Department of Physics, Osmania University, Hyderabad
M.Sc. Electronics
(Offered at affiliated colleges)
Scheme of instructions and Syllabus under CBCS
(With effect from: 2022-2023)

Semester - I

S.No.	Paper code	Paper	Paper Title	Instructions Hrs/Week	Credits	Marks
THEORY						
1	E 101T	Core Paper – I	Mathematical Physics and Circuit Analysis	3	3	100*
2	E 102T	Core Paper – II	EM Theory and Transmission Lines	3	3	100*
3	E 103T	Core Paper – III	Digital System Design	3	3	100*
4	E 104T	Core Paper – IV	C – Programming & Mat lab	3	3	100*
PRACTICALS						
5	Practical -P-101		Circuit Analysis Lab	4	2	50
6	Practical -P-102		Communication Lab	4	2	50
7	Practical -P-103		Digital Lab	4	2	50
8	Practical -P-104		Computer Lab	4	2	50
	TOTAL				20	600

*** Out of 100 Marks for each theory paper 30 Marks are allotted for internals and 70 for University exam. There shall be no internal assessment examinations for practicals. Practical Examinations will be conducted at the end of each semester.**

Pattern of Question Paper: The question paper consists of two parts, each covering all the **three units**. Part –A consists of FIVE short answer questions, carrying 5 marks each. The student has to answer all the questions. Part –B consists of THREE essay type questions with an internal choice. Each question carries 15 marks.

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Semester – I

Core Paper –I : MATHEMATICAL PHYSICS AND CIRCUIT ANALYSIS

Course Code	Course Title
E-101T	**Mathematical Physics and Circuit Analysis**

Course Objectives: This course enables the students:

COB1	To introduce the differential equations.
COB2	Understand the calculations of spectral analysis.
COB3	Understand the Fourier and Laplace Transforms
COB4	To classify the different type RC.RL circuit in Laplace.
COB5	To know about Net work systems.

Course Outcomes: After the completion of this course the student will be:

COC1	Able to calculate differential equations with different methods.
COC2	Able to know the properties of Fourier Transforms
COC3	Able to draw the RL, RC and RLC with Laplace transforms.
COC4	Able to know complex networks.
COC5	Able to understand the signal flow chart modeling.

Unit – I:

Differential equations & Spectral analysis: Power series solution for a differential equation – Legendary's differential equation and its solution – Legendry Polynomials — Generating function – Recurrence relations – Beta and Gamma functions and their properties - Bessel differential equation and its solutions – Bessel functions of first and second kind- generating functions

Spectral Analysis : Introduction to the concept of signals in time and frequency domains - Fourier series, The sampling function, response of a linear system, normalized power, normalized power in a Fourier expansion, power spectral density, effect of transfer function on power spectral density.

Unit – II:

The Fourier transform - Properties of Fourier Transforms, examples of Fourier transforms, convolution and circuit response in time domain - Parseval's theorem power energy transfer through a network, band limiting of waveforms, power and cross correlation, auto correlation, auto correlation of a periodic waveform, auto correlation of a non-periodic waveform of finite energy, auto correlation of other waveforms - expansion in orthogonal functions, completeness of an orthogonal set.

The Fourier series - The Gram-Schmitt Procedure, correspondence between signals and vectors, distinguish ability of signals.

Unit – III:

LF Circuit analysis – I Introduction – Laplace Transformation – Analysis of LC, RC, RL and RLC circuits using Laplace transforms. Unit step, shifted unit step, Ramp and Impulse functions –Waveform synthesis – convolution integral.

Concept of complex frequency - poles and zeros of network functions – restrictions on pole-zero locations for driving point functions and transfer functions – time domain behavior from pole zero plot – examples.

Single and Multi port Networks: ABCD representation – ABCD network representation of an impedance element – ABCD matrix computation of a T-network – ABCD-matrix coefficient computation of a transmission line section. Network properties and applications – Inter relations between Parameter Sets – Analysis of Microwave amplifier.

