DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY

CIRCULAR NO.SU/Sci./C.B.C. & G.S./P.G. Syll./39/2015

It is hereby inform to all concerned that, the revised Curriculum under **Choice Based Credit and Grading System** submitted by the various Ad-hoc Boards which are run at college level only and recommended by the Dean, Faculty of Science, the Hon'ble Vice-Chancellor has accepted the same on behalf of the Academic Council under Section-14[7] of the Maharashtra Universities Act, 1994 as under :-

[1]	M.Sc. Forensic Science Ist Year, Semester-I & II Progressively
[2]	M.Sc. Electronics Ist & IInd Year, Semester-I to IV Progressively
[3]	M.Sc. Industrial Automation Ist & IInd Year, Semester-I to IV Progressively [Under Innovative Programme of U.G.C.]
[4]	M.Sc. Industrial Chemistry Ist & IInd Year, Semester-I to IV Progressively
[5]	M.Sc. Herbal Technology Ist & IInd Year, Semester-I to IV Progressively [Under Innovative Programme of U.G.C.]
[6]	M.Sc. Biophysics Ist & IInd Year, Semester-I to IV Progressively
[7]	M.Sc. Bioinformatics Ist & IInd Year, Semester-I to IV Progressively
[8]	M.Sc. Plant Breeding & Molecular Genetics Ist & IInd Year, Semester-I to IV Progressively
[9]	M.Sc. Plant Biotechnology Ist & IInd Year, Semester-I to IV Progressively
[10]	M.Sc. Geology Ist & IInd Year, Semester-I to IV Progressively.

This is effective from the Academic Year 2015-16 & onwards as appended herewith.

All concerned are requested to note the contents of the circular and bring the notice to the students, teachers and staff for their information and necessary action.

University Campus, ★
Aurangabad-431 004. ★
REF.NO.SU/S.S./C.B.C. & G.S. / ★
P.G.Syll./2015/9896 - 10142 ★
Date:- 20-07-2015. ★
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Director,
Board of College and
University Development.

Copy forwarded with compliments to:-

1] The Principals, affiliated concerned colleges,
Dr. Babasaheb Ambedkar Marathwada University

Copy to :-

1] The Controller of Examinations,
2] The Director, [E-Suvidha Kendra], in-front of Registrar's Quarter, Dr. Babasaheb Ambedkar Marathwada University,
3] The Superintendent, [M.Sc. Unit],
4] The Programmer [Computer Unit-1] Examinations,
5] The Programmer [Computer Unit-2] Examinations,
6] The Record Keeper.

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S*/-030815/-

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad – 431001 (MS)

Structure and Curriculum

for

M. Sc. (ELECTRONICS) Programme

(Choice Based Credit System 80-20 pattern)

(Effective from June 2015 onwards)

Structure and Curriculum for M.Sc. (Electronics) Programme
(Credit Base 80-20 pattern)

The M.Sc. (Electronics) programme is divided into four semesters having **104 credits.** There are **14 theory courses** of **56 credits. There are 03 laboratory courses of 15 credits , 04 electronic product development of 29 credits and 01 seminar of 4 credits .** Tutorial, assignments and seminar presentation are integral components of all theory courses.

Eligibility:

Those who have completed B. Sc. with Electronics / Instrumentation / Industrial Automation as an optional subject or BE(Electrical / Electronics) from any recognized University/ Institution are eligible for registration subject to the rules and regulations laid down by Dr. Babasaheb Ambedkar Marathwada University, Aurangabad.

Admission / Promotion Process:

In response to the advertisement for registration, interested students will have to register themselves. Admission will be done on the basis of Common Entrance Test (CET) and performance of students at their qualifying graduate level examination.

Credit-to- contact hour Mapping:

One contact hour per week is assigned 1 credit for theory and 0.5 credits for laboratory courses/ research project.

