ENGINEERING MATHEMATICS – III

Sub Code	**:**	**10MAT31**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT-1

Fourier series

Convergence and divergence of infinite series of positive terms, definition and illustrative examples*

Periodic functions, Dirichlet's conditions, Fourier series of periodic functions of period 2π and arbitrary period, half range Fourier series. Complex form of Fourier Series. Practical harmonic analysis.

7 Hours

UNIT-2

Fourier Transforms

Infinite Fourier transform, Fourier Sine and Cosine transforms, properties, Inverse transforms

6 Hours

UNIT-3

Application of PDE

Various possible solutions of one dimensional wave and heat equations, two dimensional Laplace's equation by the method of separation of variables, Solution of all these equations with specified boundary conditions. D'Alembert's solution of one dimensional wave equation.

6 Hours

UNIT-4

Curve Fitting and Optimisation

Curve fitting by the method of least squares- Fitting of curves of the form $y = ax+b,\quad y=a\,x^2 + b\,x+c,\ y = a\,e^{bx},\ y = ax^b$

Optimization: Linear programming, mathematical formulation of linear programming problem (LPP), Graphical method and simplex method.

7 Hours

PART-B

UNIT-5

Numerical Methods - 1

Numerical Solution of algebraic and transcendental equations: Regula-falsi method, Newton - Raphson method. Iterative methods of solution of a system of equations: Gauss-seidel and Relaxation methods. Largest eigen value and the corresponding eigen vector by Rayleigh's power method.

6 Hours

UNIT-6

Numerical Methods – 2

Finite differences: Forward and backward differences, Newton's forward and backward interpolation formulae. Divided differences - Newton's divided difference formula, Lagrange's interpolation formula and inverse interpolation formula.

Numerical integration: Simpson's one-third, three-eighth and Weddle's rules (All formulae/rules without proof)

7 Hours

UNIT-7

Numerical Methods – 3

Numerical solutions of PDE – finite difference approximation to derivatives, Numerical solution of two dimensional Laplace's equation, one dimensional heat and wave equations

7 Hours

UNIT-8

Difference Equations and Z-Transorms

Difference equations: Basic definition; Z-transforms – definition, standard Z-transforms, damping rule, shifting rule, initial value and final value theorems. Inverse Z-transform. Application of Z-transforms to solve difference equations.

6 Hours

Note: * In the case of illustrative examples, questions are not to be set.

TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Latest edition, Khanna Publishers.
2. Erwin Kreyszig, Advanced Engineering Mathematics, Latest edition, Wiley Publications.

REFERENCE BOOKS:

1. B.V. Ramana, Higher Engineering Mathematics, Latest edition, Tata Mc. Graw Hill Publications.
2. Peter V. O'Neil, Engineering Mathematics, CENGAGE Learning India Pvt Ltd.Publishers.

ANALOG ELECTRONIC CIRCUITS
(Common to EC/TC/EE/IT/BM/ML/EI)

Sub Code	**:**	**10ES32**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT 1:

Diode Circuits: Diode Resistance, Diode equivalent circuits, Transition and diffusion capacitance, Reverse recovery time, Load line analysis, Rectifiers, Clippers and clampers. **6 Hours**

UNIT 2:

Transistor Biasing: Operating point, Fixed bias circuits, Emitter stabilized biased circuits, Voltage divider biased, DC bias with voltage feedback, Miscellaneous bias configurations, Design operations, Transistor switching networks, PNP transistors, Bias stabilization. **6 Hours**

UNIT 3:

Transistor at Low Frequencies: BJT transistor modeling, CE Fixed bias configuration, Voltage divider bias, Emitter follower, CB configuration, Collector feedback configuration, Analysis of circuits r_e model; analysis of CE configuration using h- parameter model; Relationship between h-parameter model of CE,CC and CE configuration. **7 Hours**

UNIT 4:

Transistor Frequency Response: General frequency considerations, low frequency response, Miller effect capacitance, High frequency response, multistage frequency effects. **7 Hours**

PART – B

UNIT 5:

(a) General Amplifiers: Cascade connections, Cascode connections, Darlington connections. **3 Hours**

(b) Feedback Amplifier: Feedback concept, Feedback connections type, Practical feedback circuits. Design procedures for the feedback amplifiers. **4 Hours**

UNIT 6:

Power Amplifiers: Definitions and amplifier types, series fed class A amplifier, Transformer coupled Class A amplifiers, Class B amplifier operations, Class B amplifier circuits, Amplifier distortions. Designing of Power amplifiers. **7 Hours**

UNIT 7:

Oscillators: Oscillator operation, Phase shift Oscillator, Wienbridge Oscillator, Tuned Oscillator circuits, Crystal Oscillator. (BJT Version Only) Simple design methods of Oscillators. **6 Hours**

UNIT 8:

FET Amplifiers: FET small signal model, Biasing of FET, Common drain common gate configurations, MOSFETs, FET amplifier networks.

6 Hours

TEXT BOOK:

1. **"Electronic Devices and Circuit Theory",** Robert L. Boylestad and Louis Nashelsky, PHI/Pearson Education. 9^{TH} Edition.

REFERENCE BOOKS:

1. **'Integrated Electronics',** Jacob Millman & Christos C. Halkias, Tata - McGraw Hill, 2nd Edition, 2010.
2. **"Electronic Devices and Circuits",** David A. Bell, PHI, 4th Edition, 2004.
3. "**Analog Electronics Circuits: A Simplified Approach"**, U.B. Mahadevaswamy, Pearson/Saguine, 2007.