Scattering Parameters– definition – meaning of S-Parameters – Determination of a T-network elements – Chain Scattering matrix – conversion between Z- and S-parameters.

Signal flow chart modeling– flow chart analysis of a dual port network – Generalization of S-parameters – Input impedance computation of a Transmission line using signal flow chart – Practical measurement of S-parameters.

Recommended Books :

1. Applied Mathematics for Engineers and Physicists – Louis Pipes and RA.Rarvill, (Mc Graw Hill)
2. Mathematical Physics –Satya Prakash (Kedarnath & Ramnath & Co) '95
3. Network Analysis – (7^{th} , 8^{th} 9^{th} and 10^{th} chapters) Van Valkenberg)
4. Electronic communication systems – Kennedy and Davis Tata Mc Graw Hill
5. Principles of communication systems – H. Taub and D.L. Shilling (Tata Mc Graw Hill), ,1991.
6. An Introduction to analog and digital communications – Simon Haykin (PHI)
7. Communications Systems – B.P. Lathi. (Wiley Eastern Ltd.)
8. Electronic communication systems – Roody and coolean
9. RF circuit Design – Theory and Application by Reinhold Ludwig & Pavel Bretchko – (Pearson Education Asia.)

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Semester – I
Core Paper – II : EM Theory and Transmission Lines

Course Code	Course Title
E-102T	**EM Theory and Transmission Lines**

Course Objectives: This course enables the students:

COB1	To introduce EM Theory
COB2	Understand the concept of EM wave propagation.
COB3	Understand the transmission lines and its properties.
COB4	To classify different type of strip lines and characteristics.
COB5	To know about Smith charts.

Course Outcomes: After the completion of this course the student will be:

COC1	Able to understand reflection and refraction.
COC2	Able to know Maxwell equations.
COC3	Able to study about transmission lines.
COC4	Able to know strip lines and properties.
COC5	Able to draw RL and RC circuit using smith chart.

Unit – I:

Electromagnetic waves Method for calculating potentials- Poisson and Laplace equations – vector potential – Magnetic scalar potential – derivation of Maxwell's equations- Maxwell's equations

Propagation of EM waves in bounded media – Reflection and Refraction of EM waves at the interface of non-conducting media – Fresnel's relations, total internal reflection.

Radiation of EM waves: Inhomogeneous wave equation for potentials, retarded potentials, long wavelength approximation electric dipole radiation – magnetic dipole radiation.

Unit – II:

Transmission lines **–** Frequency spectrum – RF behavior of passive components – HF resistors, capacitors and inductors – chip components – surface mounted inductors.

Transmission Lines: Examples of transmission lines – two wire lines-Coaxial lines – Microstrip lines. Equivalent circuit representation – General transmission line equation – Traveling voltage and current waves – Characteristic Impedance –loss less transmission.

microstrip transmission lines – terminated lossless transmission line – voltage reflection coefficient – propagation constant and phase velocity – standing waves – Special termination conditions – Input impedance of a lossless line- short circuit transmission line.

Unit – III:

MICD Strip lines: basic parameters, phase constant, characteristic impedance, effective dielectric constant, quality factor.

Some varieties of strip lines, parallel strip lines, coplanar strip lines, shielded strip lines. Variation of the characteristic impedance with frequency.

Microwave Integrated Circuit Design: Introduction, Microwave Integrated Circuits, MIC Materials, Types of MICs.

Smith Chart and Applications: From reflection coefficient to load impedance – normalized impedance equation – parametric reflection coefficient equation – graphical representation –

Impedance transformation – special transformation conditions – short circuit transformations – admittance transformations.