Course Structure:

Semester I				
Course	**Course Title**	**Teaching time/week**	**Marks**	Credits
ELEC-111	Embedded Systems -I	4 hours	100	4
ELEC-112	PC Based Instrumentation	4 hours	100	4
ELEC-113	Industrial Power Electronics	4 hours	100	4
ELEC -114	Signal Conditioning Circuits	4 hours	100	4
ELEL- 121	Lab course 1: Based on ELEC112,113 & 114	10 hours	100	5
ELEL- 122	Electronic Product Development- I	10 hours	100	5
Total Credits for Semester I : 26 (Theory : 16 ; Laboratory : 10)				
Semester -II				
ELEC-211	Embedded System –II (PIC Microcontroller)	4 hours	100	4
ELEC-212	Biomedical Instrumentation	4 hours	100	4
ELEC-213	Industrial Monitoring and Control Systems	4 hours	100	4
ELEC-214	Wireless Communication Systems and Networks	4 hours	100	4
ELEL-221	Lab course 2: (Based on ELEC212,213 & 214)	10 hours	100	5
ELEL-222	Electronic Product Development- II	10 hours	100	5
Total Credits for Semester II : 26 (Theory : 16 ; Laboratory : 10)				
Semester - III				
ELEC-311	Smart Fusion Technology based System Design	4 hours	100	4
ELEC-312	Sensors and Actuators	4 hours	100	4
ELEC-313	PLC based Industrial Automation	4 hours	100	4
ELEC-314	ARM Microcontroller	4 hours	100	4
ELEL-321	Lab course 3: (Based on ELEC312,313)	10 hours	100	5
ELEL-322	Electronic Product Development- III	10 hours	100	5
Total Credits for Semester III : 26 (Theory : 16 ; Laboratory : 10)				

Semester IV				
ELEC-411	Project Management and Quality Standards	4 hours	100	4
ELEE-412	Elective-A:VLSI Design, Tools and Technology Elective-B: Mixed Signal SoC Design Elective-C: HMI, SCADA basics and Databases	4 hours	100	4
ELEL -421	Electronic Product Development- IV	28 hours	300	14
ELEL-422	Seminar based on Elective paper	8 hours	100	4
Total Credits for Semester IV : 26 (Theory : 08 ; Laboratory : 14 ; Seminar : 04)				
Total Credits : 104 (Sem I : 26 + Sem II : 26 + Sem III : 26 + Sem IV : 26)				

Attendance:

Students must have 75 % of attendance in each core, foundation, elective, laboratory and research project course for appearing examination otherwise he / she will not be allowed for appearing the examination of each course.

Evaluation Methods:

- **For all theory papers 80% (External) marks will be for semester end examination and 20% (internal) will be for Assignments, Tutorials , field work etc**

- **Assessment of laboratory courses, Electronic Product Development and seminar will at the end of each semester by external examiner.**

Semester – I

ELEC-111: Embedded System - I

Unit –I

1. 8051 Microcontroller

Introduction, Microcontrollers and Microcontrollers, history of microcontrollers, embedded versus external memory devices, 8-bit and 16-bit microcontrollers, CISC and RISC processors, Harvard and Von Neumann architecture, 8051 features, architecture, pin diagram, memory organization, external memory interfacing, stack.

2. Addressing Modes and Instruction Set

Instruction syntax, data types, subroutines, addressing modes, instruction timings, 8051 instructions, assembly language programming, time delay calculations, software development tools.

Unit –II

3. 8051 Parallel I/O Ports

Basic I/O concepts, port structure and operations, Interfacing push button, switches and LEDs, Interfacing matrix keyboard and seven segment display, Interfacing matrix keyboard and LCD, Interfacing DAC, Interfacing ADC, Interfacing stepper motor.

Unit –III

4. Interrupts, timers/counters and serial communications

Basics of interrupts, 8051 interrupt structure, Timers and counters, 8051 Timers/Counters, Timer/Counter operation modes, programming 8051 Timers/Counters, Data communication, basics of serial data communication, 8051 serial communication, serial communication modes, serial communication programming, RS232.

Unit –IV

5. RTOS & Inter-process Communication

Concepts of RTOS, Need of RTOS in Embedded systems, Multitasking, Task synchronization & Mutual Exclusion, Starvation, Deadlock, Multiple process, Basics of Inter-process Communication

Text/References Books -

1. 8051 Microcontroller – V.Udayashankara, M.S. Mallikarjunswamy , Tata McGraw-Hill
2. The 8051 Microcontroller and Embedded systems – M.A. Mazadi, J.G.Mazadi, R.D. McKinlay- Second edition –Pearson
3. Microcontrollers [Theory and Applications] – Ajay Deshmukh, TMH, New Delhi, 2009

ELEC-112: PC Based Instrumentation

Unit –I

1. Principles of Data acquisition
Sampling concept, digital to analog converters, Analog to digital converters, Data acquisition systems

Unit –II

2. Data acquisition using serial interface
Serial communication, serial interface standards, PC serial port, 8051 microcontroller interface, USB interface

Unit –III

3. Data acquisition using USB and IEEE
USB, IEEE1394

Unit –IV

4. Networked Data Acquisition
Network data communication, Local Area Networks, HART communication

Text/References Books -

1. PC-Based Instrumentation – N. Mathivanan –PHI
2. Operational Amplifiers
3. Digital Electronics

ELEC-113: Industrial Power Electronics

Unit –I

1. Introduction to power switching devices

Thyristor, Triac, MOSFET, IGBT their characteristics, internal structure, firing circuits, protection scheme including snubber, mounting requirements.