LOGIC DESIGN
(Common to EC/TC/EE/IT/BM/ML/EI)

Sub Code	**:**	**10ES33**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

UNIT 1:

Principles of combinational logic-1: Definition of combinational logic, Canonical forms, Generation of switching equations from truth tables, Karnaugh maps-3, 4 and 5 variables, Incompletely specified functions (Don't Care terms), Simplifying Max term equations. **6 Hours**

UNIT 2:

Principles of combinational Logic-2: Quine-McCluskey minimization technique- Quine-McCluskey using don't care terms, Reduced Prime Implicant Tables, Map entered variables. **7 Hours**

UNIT 3:

Analysis and design of combinational logic - I: General approach, Decoders-BCD decoders, Encoders. **6 Hours**

UNIT 4:

Analysis and design of combinational logic - II: Digital multiplexers-Using multiplexers as Boolean function generators. Adders and subtractors-Cascading full adders, Look ahead carry, Binary comparators. Design methods of building blocks of combinational logics.

7 Hours

PART – B

UNIT 5:

Sequential Circuits – 1: Basic Bistable Element, Latches, SR Latch, Application of SR Latch, A Switch Debouncer, The $\overline{S}\,\overline{R}$ Latch, The gated SR Latch, The gated D Latch, The Master-Slave Flip-Flops (Pulse-Triggered Flip-Flops): The Master-Slave SR Flip-Flops, The Master-Slave JK Flip-Flop, Edge Triggered Flip-Flop: The Positive Edge-Triggered D Flip-Flop, Negative-Edge Triggered D Flip-Flop. **7 Hours**

UNIT 6:

Sequential Circuits – 2: Characteristic Equations, Registers, Counters - Binary Ripple Counters, Synchronous Binary counters, Counters based on Shift Registers, Design of a Synchronous counters, Design of a Synchronous Mod-6 Counter using clocked JK Flip-Flops Design of a Synchronous Mod-6 Counter using clocked D, T, or SR Flip-Flops **7 Hours**

UNIT 7:

Sequential Design - I: Introduction, Mealy and Moore Models, State Machine Notation, Synchronous Sequential Circuit Analysis and Design.

6 Hours

UNIT 8:

Sequential Design - II: Construction of state Diagrams, Counter Design.

6 Hours

TEXT BOOKS:

1. **"Digital Logic Applications and Design"**, John M Yarbrough, Thomson Learning, 2001.
2. **"Digital Principles and Design ",** Donald D Givone, Tata McGraw Hill Edition, 2002.

REFERENCE BOOKS:

1. **"Fundamentals of logic design",** Charles H Roth, Jr; Thomson Learning, 2004.
2. **"Logic and computer design Fundamentals",** Mono and Kim, Pearson, Second edition, 2001.
3. **"Logic Design",** Sudhakar Samuel, Pearson/Saguine, 2007

NETWORK ANALYSIS
(Common to EC/TC/EE/IT/BM/ML/EI)

Sub Code	**:**	**10ES34**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT 1:

Basic Concepts: Practical sources, Source transformations, Network reduction using Star – Delta transformation, Loop and node analysis With linearly dependent and independent sources for DC and AC networks, Concepts of super node and super mesh. **7 Hours**

UNIT 2:

Network Topology: Graph of a network, Concept of tree and co-tree, incidence matrix, tie-set, tie-set and cut-set schedules, Formulation of equilibrium equations in matrix form, Solution of resistive networks, Principle of duality**.** **7 Hours**

UNIT 3:

Network Theorems – 1: Superposition, Reciprocity and Millman's theorems. **6 Hours**

UNIT 4:

Network Theorems - II:

Thevinin's and Norton's theorems; Maximum Power transfer theorem **.** **6 Hours**

PART – B

UNIT 5: Resonant Circuits: Series and parallel resonance, frequency-response of series and Parallel circuits, Q –factor, Bandwidth.

7 Hours

UNIT 6:

Transient behavior and initial conditions: Behavior of circuit elements under switching condition and their Representation, evaluation of initial and final conditions in RL, RC and RLC circuits for AC and DC excitations.

7 Hours

UNIT 7:

Laplace Transformation & Applications : Solution of networks, step, ramp and impulse responses, waveform Synthesis. **6 Hours**

UNIT 8:

Two port network parameters: Definition of z, y, h and transmission parameters, modeling with these parameters, relationship between parameters sets. **6 Hours**

TEXT BOOKS:

1. **"Network Analysis",** M. E. Van Valkenburg, PHI / Pearson Education, 3rd Edition. Reprint 2002.
2. **"Networks and systems",** Roy Choudhury, 2nd edition, 2006 re-print, New Age International Publications.

REFERENCE BOOKS:

1. **"Engineering Circuit Analysis",** Hayt, Kemmerly and DurbinTMH 7th Edition, 2010
2. **"Basic Engineering Circuit Analysis"**, J. David Irwin / R. Mark Nelms, John Wiley, 8th ed, 2006.
3. 3.**" Fundamentals of Electric Circuits"**, Charles K Alexander and Mathew N O Sadiku, Tata McGraw-Hill, 3 ed, 2009.

