) "Fast and Effective Embedded Systems Design Applying the ARM mbed", Rob Toulson and Tim Wilmshurst, Newness, 2012

Real-Time Digital Signal Processing

Unit I

Introduction to Real-Time Digital Signal Processing: Basic Elements of Real-Time DSP Systems, Analog Interface, DSP Hardware, DSP System Design, Introduction to DSP Development Tools, Experiments and Program Examples Introduction to TMS320C55x Digital Signal Processor: Introduction, TMS320C55x Architecture, TMS320C55x Peripherals, TMS320C55x Addressing Modes, Pipeline and Parallelism, TMS320C55x Instruction Set, TMS320C55x Assembly Language Programming DSP Fundamentals and Implementation Considerations

Unit II

Audio Signal Processing: Introduction, Basic Principles of Audio Coding, Multichannel

Audio Coding, Connectivity Processing, Experiments and Program Examples Channel Coding Techniques: Introduction, Block Codes, Convolutional Codes, Experiments
and Program Examples,

Unit III

Introduction to Digital Image Processing: Digital Images and Systems, RGB Color Spaces
and Color Filter Array Interpolation, Color Spaces , YCbCr Subsampled Color Spaces, Color
Balance and Correction, Image Histogram, Image Filtering, Image Filtering Using Fast
Convolution, Practical Applications, Experiments and Program Examples

Text book:

1. Real-Time Digital Signal Processing Implementations and Applications Second
Edition Sen M Kuo and others

Real Time Operating Systems

Unit I

Review of Operating Systems: What Operating Systems Do? , OperatingSystem Structure, OperatingSystem Operations, Process Management, Memory Management, Storage Management, Protection and Security, OperatingSystem Services, System Calls, Types of System Calls,Distributed Systems.

Introduction to Real Time

Operating Systems: A Brief History of Operating Systems, Defining an RTOS, the Scheduler,
Preemptive PriorityBased Scheduling, Key Characteristics of an RTOS.

Tasks: Defining a Task, Task States and Scheduling, Typical Task Operations, Typical Task
Structure, Synchronization, Communication, and Concurrency.

Unit II

Semaphores: Defining Semaphores**,** Typical Semaphore Operations, Typical Semaphore Use,
Message queues: Defining Message Queues, Message Queue States, Message Queue Content, Message Queue Storage, Typical Message Queue Operations, Typical Message Queue Use
Other kernel Objects: Pipes, Event Registers, Signals, Condition Variables
Timer and Timer Services: RealTime Clocks and System Clocks, Programmable Interval Timers,Timer Interrupt Service Routines, a Model for Implementing the SoftTimer Handling Facility,Timing Wheels,

Unit III

I/O sub system: Basic I/O Concepts, the I/O Sub system.
Memory Management: Dynamic Memory Allocation, Fixed Size Memory Management, Blocking vs. Non Blocking Memory Functions, Hardware Memory Management Units
Synchronization and Communication: Synchronization, Communication, Resource Synchronization Methods, Common Practical Design Patterns.

Text Books:

1. Abraham Silberschatz, Peter Baer Galvin, Burlington, Greg Gagne, "Operating System Concepts",8th edition, Wiley

2. Qing Li with Caroline Yao, "Real Time Concepts for Embedded Systems", Published by CMP

Books, 2011.

3. Jean J. Labrosse, "MicroC OS II, The Real Time Kernel", 2nd edition, CMP Books.

Internet of Things

Unit – I

Introduction to IoT: Definition and Characteristic of IoT, Physical Design of IoT, Things in IoT, Protocols in IoT, Logical Design of IoT, IoT Functional Blocks, IoT Communication Models, IoT Enabling Technologies, IoT Levels and Deployment Templates.
IoT and M2M: Domain specific IoTs, Machine-to-Machine systems, Difference between IoT and M2M, SDN and NFV for IoT
IoT system Management with NETCONF-YANG: Need for IoT Systems Management, SNMP, Network Operator Requirements, NETCONF, YANG, IoT system Management with NETCONFYANG.**(16 Hours)**

Unit – II

IoT Platforms Design Methodology: Purpose and Requirement Specification, Process Specification, Domain Model Soecification, Information Model Soecification, Service Specification, IoT Level Soecification, Functional View Specification, Operational View Specification, Device and Component Integration, Applciation Development.

IoT System Logical Design using Python: Python Data Types and Data Structures, Type Conversions, Control Flow, Functions, Modules, Packages, File Handling, Classes, Python Packages of Interest for IoT.

IoT physical Devices and End Points: Basic Building Blocks of an IoT, Device, Raspberry Pi Interfaces, Programming Raspberry Pi with Python, Other IoT Devices. **(16 Hours)**

Unit – III

Data Analytics for IoT: Apache Hadoop, Map Reduce Programming Model, Hadoop Map Reduce for Execution, Map Reduce Job Execution Workflow, Using Hadoop Map reduce for Batch Data Analysis, Hadoop YARN, Apachie Oozie, Apache Spark, Apache Storm, Using Apache Storm for Real-time Data Analysis, Structural Health Monitoring Case Study.

Tools for IoT: Chef, Chef Case Studies, Puppet, Puppet Case Study-Multi-Tier Deployment, NETCONF-YANG Case studies, IoT Cade Generator.
Case Studies Illustrating IoT Design: Smart Lighting, Home Intrusion Detection, Smart Parking,Weather Monitoring System, Weather Report Bot, Air Pollution Monitoring, Forest Fire, Detection, Smart Irrigation, IoT Printer. **(16 Hours)**

Text Book:

"Internet of Things: A Hands-on Approach", Arshdeep Bhaga and Vijay MAdisetti, VPT Publisher, First Edition, ISBN-978-0996025515.

First Semester PG Diploma Examination

EMBEDDED SYSTEM

(Paper Title)

(CBCS SCHEME)

Time: 3 Hours
Max. Marks : 70

The question paper shall have two parts (Part A and Part B).

Part A

Shall consist of 5 compulsory questions of 2 marks each. The questions shall be asked from all the three units.

Note:

1. Answer all questions. **(2 * 5 = 10)**

a)

b)

c)

d)

e)

Part B

Shall consist of 6 main questions (two questions from each unit) of 20 marks each. Each main question can be further subdivided by the examiner like 10 + 10 or 15 + 5 or 12 + 8 etc.

The student shall answer one full question from each unit in Part B.

Note: Answer the following: **(20 × 3 = 60)**

Q. No. 2 or Q. No. 3

Q. No. 4 or Q. No. 5

Q. No. 6 or Q. No. 7

Qualification for teachers to PG Diploma in Embedded System

Eligibility: Minimum Qualification for teachers: M Sc Electronics, M. Tech/ MS in subject related to Electronics.