Unit –II

2. Phase Controlled Rectifiers

Single phase bridge rectifier with R, RL and RLE load, three phase semi-converter, three phase full-converter, dual converter, harmonic issues in controlled rectifiers.

Unit –III

3. Inverters

Single phase bridge inverter, three phase bridge inverter, 120 and 180 degree mode of operation, voltage and frequency control in inverters, different methods of PWM, harmonic elimination with PWM, performance parameters.

4. Introduction of UPS

Online and offline systems, UPS architecture, Battery bank management.

Unit –IV

5. DC - DC Converters

Principle of operation of buck, boost, buck-boost, Flyback, Input & output filter design.

6. AC voltage controllers

Single phase and three phase ac voltage controllers, harmonic performance, different topologies for three phase controllers.

Text/References Books -

1. NED MOHAN TORE. M. UNDELAND & WILLIAM. P. ROBBINS; "Power Electronics: Converters, Applications and Design", 3rd Edition, John Wiley and Sons, 2003
2. RASHID M. H, Power Electronics – Circuits, Devices and Applications", PHI / Pearson Education, 3rd Edition, 2004
3. B. K. BOSE: Power Electronics and AC drives, Prentice Hall, 1986
4. S. N. SINGH: Power Electronics

ELEC-114: Signal Conditioning Circuit Design

Unit –I

1. Components of Analog Signal Conditioning

Signal level and bias changes, linearization, conversion, filtering and impedance matching, concept of loading. Passive signal conditioners − voltage divider, Wheatstone bridge circuits (Current, Voltage, Balanced and Unbalanced), RC filters, and Active signal conditioners- op-amp based circuits. Standard Signals (Analog).

2. Operational Amplifier

Ideal and practical op-amp, Differential Amplifier-a.c. and d.c. analysis, improving voltage gain using active load etc, current sources, unbalanced op-amp frequency response and stabilizing unbalanced operation, circuit diagram of IC741 and working in detail, a.c. and d.c. characteristics, specifications, measurement of op-amp parameters.

Unit –II

3. Operational Amplifier Circuits in Instrumentation

Voltage follower, inverting and non-inverting Amplifier, Adder, Subtractor, Differential Amplifier, Instrumentation Amplifier, V to I and I to V converter with floating load and grounded load, Integrator, differentiator and compensated differentiator, Precision rectifier- half wave, full wave, absolute value circuits, clipping, clamping circuits, practical clamping circuits, sample and hold circuits, peak detectors, log amplifiers, temperature compensated log amplifier, antilog amplifier, multiplier, divider, comparator, threshold detector, zero crossing detector, window detector, Schmitt trigger, Active filters, Guidelines for analog signal conditioning design, design problems based on these guidelines.

UNIT –III

4. Components of Digital Signal Conditioning

Converters – ADC, DAC, V to F (LM331 and 555 timer) and F to V – Types and Structure, conversion, resolution and other characteristics. Characteristics of digital data- digitized value, sampled data system and linearization, Standard signals (Digital). Data acquisition system hardware, Data Logger

UNIT –IV

5. Transducer Signal Conditioning Design

Thermal sensor conditioning − design considerations and applications for RTD, Thermistor, thermocouple and solid state temperature sensors. Optical sensor conditioning-photoconductor, photovoltaic, photodiode, phototransistor, and photomultiplier tube, Optical encoder conditioning for linear displacement, linear velocity and angular displacement application

Other Sensors conditioning – Potentiometer, LVDT, strain gauges, piezoelectric transducers and capacitive transducers

Text/References Books -

1. Op-Amps and Linear Integrated circuits --- Ramakant .A.Gaikwad
2. Electronic Instrumentation – H.S.Kalsi

Semester – II

ELEC 211: Embedded System –II (PIC & AVR Microcontroller)

Unit –I

PIC 16F8XX Flash microcontrollers

Introduction, pin diagram, PIC reset actions, PIC oscillator connections, status register , PCON, option_reg, PIC 16F8XX program memory, PIC 16F8XX data memory, data EEPROM and Flash program EEPROM, Interrupts in 16F877, I/O Ports, Timer.