ELECTRONIC MEASUREMENTS

Sub Code	**:**	**10EI35**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

UNIT – 1:

Introduction

(a) Measurement System & Errors: Measurements, Significance of measurements, methods of measurements, instruments and measurement systems, Functions of instruments and measurement systems, Applications of measurement systems. Gross errors and systematic errors, Absolute and relative errors, Basic concepts of accuracy, Precision, Resolution and Significant figures, Measurement error combinations.

(b) Multimeters: Introduction, DC voltmeter, DC ammeter, Multirange voltmeter, Extending voltmeter ranges, Loading, AC voltmeter using Rectifiers – Half wave and full wave, Peak responding and True RMS voltmeters.

07 Hrs

UNIT – 2:

Digital Instruments

Digital Voltmeters – Introduction, DVM's based on V–T, V–F and Successive approximation principles, Resolution and sensitivity, General specifications, Digital Multi-meters, Digital frequency meters, Digital measurement of time.

06 Hrs

UNIT – 3:

Oscilloscopes

Introduction, Basic principles, CRT features, Block diagram and working of each block, Typical CRT connections, Dual beam and dual trace CROs, Electronic switch, measurement of frequency by Lissajous method, Sampling and digital storage oscilloscopes.

07 Hrs

UNIT – 4:

Instrument Calibration

Introduction, comparison methods, digital multimeters as standard instruments, calibration instruments, potentiometers, potentiometer calibration methods.

06 Hrs

PART – B

UNIT – 5:

Signal Generators

Introduction, Fixed and variable AF oscillator, Standard signal generator, Laboratory type signal generator, AF sine and Square wave generator, Function generator, Square and Pulse generator, Sweep frequency generator, Frequency synthesizer.

06 Hrs

UNIT – 6:

Bridge Circuits for Measurement of R, L & C:

Introduction, Wheatstone's bridge, Kelvin Bridge; AC bridges, Capacitance Comparison Bridge, inductance Comparison Bridge, Maxwell's bridge, Hay Bridge, Schearing Bridge, Wien Bridge, Wagner ground connection.

07 Hrs

UNIT – 7:

Opto Electronic Measurement

Optical spectrum, Luminosity curve, optical transducer, optical sources, optical detectors: Photodiode, photo transistor, photo voltaic cells, thermal sensors.

Signal Analyzer: Wave analyzer- frequency selective wave analyzer, heterodyne wave analyzer, applications of wave analyzers. Harmonic distortion analyzers.

Spectrum Analyzer: Basic Spectrum analyzer, spectral displays, spectra of different signals.

07 Hrs

UNIT – 8:

Display Devices and Recorders: Introduction, electrical indicating instruments, digital instruments, digital display methods, digital display unit.

Segmental Displays: Seven segmental display, dot matrices, LED, LCD, decade counting assemblies, display systems.

Recorders: Recording requirements, analog recorders- Graphic recorders- strip chart recorders & its types, X-Y recorder, Magnetic & Digital tape recorders.

06 Hrs

Note: Wherever needed, numerical problems are to be solved in all units

TEXT BOOKS:

1. "Electronic Instrumentation", H. S. Kalsi, TMH, 2004
2. "Electronic Instrumentation and Measurements", David A Bell, PHI / Pearson Education, 2006.
3. "Electrical and Electronic Measurements and Instrumentation", A K Sawhney, 9th Edition, Dhanpat Rai & Sons, 2004.

REFERENCE BOOKS:

1. "Principles of measurement systems", John P. Beately, 3rd Edition, Pearson Education, 2000
2. "Modern electronic instrumentation and measuring techniques", Cooper D & A D Helfrick, PHI, 1998.

TRANSDUCERS AND INSTRUMENTATION

Sub Code	**:**	**10EI36**	**IA MARKS**	**: 25**
Hrs/Week	**:**	**04**	**Exam Hours**	**: 03**
Total Hrs	**:**	**52**	**Exam Marks**	**:100**

PART-A

Unit-1:

Introduction: Measurements, Monitoring, Control & Analysis Instruments: Transducer, Signal Conditioner & Transmitter, Display/Recording device.

Classification and Functional Elements of Instrument/measurement system:

Mechanical, electrical and electronic instruments, Deflection and Null type instruments, Analog and digital modes of operation, Elements of generalized measurement system, Input-output configuration of measuring instruments and measurement systems, methods of correction for interfering and modifying inputs.

07 Hrs.

Unit-2:

Static and Dynamic Characteristics: Static calibration and error calibration curve, Accuracy and Precision, indications of precision, Sensitivity, scale range and scale span, Reproducibility and drift, static error, dead zone, Linearity, Threshold, Resolution, Hysteresis, Dead zone and dead time, signal to noise ratio, selection of transducers.

Dynamic response, Introduction to time domain and frequency domain analysis

06 Hrs.

Unit-3:

Measurement of Displacement: Introduction, Principles of Transduction, Variable resistance devices, variable Inductance Transducer, Induction Potentiometers, Variable Capacitance Transducer, Hall Effect Devices, Proximity Devices, Digital Transducer.

06 Hrs.

Unit-4:

Measurement of Strain: Introduction, Factors affecting strain measurements, Types of Strain Gauges, Theory of operation of resistance strain gauges, Types of Electrical Strain Gauges, Materials for Strain Gauges, Gauging Techniques and other factors, Strain gauge Circuits, Temperature Compensation, Application.

07 Hrs

PART-B

Unit-5:

Measurement of Temperature: Introduction, temperature scales, mechanical temperature sensors, resistance-type temperature sensors, resistance-type temperature sensors, platinum resistance thermometer, thermistors, thermocouples, solid-state sensors, Quartz thermometer, Temperature measurement by radiation methods, optical pyrometer, calibration of thermometers.

07 Hrs.

Unit-6:

Measurement of Pressure: Introduction, Diaphragms, other elastic elements, transduction methods, force balance transducer, solid-state devices, thin-film pressure transducers, piezo-electric pressure transducer, pressure multiplexer, pressure calibration.

06 Hrs.

Unit-7:

Measurement of Level:

Capacitance probes, conductivity probes, diaphragm level detector, differential pressure level detector, float level devices, level gauges, optical level switches, radiation level sensor, ultrasonic level detector, thermal level sensors.

07 Hrs.

Unit-8:

Miscellaneous Sensors: Energy management Devices, Leak Detectors, Metal Detectors, Noise Sensors, Speed Sensors, Thickness Measurement, Weather Stations, pH sensors.

06 Hrs.

Note: Wherever needed, numerical problems are to be solved in all units

Text Books:

1. Electrical and Electronic Measurements and Instrumentation - A K Sawhney, 9th Edition, Dhanpat Rai & Sons, 2004.
2. Instrumentation Devices and Systems- C.S.Rangan, G.R.Sharma, V.S.V.Mani, Tata McGraw Hill.
3. Process Measurement Instrument Engineers Handbook- Bela G.Liptak, Chilton Book Company.

Reference Books:

1. Introduction to Instrumentation and Control-A.K.Ghosh, PHI.
2. Instrumentation Measurement and Analysis- B.C.Nakra, K.K.Choudhry.
3. Measurement Systems Application and design- Ernest O.Doeblin-Tata McGraw Hill.

ANALOG ELECTRONICS LAB
(Common to EC/TC/EE/IT/BM/ML/EI)

Sub Code	**:**	**10ESL37**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**03**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**42**	**Exam Marks**	**:**	**50**

NOTE: Use the Discrete components to test the circuits. LabView can be used for the verification and testing along with the above.

1. Wiring of RC coupled Single stage FET & BJT amplifier and determination of the gain-frequency response, input and output impedances.

2. Wiring of BJT Darlington Emitter follower with and without bootstrapping and determination of the gain, input and output impedances (Single circuit) (One Experiment)

3. Wiring of a two stage BJT Voltage series feed back amplifier and determination of the gain, Frequency response, input and output impedances with and without feedback (One Experiment)

4. Wiring and Testing for the performance of BJT-RC Phase shift Oscillator for $f_0 \leq 10$ KHz

5. Testing for the performance of BJT – Hartley & Colpitts Oscillators for RF range $f_0 \geq 100$KHz.

6. Testing for the performance of BJT -Crystal Oscillator for $f_0 > 100$ KHz
7 Testing of Diode clipping (Single/Double ended) circuits for peak clipping, peak detection

8. Testing of Clamping circuits: positive clamping /negative clamping.
9. Testing of a transformer less Class – B push pull power amplifier and determination of its conversion efficiency.

10. Testing of Half wave, Full wave and Bridge Rectifier circuits with and without Capacitor filter. Determination of ripple factor, regulation and efficiency

11. Verification of Thevinin's Theorem and Maximum Power Transfer theorem for DC Circuits.

12. Characteristics of Series and Parallel resonant circuits.

LOGIC DESIGN LAB
(Common to EC/TC/EE/IT/BM/ML/EI)

Sub Code	**:**	**10ESL38**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**03**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**42**	**Exam Marks**	**:**	**50**

NOTE: Use discrete components to test and verify the logic gates. LabView can be used for designing the gates along with the above.

1. Simplification, realization of Boolean expressions using logic gates/Universal gates.
2. Realization of Half/Full adder and Half/Full Subtractors using logic gates.
3. (i) Realization of parallel adder/Subtractors using 7483 chip
   (ii) BCD to Excess-3 code conversion and vice versa.
4. Realization of Binary to Gray code conversion and vice versa
5. MUX/DEMUX – use of 74153, 74139 for arithmetic circuits and code converter.
6. Realization of One/Two bit comparator and study of 7485 magnitude comparator.
7. Use of a) Decoder chip to drive LED display and b) Priority encoder.
8. Truth table verification of Flip-Flops: (i) JK Master slave (ii) T type and (iii) D type.
9. Realization of 3 bit counters as a sequential circuit and MOD – N counter design (7476, 7490, 74192, 74193).
10. Shift left; Shift right, SIPO, SISO, PISO, PIPO operations using 74S95.
11. Wiring and testing Ring counter/Johnson counter.
12. Wiring and testing of Sequence generator.

IV SEMESTER
ENGINEERING MATHEMATICS - IV

Sub Code	**:**	**10MAT41**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

Unit-1:
NUMERICAL METHODS - 1

Numerical solution of ordinary differential equations of first order and first degree; Picard's method, Taylor's series method, modified Euler's method, Runge-kutta method of fourth-order. Milne's and Adams - Bashforth predictor and corrector methods (No derivations of formulae).