Unit –II

Interfacing and Industrial applications of Microcontroller

LED, push buttons, relays and latch connections, Interfacing of 7 segment display, LCD Interfacing, ADC and DAC Interfacing

Unit –III

AVR Microcontroller

AVR microcontroller Features, architecture, pin connections, AVR Fuse bits, Instruction set

Unit –IV

AVR Timer, counter, programming in C

Text/References Books -

1. Programming and customizing PIC Microcontroller- Myke Predko, 3rd edn.TMHMicrocontrollers : Theory and Applications – Ajay Deshmukh –TMH
2. Microchip PIC 16F8XX catalog from website www.microchip.com
3. AVR Microcontroller and Embedded Systems using Assembly and C – Muhammad Ali Mazidi, Samad Naimi, Sepehr **Naimi, Pearson 2014**

ELEC-212: Biomedical Electronics and Instrumentation

Unit –I

1. Bio-electric Signals and Electrodes

Basic Physics of membrane potential, resting membrane potential of nerves, nerve action potential, origin of bio-electric signals, recording electrodes, polarization, skin contact impedance, electrodes for ECG, electrodes for EEG, electrical conductivity of electrodes jellies and creams, microelectrodes.

Physiological Transducers

Signal characteristics from cardio-vascular system, pressure transducers, transducers for body temperature measurement, pulse sensors, respiration sensors.

Unit –II

2. Bio-medical Recorders

Electro-cardiograph, phonocardiograph, electroencephalograph, electromyography

3. Electrocardiography

Heart as potential source, characteristics of normal ECG, ECG waveforms, standard lead system, other ECG signals, ECG preamplifier, ECG readout devices, ECG machine

Unit –III

4. Physiological Pressure and other cardiovascular measurement and devices

Physiological pressure, pressure measurement, blood pressure measurement, oscillometric and ultrasonic noninvasive pressure measurement, direct method, pressure transducers, pressure amplifiers, typical calibration method, pressure amplifier design, ac carrier amplifier, systolic, diastolic and mean detector circuits, practical problems in pressure monitoring, cardiac output measurement, dilution method, right side heart pressure, blood flow measurement, phonocardiogram, vectorcardiogram, pacemaker.

Unit –IV

5. Instrumentation for measuring brain function

Brain parameters, instrumentation, cerebral angiographies, electroencephalography, EEG electrodes and 10-20 systems, EEG amplitudes and frequency bands, EEG diagnostic uses and sleep patterns, multi-channel EEG recording system, preamplifiers, EEG system specification.

Text/References Books -

1. **Handbook of Bio-medical Instrumentation – R.S. Khandpur, TMH, New Delhi**
2. **Introduction to Bio-medical equipment Technology- J.J Carr, Pearson Pvt.Ltd.**
3. **Bio-medical Electronics and Instrumentation- S.K.Venkata Ram, Galgotia pub.**
4. **Bio-medical Instrumentation – L.Cromwell, PHI, 1980**

ELEC-213: Industrial Monitoring and Control Systems

Unit –I

1. Temperature Measurement

Thermometers: Bimetallic strip, metal expansion type, mercury in glass, liquid thermometer, vapor pressure. Thermostat.RTD: Types- PT100, CU60, 2 wire, 3wire and 4 wire. Bare and Industrial RTD. Lead wire compensation. Self heating effect.Thermistors: Types: NTC, PTC, Thermocouples: characteristics, law of thermoelectricity, thermocouple tables, cold junction compensation methods, change of table reference construction and protection, thermowell, thermopile. Semiconductor temperature sensors: Diode and IC temp sensors. Ultrasonic temp detector, quartz crystal temp. detector. Radiation: Pyrometers (Total and Radiation)

Unit –II

2. Flow Measurement

Positive displacement flow meters. Bernoulli's theorem, Reynolds Number. Differential pressure type flow sensors: Orifice and their types, Venturi and Nozzle. Pressure taps Pitot tube, annubar Variable area meter (Rotameter). Turbine type flow meter, Electromagnetic flow type, ultrasonic flow meter, Vortex shedding type, mass flow meters, anemometers, flow totalizers and solid flow measurement.

Unit –III

3. Pressure measurement

Pressure scale and standards Manometers: U-tube, well type, inclined tube, ring balance and digital manometer. Elastic pressure sensors: Bellows, bourdon tubes, diaphragm. Secondary pressure sensors, Differential pressure measurements: Force balance type, motion balance type, capacitive (delta cell), ring balance, vibrating cylinder type. High-pressure sensors: Dead weight tester, Bulk modulus cell, Bridge man type (Pressure sensitive wires).Vacuum sensors: McLeod gauge, thermal conductivity (Pirani, Thermocouple gage) ionization types, molecular momentum gage, penning gage.

Unit –IV

4. Level measurement

Float, displacers, bubbler, and DP- cell, Ultrasonic, capacitive, microwave, radar, radioactive type, laser type transducers, level gages, resistance, thermal, TDR/ PDS type, solid level detectors, fiber optic level detectors.

Text/References Books -

1. Measurement Systems - E.O. Doebelin (4th Edition).
2. Process Control Instrumentation Technology - C.D. Johnson (5th Edition).
3. Process Measurement & analysis - B.G. Liptak (Vol-I)
4. Electronic Instruments & Measurement - A. K. Sawhney
5. Applied Instrumentation volume 2, William Andrews
6. Electronic Instruments and instrumentation Technology by M.M.S.Anand.,PHI
7. Electronic Instrumentation by H.S. Kalsi – TMH.

ELEC-214: Wireless Communication Systems and Networks

Unit –I

1. Wireless Telecommunication systems and networks

The history and evolution of wireless radio systems, development of modern telecommunication infrastructure, overview of existing network infrastructure, overview of OSI model, wireless network applications

Evolution and development of cellular telephone system

Generations of wireless cellular networks, 1G cellular system, 2G cellular system, 3G cellular system, 3G cellular system, 4G cellular system.

Unit –II

2. Common Cellular System Components

Common cellular system components, hardware and software views, 3G cellular system components, cellular component identification, cell establishment

Wireless Network architecture and operations: The cellular concept, cell fundamentals, capacity expansion techniques, cellular backhaul networks, mobile management, radio resources and power management, wireless network security

Unit –III

3. GSM, TDMA and CDMA Technology

Introduction to GSM and TDMA, GSM network and system architecture, GSM channel concept, GSM identities, GSM system operations, GSM infrastructure communication;TDMA systems, Introduction to CDMA, CDMA network and system architecture, CDMA channel concept, CDMA system operations, 3G CDMA

Unit –IV

4. Cellular wireless data networks

Introduction to mobile wireless data networks, CDPD, GPRS and EDGE data networks, CDMA data networks, Evolution to GSM to 3G, Evolution of CDMA to 3G. SMS,EMS,MMS and MIM services.

Text/References Books -

1. Introduction to Wireless Telecommunication Systems and Networks – Gary J. Mullett, Delmar Cengage learning, India Edition 2007
2. Wireless and Mobile Communication – Sanjeev Kumar, New Age Int.2008

Semester – III

ELEC-311: Smart Fusion Technology based System Design

Unit –I

1. Introduction to Fusion Technology

Concept of fusion and smart fusion technology, Antifuse, Static RAM, EPROM and EEPROM Technologies Logic modules 1, 2, 3. Shannons Expansion theorem, Multiplexor logic as function generator, ASIC Logic cell, Types of ASIC, ASIC design flow, Combinational, Sequential, Data paths, I/O cells, Cell Compilers

Unit –II

2. Architecture of Smart Fusion device

Introduction to customizable System-on-Chip (CSoC), Architecture of Smart Fusion Device, Block diagram of Smart Fusion A2F200M3F, Microcontroller Subsystem (MSS), Microcontroller Core, Programmable analog block, Programmable digital block, Programmable communication interfaces, FPGA fabric, : Clocking resources, SRAM , User I/Os, banks and standards . Review of evaluation board of Micro-semi cSoC.

Unit –III

3. Programmable Analog:

Features of programmable Analog Compute Engine (ACE), Analog Front End (AFE), Features of ADC, DAC, ABPS, Current monitor, Temperature Monitor, High-Speed comparator.

Development tools for Microsemi smart fusion device.

Re-configurability and dynamic re-configurability, concept of hardware software co-design, Design tools for smart fusion devices, design flow, Libero SoC, configuration of MSS, Simplify model, sim Softconsole.

Unit –IV

4. Programmable SoC design with smart fusion

Design of system for

a. Temperature measurement
b. Humidity Measurement
c. Mobile communication
d. Core of 8051 microcontroller

Text/References Books -

1. Application Specific Integrated Circuits, Michael Smith, Person Education Asia
2. Datasheet of SmartFusion Customizable System-on-Chip
3. SmartFusion Microcontroller Subsystem Users Guide
4. SmartFusion Programmable Analog Users Guide,

ELEC-312: Sensors and Actuators

Unit –I

1. Passive Electrical Transducers

Resistive transducer: Resistance thermometer, hot-wire transducer, displacement, strain, pressure, moisture, magnetic flux, optical radiation transducers.