[6 hours]

Unit-2:
NUMERICAL METHODS – 2

Numerical solution of simultaneous first order ordinary differential equations: Picard's method, Runge-Kutta method of fourth-order. Numerical solution of second order ordinary differential quations: Picard's method, Runge-Kutta method and Milne's method.

[6 hours]

Unit-3:
Complex Variables – 1

Function of a complex variable, Analytic functions-Cauchy-Riemann equations in cartesian and polar forms. Properties of analytic functions. Application to flow problems- complex potential, velocity potential, equipotential lines, stream functions, stream lines.

[7 hours]

Unit-4: Complex Variables – 2

Conformal Transformations: Bilinear Transformations. Discussion of Transformations:
$w = z2$, $w = ez$, $w = z + (a2 / z)$. Complex line integrals- Cauchy's theorem and Cauchy's integral formula.

[7 hours]

PART-B

Unit-5:
SPECIAL FUNCTIONS
Solution of Laplace equation in cylindrical and spherical systems leading Bessel's and Legendre's differential equations, Series solution of Bessel's differential equation leading to
Bessel function of first kind. Orthogonal property of Bessel functions. Series solution of Legendre's differential equation leading to Legendre polynomials, Rodrigue's formula.

[7 hours]

Unit-6:
PROBABILITY THEORY - 1
Probability of an event, empherical and axiomatic definition, probability associated with set theory, addition law, conditional probability, multiplication law, Baye's theorem.

[6 hours]

Unit-7:
PROBABILITY THEORY- 2
Random variables (discrete and continuous), probability density function, cumulative density function. Probability distributions – Binomial and Poisson distributions; Exponential and normal distributions.

[7 hours]

Unit-8:
SAMPLING THEORY
Sampling, Sampling distributions, standard error, test of hypothesis for means, confidence limits for means, student's t distribution. Chi -Square distribution as a test of goodness of fit.
[6 hours]

Text Books:
1. B.S. Grewal, Higher Engineering Mathematics, Latest edition, Khanna Publishers
2. Erwin Kreyszig, Advanced Engineering Mathematics, Latest edition, Wiley Publications.
Reference Book:
1. B.V. Ramana, Higher Engineering Mathematics, Latest edition, Tata Mc. Graw Hill Publications.

2. Peter V. O'Neil, Engineering Mathematics, CENGAGE Learning India Pvt Ltd.Publishers

MICROCONTROLLERS
(Common to EC/TC/EE/IT/BM/ML/EI)

Sub Code	**:**	**10ES42**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT 1:
Microprocessors and microcontroller. Introduction, Microprocessors and Microcontrollers, RISC & CISC CPU Architectures, Harvard & Von-Neumann CPU architecture, Computer software.
The 8051 Architecture: Introduction, Architecture of 8051, Pin diagram of 8051, Memory organization, External Memory interfacing, Stacks.

6 Hours

UNIT 2:
Addressing Modes: Introduction, Instruction syntax, Data types, Subroutines, Addressing modes: Immediate addressing , Register addressing, Direct addressing, Indirect addressing, relative addressing, Absolute addressing, Long addressing, Indexed addressing, Bit inherent addressing, bit direct addressing.
Instruction set: Instruction timings, 8051 instructions: Data transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Subroutine instructions, Bit manipulation instruction.

6 Hours

UNIT 3:
8051 programming: Assembler directives, Assembly language programs and Time delay calculations. **6 Hours**

UNIT 4:
8051 Interfacing and Applications: Basics of I/O concepts, I/O Port Operation, Interfacing 8051 to LCD, Keyboard, parallel and serial ADC, DAC, Stepper motor interfacing and DC motor interfacing and programming

7 Hours

PART – B

UNIT 5:

8051 Interrupts and Timers/counters: Basics of interrupts, 8051 interrupt structure, Timers and Counters, 8051 timers/counters, programming 8051 timers in assembly and C . **6 Hours**

UNIT 6:

8051 Serial Communication: Data communication, Basics of Serial Data Communication, 8051 Serial Communication, connections to RS-232, Serial communication Programming in assembly and C.

8255A Programmable Peripheral Interface:, Architecture of 8255A, I/O addressing,, I/O devices interfacing with 8051 using 8255A.

5 Hours

Course Aim – The MSP430 microcontroller is ideally suited for development of low-power embedded systems that must run on batteries for many years. There are also applications where MSP430 microcontroller must operate on energy harvested from the environment. This is possible due to the ultra-low power operation of MSP430 and the fact that it provides a complete system solution including a RISC CPU, flash memory, on-chip data converters and on-chip peripherals.

UNIT 7:

Motivation for MSP430microcontrollers – Low Power embedded systems, On-chip peripherals (analog and digital), low-power RF capabilities. Target applications (Single-chip, low cost, low power, high performance system design).

2 Hours

MSP430 RISC CPU architecture, Compiler-friendly features, Instruction set, Clock system, Memory subsystem. Key differentiating factors between different MSP430 families.

2 Hours

Introduction to Code Composer Studio (CCS v4). Understanding how to use CCS for Assembly, C, Assembly+C projects for MSP430 microcontrollers. Interrupt programming.

2 Hours

Digital I/O – I/O ports programming using C and assembly, Understanding the muxing scheme of the MSP430 pins. **2 Hours**

UNIT 8:

On-chip peripherals. Watchdog Timer, Comparator, Op-Amp, Basic Timer, Real Time Clock (RTC), ADC, DAC, SD16, LCD, DMA.