Inductive transducers : Thickness, displacement, movable core, eddy current inductive transducers.

Capacitive transducers : Thickness, displacement and moisture transducers.

Unit –II

2. Active Electrical Transducers

Thermoelectric, piezoelectric, magnetostictive, hall effect, electromechanical, photoelectric, digital, electrochemical transducers.

3. Actuators : electromechanical, electro-thermal, electro-optical and electrochemical actuators, working principles, specifications and application examples, relays.

Unit –III

Electric motors

DC motors: Principle, rotary motion, control of field flux, counter electromotive force, armature reaction, motor selection, basic motor construction, motor classifications, coil terminal identification.

AC motors: Fundamental operation, stator construction and operation, types of AC motors

Servo motors: Brushless DC motors, stepper motors PM stepper motor, variable reluctance stepper motor, AC servo motors.

Unit –IV

4. Variable Speed drives :

DC Drives: Fundamentals, variable voltage DC drive, motor braking.

AC drives: Fundamentals, AC drive system, drive controller internal circuitry, circuit operation of AC drive.

Text/References Books -

1. Transducers and Instrumentation, 2nd Edition- D.V.S.Murty, PHI, 2010
2. Industrial Electronics – Terry Bartelt, DELMAR Cengage learning, 2006
3. Sensors & Trnsducers – Patranabis
4. Measurement Systems (Application & Design), E.D.Doebelin
5. Transducers & Instrumentation, Rangan Mani Sharma

ELEC-313: PLC based Industrial Automation

Unit –I

1. Introduction to Programmable Controllers

Industrial Motor Control circuits, Relay Ladder Logic Circuits, building a Ladder Diagram, Motor Control Starter Circuit, Rack Assembly, Power Supply, PLC Programming Unit, Input / Output Sections, Processor Unit, Addressing, Relationship of Data File Addresses to I/O Modules

Unit –II

2. Fundamental PLC Programming

PLC Program Execution, Ladder Diagram programming Language, Ladder Diagram Programming, Relay logic Instructions, Timer Instructions, Counter Instructions, Data Manipulation Instructions, Arithmetic Operations, Writing a Program.

Unit –III

3. Advanced Programming, PLC Interfacing and Troubleshooting

Jump Commands, Data Manipulations, Discrete Input / Output Modules, Troubleshooting I / O Interfaces, Analog Input and Output Signals, Special purpose Modules, Troubleshooting Programmable Controllers

Unit –IV

4. PID controllers

Control loop characteristics, process equation, process, lead, lag, self regulation, control system parameters, error, variable range, control parameter range, control lag, dead time, cycling, controller modes, ON-OFF control, proportional mode, integral and differential actions, P, PI, PID modes, Analog and digital PID controllers, open/ closed loop tuning of PID, Ziegler-Nicholas method.

Text/References Books -

1. Industrial Electronics- Circuits, Instruments and Control Techniques – Terry Bartelt, DELMAR, Cengage Learning India Pvt. Ltd.Delhi, 2009
2. Programmable Logic Controllers – Gary Dunning, Cengage learning, DELMAr-2006
3. Microprocessor-Based Process Control, C.D.Johnson,Prentice Hall Inc.New Jercy

ELEC-314: ARM Microcontroller

Unit –I

1. **ARM Embedded Systems**
   The RISC Design Philosophy, The ARM Design Philosophy, Embedded System Hardware, Embedded System Software
2. **ARM Processor Fundamentals**
   Registers, Current Program Status Register, Pipeline, Exceptions, Interrupts, and the Vector Table, Core Extensions, Architecture Revisions, ARM Processor Families

Unit –II

3. **Introduction to the ARM Instruction Set**
   Data Processing Instructions, Branch Instructions, Load-Store Instructions, Software Interrupt Instruction, Program Status Register Instructions, Loading Constants, ARMv5E Extensions, Conditional Execution

Unit –III

4. **Introduction to the Thumb Instruction Set**
   Thumb Register Usage, ARM-Thumb Interworking, Other Branch Instructions, Data Processing Instructions, Single-Register Load-Store Instructions, Multiple-Register Load-Store Instructions, Stack Instructions, Software Interrupt Instruction

Unit –IV

5. **Efficient C Programming**
   Overview of C Compilers and Optimization, Basic C Data Types, C Looping Structures, Register Allocation, Function Calls, Pointer Aliasing, Structure Arrangement, Bit-fields, Unaligned Data and Endianness, Division, Floating Point, Inline Functions and Inline Assembly, Portability Issues

6. **Writing and Optimizing ARM Assembly Code**
   Writing Assembly Code, Profiling and Cycle Counting, Instruction Scheduling, Register Allocation, Conditional Execution, Looping Constructs, Bit Manipulation, Efficient Switches, Handling Unaligned Data

Text/References Books -

1. ARM System Developer's Guide: Designing and Optimizing System Software – Andrew N. SLOSS, Dominic SYMES, Chris WRIGHT, **Elsevier**
2. ARM Assembly Language: Fundamentals and Techniques – William Hohl, **CRC Press**

Semester – IV

ELEC-411: PROJECT MANAGEMENT AND QUALITY STANDARDS

Unit –I

Introduction: Foundations of Project Management, Project Life Cycle, Project Environment, Project Selection, Project Proposal, Project Scope, Work Breakdown Structure, documentation.

Unit –II

Project Monitoring, Control and Costing: Critical Path Method, Program Evaluation & Review Technique, Planning and Scheduling of Activity Networks, Assumptions in PERT Modeling, Time-cost Trade-offs, Estimation of Project Costs, Monitoring Project Progress, Project Appraisal and Selection, Recent Trends in Project Management, Introduction to project management software

Unit –III

Quality Systems: Introduction to ISO, TQM and 6σ, Quality Systems Standards, Quality functions & functions-various definitions such as quality function, quality measurement, quality costs. Quality in production, design, marketing etc. Quality conduit, SQC, quality assurance, total quality control

Unit –IV

TQM & ISO

TQM- Introduction, history, principles, Quality policy, Quality system, Quality management, TQM system & models, Essentials of TQM, ISO 9000 quality management system, ISO 9000 elements, applications and benefits. Zero defect. Implementation registration & certification for ISO 9000, Case studies on TQM

Text/References Books -

1. LIPTAK: Process Control Handbook
2. ANDREWS: Applied Instrumentation in Process Industries
3. TAPAN BAGCHI: ISO-9000 Concepts, Methods and Implementation, WHEELER
4. ISO-9000 Guidelines for the process industries
5. N. LOGO THETIS, “Managing for total quality”-Prentice Hall of India Pvt. Ltd.-1997.
6. JOEL E. ROSS, “Total Quality Management”-Varity Book International, New delhi-1995.
7. S.M. SUNDAVA RAJU, “Total Quality Management”-Tata Mc Graw Hill Publishing Co. P. Ltd, New Delhi-1995.
8. A.N.SINGH, “reparation, Implementation & Registration of ISO 9000 Quality System”-Dolphin Books, New Delhi-1993.

ELEE-412: Elective

Elective- A: VLSI Design, Tools and Technology

Unit –I

1. MOS Technology and Techniques

MOS technology and VLSI, process parameters and considerations for BJT, MOS and CMOS, electrical properties of MOS circuits and device modeling

Unit –II

2. MOS circuit design process

MOS layers, stick diagram, layout diagram, propagation delays, examples of combinational logic design, sealing of MOS circuits.

Unit –III

3. Digital circuits and systems

Programmable logic array (PLA) and finite stste machine, design of ALUs, Memories and Registers

Unit –IV

4. Analog VLSI and high speed VLSI

Introduction to analog VLSI, realization neural networks and switched capacitor filters, sub-micron technology and GaAs VLSI technology

Hardware Description Language

VHDL background and basic concept, structural specification of hardware design, organization and parameterization.

Text/References Books -

1. Basic VLSI Design Systems and Circuits – Douglas A, Pucknell and Karmran, PHI 1993
2. Modern VLSI Design , 2nd Edition- Wayne Wolf , Prentice Hall, 1998
3. VLSI Design Technology for Analog and Digital Circuits- Randall L Geiger and P E Allen, McGraw Hill International 1990
4. Introduction to VLSI Design- Fabricious E, McGraw Hill 1990
5. The Designer's Guide to VHDL- Peter J. Ashenden, Harcourt Asia Private limited 1996.
6. A VHDL Primer- J.Bhaskar, Addison Wesley, 1999.