2 Hours

Using the Low-power features of MSP430. Clock system, low-power modes, Clock request feature, Low-power programming and Interrupt.

2 Hours

Interfacing LED, LCD, External memory. Seven segment LED modules interfacing. Example – Real-time clock.

2 Hours

Case Studies of applications of MSP430 - Data acquisition system, Wired Sensor network, Wireless sensor network with Chipcon RF interfaces.

2 Hours

TEXT BOOKS:

1. **"The 8051 Microcontroller and Embedded Systems – using assembly and C "-,** Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay; PHI, 2006 / Pearson, 2006
2. **"MSP430 Microcontroller Basics",** John Davies, Elsevier, 2010 (Indian edition available)

REFERENCE BOOKS:

1. **"The 8051 Microcontroller Architecture, Programming & Applications",** 2e Kenneth J. Ayala ;, Penram International, 1996 / Thomson Learning 2005.
2. "**The 8051 Microcontroller",** V.Udayashankar and MalikarjunaSwamy, TMH, 2009
3. **MSP430 Teaching CD-ROM,** Texas Instruments, 2008 (can be requested **http://www.uniti.in**)
4. **Microcontrollers: Architecture, Programming, Interfacing and System Design",**Raj Kamal, "Pearson Education, 2005

CONTROL SYSTEMS
(Common to EC/TC/EE/IT/BM/ML/EI)

Sub Code	**:**	**10ES43**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT 1:

Modeling of Systems: Introduction to Control Systems, Types of Control Systems, Effect of Feedback Systems, Differential equation of Physical Systems -Mechanical systems, Friction, Translational systems (Mechanical accelerometer, systems excluded), Rotational systems, Gear trains, Electrical systems, Analogous systems. **7 Hours**

UNIT 2:

Block diagrams and signal flow graphs: Transfer functions, Block diagram algebra, Signal Flow graphs (State variable formulation excluded) **6 Hours**

UNIT 3:

Time Response of feed back control systems: Standard test signals, Unit step response of First and second order systems, Time response specifications, Time response specifications of second order systems, steady – state errors and error constants. Introduction to PID Controllers(excluding design) **7 Hours**

UNIT 4:

Stability analysis: Concepts of stability, Necessary conditions for Stability, Routh- stability criterion, Relative stability analysis; More on the Routh stability criterion. **6 Hours**

PART – B

UNIT 5:

Root–Locus Techniques: Introduction, The root locus concepts, Construction of root loci. **6 Hours**

UNIT 6:

Frequency domain analysis: Correlation between time and frequency response, Bode plots, Experimental determination of transfer functions, Assessment of relative stability using Bode Plots. Introduction to lead, lag and lead-lag compensating networks (excluding design). **7 Hours**

UNIT 7:

Stability in the frequency domain: Introduction to Polar Plots, (Inverse Polar Plots excluded) Mathematical preliminaries, Nyquist Stability criterion, Assessment of relative stability using Nyquist criterion, (Systems with transportation lag excluded). **7 Hours**

UNIT 8:

Introduction to State variable analysis: Concepts of state, state variable and state models for electrical systems, Solution of state equations.

6 Hours

TEXT BOOK :

1. **J. Nagarath and M.Gopal**, "Control Systems Engineering", New Age International (P) Limited, Publishers, Fourth edition – 2005.

REFERENCE BOOKS:

3. **"Modern Control Engineering ",** K. Ogata, Pearson Education Asia/ PHI, 4th Edition, 2002.
4. **"Automatic Control Systems",** Benjamin C. Kuo, John Wiley India Pvt. Ltd., 8th Edition, 2008.
5. **"Feedback and Control System",** Joseph J Distefano III et al., Schaum's Outlines, TMH, 2nd Edition 2007.

SIGNALS & SYSTEMS
(Common to EC/TC/IT/BM/ML/EI)

Sub Code	**:**	**10EC44**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT 1:

Introduction: Definitions of a signal and a system, classification of signals, basic Operations on signals, elementary signals, Systems viewed as Interconnections of operations, properties of systems. **6 Hours**

UNIT 2:

Time-domain representations for LTI systems – 1: Convolution, impulse response representation, Convolution Sum and Convolution Integral.

6 Hours

UNIT 3:

Time-domain representations for LTI systems – 2: Properties of impulse response representation, Differential and difference equation Representations, Block diagram representations. **7 Hours**

UNIT 4:

Fourier representation for signals – 1: Introduction, Discrete time and continuous time Fourier series (derivation of series excluded) and their properties . **7 Hours**

PART – B

UNIT 5:

Fourier representation for signals – 2: Discrete and continuous Fourier transforms(derivations of transforms are excluded) and their properties.

6 Hours

UNIT 6:

Applications of Fourier representations: Introduction, Frequency response of LTI systems, Fourier transform representation of periodic signals, Fourier transform representation of discrete time signals. Sampling theorm and Nyquist rate. **7 Hours**

UNIT 7:

Z-Transforms – 1: Introduction, Z – transform, properties of ROC, properties of Z – transforms, inversion of Z – transforms.

6 Hours

UNIT 8:

Z-transforms – 2: Transform analysis of LTI Systems, unilateral Z-Transform and its application to solve difference equations. **7 Hours**

TEXT BOOK

1. **Simon Haykin,** "Signals and Systems", John Wiley India Pvt. Ltd., 2nd Edn, 2008.
2. **Michael Roberts,** "Fundamentals of Signals & Systems", 2nd ed, Tata McGraw-Hill, 2010.

REFERENCE BOOKS:

- **Alan V Oppenheim, Alan S, Willsky and A Hamid Nawab,** "Signals and Systems" Pearson Education Asia / PHI, 2nd edition, 1997. Indian Reprint 2002.
- **H. P Hsu, R. Ranjan**, "Signals and Systems", Scham's outlines, TMH, 2006.
- **B. P. Lathi**, "Linear Systems and Signals", Oxford University Press, 2005.
- **Ganesh Rao and Satish Tunga**, "Signals and Systems", Pearson/Sanguine Technical Publishers, 2004.

FUNDAMENTALS OF HDL
(Common to EC/TC/IT/BM/ML/EI)

Sub Code	**:**	**10EC45**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT 1:
Introduction: Why HDL? , A Brief History of HDL, Structure of HDL Module, Operators, Data types, Types of Descriptions, simulation and synthesis, Brief comparison of VHDL and Verilog

7 Hours

UNIT 2:
Data –Flow Descriptions: Highlights of Data-Flow Descriptions, Structure of Data-Flow Description, Data Type – Vectors. **6 Hours**

UNIT 3:
Behavioral Descriptions: Behavioral Description highlights, structure of HDL behavioral Description, The VHDL variable –Assignment Statement, sequential statements. **6 Hours**

UNIT 4:
Structural Descriptions: Highlights of structural Description, Organization of the structural Descriptions, Binding, state Machines, Generate, Generic, and Parameter statements.

7 Hours

PART – B

UNIT 5:
Procedures, Tasks, and Functions: Highlights of Procedures, tasks, and Functions, Procedures and tasks, Functions.
Advanced HDL Descriptions: File Processing, Examples of File Processing

7 Hours

UNIT 6:

Mixed –Type Descriptions: Why Mixed-Type Description? VHDL User-Defined Types, VHDL Packages, Mixed-Type Description examples

6 Hours

UNIT 7:

Mixed –Language Descriptions: Highlights of Mixed-Language Description, How to invoke One language from the Other, Mixed-language Description Examples, Limitations of Mixed-Language Description.

7 Hours

UNIT 8:

Synthesis Basics: Highlights of Synthesis, Synthesis information from Entity and Module, Mapping Process and Always in the Hardware Domain.

6 Hours

TEXT BOOKS:

1. **HDL Programming (VHDL and Verilog**)- Nazeih M.Botros- John Weily India Pvt. Ltd. 2008.

REFERENCE BOOKS:

1. **Fundamentals of HDL** – Cyril P.R. Pearson/Sanguin 2010.
2. **VHDL** -Douglas perry-Tata McGraw-Hill.
3. **A Verilog HDL Primer**- J.Bhaskar – BS Publications
4. **Circuit Design with VHDL**-Volnei A.Pedroni-PHI.

LINEAR IC's & APPLICATIONS
(Common to EC/TC/IT/BM/ML/EI)

Sub Code	**:**	**10EC46**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT 1:

Operational Amplifier Fundamentals: Basic Op-Amp circuit, Op-Amp parameters – Input and output voltage, CMRR and PSRR, offset voltages and currents, Input and output impedances, Slew rate and Frequency limitations; Op-Amps as DC Amplifiers- Biasing Op-Amps, Direct coupled -Voltage

Followers, Non-inverting Amplifiers, Inverting amplifiers, Summing amplifiers, Difference amplifier. **7 Hours**

UNIT 2:

Op-Amps as AC Amplifiers: Capacitor coupled Voltage Follower, High input impedance - Capacitor coupled Voltage Follower, Capacitor coupled Non-inverting Amplifiers, High input impedance - Capacitor coupled Non-inverting Amplifiers, Capacitor coupled Inverting amplifiers, setting the upper cut-off frequency, Capacitor coupled Difference amplifier, Use of a single polarity power supply. **7 Hours**

UNIT 3:

Op-Amps frequency response and compensation: Circuit stability, Frequency and phase response, Frequency compensating methods, Band width, Slew rate effects, Z_{in} Mod compensation, and circuit stability precautions. **6 Hours**

UNIT 4:

OP-AMP Applications: Voltage sources, current sources and current sinks, Current amplifiers, instrumentation amplifier, precision rectifiers, Limiting circuits. **6 Hours**

PART – B

UNIT 5:

More applications: Clamping circuits, Peak detectors, sample and hold circuits, V to I and I to V converters, Log and antilog amplifiers, Multiplier and divider, Triangular / rectangular wave generators, Wave form generator design, phase shift oscillator, Wein bridge oscillator.

7 Hours

UNIT 6:

Non-linear circuit applications: crossing detectors, inverting Schmitt trigger circuits, Monostable & Astable multivibrator, Active Filters –First and second order Low pass & High pass filters. **6 Hours**

UNIT 7:

Voltage Regulators: Introduction, Series Op-Amp regulator, IC Voltage regulators, 723 general purpose regulator, Switching regulator.