Elective -B: Mixed Signal SoC Design

Unit –I

1: Mixed-signal embedded SoC architectures

Basic of CMOS and BiCMOS transistor, Op-Amp design. Concept of mixed signal design. Design Issues of Mixed Signal VLSI, Mixed-signal SoC ,architectures. Microcontroller M8C core. Instruction set. RAM and flash memory system. I/Os. System buses. Interrupt subsystem. Interrupt Service Routine (ISR). Boot program, Static & Dynamic reconfiguration.

Programmable Digital subsystem

Performance improvement through architecture customization. Profiling. Performance profiling. PSoC programmable digital building blocks (timers, counters, CRC generator, PWM). Data communication in embedded systems. Serial communication using SPI and UART.

Unit –II

2 : Continuous Time analog building blocks

Basics of continuous time analog circuits. Presentation of basic building blocks, i.e., ideal op amps, comparators, PGA, Instrumentation amplifier, integrators, etc.

Switched-capacitor analog building blocks

Basics of switched capacitor analog circuits. Presentation of basic building blocks, i.e., ideal op amps, comparators, gain, integrators, etc. Application of Switch-Capacitor circuits.

Unit –III

3: Delta-Sigma Analog to digital converters

Basics of Delta-Sigma converters (DS). Sampling. Quantization. Oversampling. Noise shaping. Performance of DS ADC. First-order DS ADC. Second-order DS ADC. Implementation using PSoC. Impact of circuit nonidealities on ADC performance.

Unit –IV

4: Design of Mixed signal based system

Design of mixed signal based system for

a) Temperature, Humidity and CO2 measurement

b) Interfacing of PIR sensor

c) Touch sensing

Text/References Books -

1. Introduction to Mixed signal, Embedded Design A. N. Doboli and E. H Currie Cypress semiconductor corporation (2007)
2. Designers Guide to the Cypress PSoC by Robert Ashby Elsevier
3. CMOS Circuit design, Layout and Simulation, R. J. Baker, WSE, Willey (2009)

Elective- C: HMI, SCADA basics and Databases

Unit –I

1. Plant wide Control Systems and Automation Strategy, Evolution of instrumentation and control, Role of automation in industries, Benefits of automation, Introduction to automation tools PLC, DCS, SCADA, Hybrid DCS/PLC, Automation strategy evolution, Control system audit, performance criteria, Safety Systems.

Advance Applications of PLC and SCADA, PLC programming methods as per IEC 61131, PLC applications for batch process using SFC, Analog Control using PLC, PLC interface to SCADA/DCS using communication links (RS232, RS485) and protocols (Modbus ASCII/RTU)

Unit –II

2. Instrumentation Standard Protocols: HART Protocol introduction, frame structure, programming, implementation examples, Benefits, Advantages and Limitations. Foundation Fieldbus H1 introduction, structure, programming, FDS configuration, implementation examples, Benefits, Advantages and Limitations. Comparison with other fieldbus standards including Device net, Profibus, Control net, CAN, Industrial Ethernet etc.

Unit –III

3. MMI/HMI Human Machine Interface: MMI- Introduction of MMI, application of MMI, types of MMI, selection of MMI, h/w of MMI, cable of MMI , ports of MMI, programming s/w of MMI, key field, changing the set points of timer, changing the set points of counter, use of user define function keys, display of outputs, display of faults, display of timer current value. Interfacing with PLC.

Unit –IV

4. SCADA (Wonder ware, Win cc, Intellection or RSview 32): Introduction to SCADA, configuration of different drivers, gateway. Database of tags and its use. Interfacing with PLC and simulation of PLC application in SCADA. selection of SCADA s/w, programming cable of SCADA, creating new SCADA application, crating & editing graphic display, crating & editing elementary graphic, creating data base of tags, start stop command, drivers of SCADA s/w, configuration of drivers file in s/w, communication of SCADA s/w, data entry, analog entry, connectivity between s/w

Text/References Books -

1) Applied Instrumentation in the process Industries, Volume I, Andrew and Williams Gulf Publishing Company Second Edition
2) Programmable Logic Controllers by Garry Dunning, 3rd Ed, PHI Pub. 2004.
3) Control Valve Handbook by ISA
4) Distributed Computer Control for Industrial Automation, Poppovik Bhatkar, Dekkar Publications.
5) Programmable Logic Controllers: Principles and Applications, Webb and Reis, PHI.
6) Computer Aided Process Control, S.K.Singh, PHI
7) The Management of Control System: Justification and Technical Auditing, N.E.Battikha, ISA
8) Computer Based Process Control, Krishna Kant, PHI