6 Hours

UNIT 8:

Other Linear IC applications: 555 timer - Basic timer circuit, 555 timer used as astable and monostable multivibrator, Schmitt trigger; PLL-operating principles, Phase detector / comparator, VCO; D/A and A/ D converters – Basic DAC Techniques, AD converters. **7 Hours**

TEXT BOOKS:

1. **"Operational Amplifiers and Linear IC's",** David A. Bell**,** 2nd edition, PHI/Pearson, 2004.
2. **"Linear Integrated Circuits",** D. Roy Choudhury and Shail B. Jain**,** 2nd edition, Reprint 2006, New Age International.

REFERENCE BOOKS:

1. **"Opamps- Design, Applications and Trouble Shooting",** Terrell, Elsevier, 3rd ed. 2006.
2. **"Operational Amplifiers",** George Clayton and Steve Winder, Elsever
3. 5th ed., 2008.
4. **"Operational Amplifiers and Linear Integrated Circuits",** Robert. F. Coughlin & Fred.F. Driscoll**,** PHI/Pearson, 2006.
5. **"Design with Operational Amplifiers and Analog Integrated Circuits",** Sergio Franco**,** TMH, 3e, 2005.

MICROCONTROLLERS LAB
(Common to EC/TC/EE/IT/BM/ML/EI)

Sub Code	**:**	**10ESL47**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**03**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**42**	**Exam Marks**	**:**	**50**

I. PROGRAMMING

1. Data Transfer - Block move, Exchange, Sorting, Finding largest element in an array.
2. Arithmetic Instructions - Addition/subtraction, multiplication and division, square, Cube – (16 bits Arithmetic operations – bit addressable).
3. Counters.
4. Boolean & Logical Instructions (Bit manipulations).
5. Conditional CALL & RETURN.
6. Code conversion: BCD – ASCII; ASCII – Decimal; Decimal - ASCII; HEX - Decimal and Decimal - HEX .
7. Programs to generate delay, Programs using serial port and on-Chip timer / counter.

Note: Programming exercise is to be done on both 8051 & MSP430.

II. INTERFACING:

Write C programs to interface 8051 chip to Interfacing modules to develop single chip solutions.

8. Simple Calculator using 6 digit seven segment displays and Hex Keyboard interface to 8051.
9. Alphanumeric LCD panel and Hex keypad input interface to 8051.
10. External ADC and Temperature control interface to 8051.
11. Generate different waveforms Sine, Square, Triangular, Ramp etc. using DAC interface to 8051; change the frequency and amplitude.
12. Stepper and DC motor control interface to 8051.
13. Elevator interface to 8051.

HDL LAB
(Common to EC/TC/IT/BM/ML/EI)

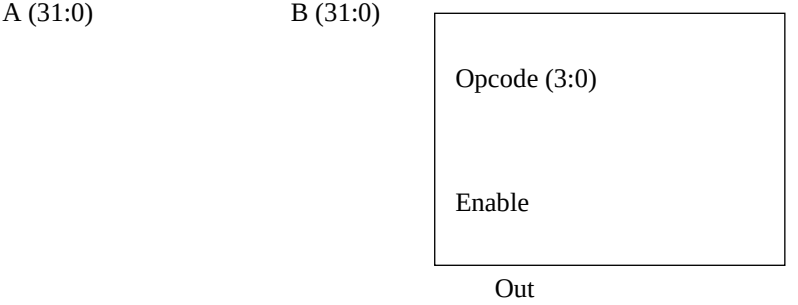
Sub Code	**:**	**10ECL48**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**03**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**42**	**Exam Marks**	**:**	**50**

Note: Programming can be done using any compiler. Download the programs on a FPGA/CPLD boards such as Apex/Acex/Max/Spartan/Sinfi/TK Base or equivalent and performance testing may be done using 32 channel pattern generator and logic analyzer apart from verification by simulation with tools such as Altera/Modelsim or equivalent.

PROGRAMMING (using VHDL /Verilog)

1. Write HDL code to realize all the logic gates
2. Write a HDL program for the following combinational designs
    1. 2 to 4 decoder
    2. 8 to 3 (encoder without priority & with priority)
    3. 8 to 1 multiplexer
    4. 4 bit binary to gray converter
    5. Multiplexer, de-multiplexer, comparator.
6. Write a HDL code to describe the functions of a Full Adder Using three modeling styles.

7. Write a model for 32 bit ALU using the schematic diagram shown below



1. ALU should use combinational logic to calculate an output based on the four bit op-code input.

2. ALU should pass the result to the out bus when enable line in high, and tri-state the out bus when the enable line is low.

3. ALU should decode the 4 bit op-code according to the given in example below.

OPCODE	ALU OPERATION
1.	A + B
2.	A – B
3.	A Complement
4.	A * B
5.	A AND B
6.	A OR B
7.	A NAND B
8.	A XOR B

8. Develop the HDL code for the following flip-flops, SR, D, JK, T.
9. Design 4 bit binary, BCD counters (Synchronous reset and Asynchronous reset) and "any sequence" counters

INTERFACING (at least four of the following must be covered using VHDL/Verilog)

1. Write HDL code to display messages on the given seven segment display and LCD and accepting Hex key pad input data.

2. Write HDL code to control speed, direction of DC and Stepper motor.

3. Write HDL code to accept 8 channel Analog signal, Temperature sensors and display the data on LCD panel or Seven segment display.

4. Write HDL code to generate different waveforms (Sine, Square, Triangle, Ramp etc.,) using DAC change the frequency and amplitude.

5. Write HDL code to simulate Elevator operations
6. Write HDL code to control external lights using relays.