Recommended Books:

1. Electromagnetic – Kraus - 4th edition McGraw Hill
2. Introduction to electrodynamics – D.J. Griffiths, (PHI)
3. Electronic communications – D. Roddy & J. Coolen 4th edition (PHI)
4. Electronic communication systems – Kennedy & Davis – 11th Chapter for Unit IV
5. Electromagnetic_ Jordan and Balman
6. Electromagnetic by J.A.Edminister (MGH)
7. Electromagnetic waves by R.K.Shev Gaonkar.1st edition (MGH)
8. R.F. Circuit Design - Theory and Applications - Reinhold Ludwig & Pavel Bretchko - Pearson Education Asia
9. Networks lines and fields –5th Edition Ryder
10. Secrets of RF circuit design by Carr 3rd edition 2002 (MGH)
11. Fundamentals of microwave engineering by R.E.Collin

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Semester – I
Core Paper – III: Digital System Design

Course Code	Course Title
E-103T	**Digital System Design**

Course Objectives: This course enables the students:

COB1	To introduce different type number conversions.
COB2	Understand the logic circuits.
COB3	Understand simplify logic equation using K-maps.
COB4	To classify Synchronous and Asynchronous circuits.
COB5	To know memory devices.

Course Outcomes: After the completion of this course the student will be:

COC1	Able to calculate differential type of numbers systems.
COC2	Able to simplify the logic equations using K-map.
COC3	Able to draw different type of logic circuits.
COC4	Able to know flip flops, registers and counters.
COC5	Able to understand memory devices.

Unit –I

Binary System and Boolean Algebra & Functions: Basic theorems and functions, Digital Logic Gates and Integrated Circuits (Detailed Explanation of Logic Families & Technologies).

Gate Level Minimization: Canonical Equations (SOP & POS), Simplifications of 2 to 6 Variable Boolean functions - using Boolean Identities, Karnaugh Map, Tabulation Method's (Including Concept of Implicants), NAND and NOR implementation, Multi-Level Implementations, Ex-OR Functions.

Unit – II

Combinational and Sequential Logic Design: Combinational Logic Circuits – Code conversion, Decimal & Binary Adders, Subtractors, Magnitude Comparators, Decoders, Encoders, MUXs and De-MUXs.

Synchronous Sequential Circuits: Latches, Flip – Flop Analysis (Character Equation, Table & Excitation Tables). Analysis & Designing of Synchronous Sequential Circuits (State Reduction and Assignments)

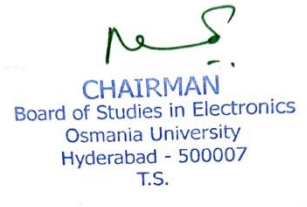
Asynchronous Sequential Circuits: Analysis & Designing of Asynchronous Sequential Circuits (State Reduction and Assignments), Circuit with Latches, Race

Unit – III

Memory and PLD Devices: Introduction, PLD Notation, Gate Array (AND & OR). Combinational PLDs – ROM, PLA, PAL, GAL, CPLD (XC9500) and FPGA (XC4000). Introduction to Hardware Description Languages– ABEL, VHDL, Verilog, CUPL. Algorithmic State Machines – ASM charts, Timing and control implementation, Design with MUXs, PLA Control.

Recommended Books:

1. Digital Design – By M. Morris Mano, 2nd Ed., PHI, 2000
2. Switching theory & Logic design - By R.P.Jain, TMH, 2003
3. Digital Design – By John F Wakerly, 4th Ed., PHI, 2006
4. Digital Principles & Design - By Donald D. Givone., TMH, 2002
5. Modern Digital Electronics – By R.P.Jain., 3rd Ed., TMH,2003
6. Digital Design – By M. Morris Mano, 3rd Ed., PHI, 2003
7. Digital system principles & Applications – By Ronald J. Tocci, Neal Widmer , 6th Ed., PHI., 1994
8. Digital Principles & Applications – By Donald P. Leach & Albert Paul Malvino, 5th Ed., 2002
9. Digital Fundamentals – By Floyd., 7th Ed., PHI, 2002



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Semester – I
Core Paper – IV: C – PROGRAMMING AND MATLAB

Course Code	Course Title
E-104T	**C- Programming and Matlab**

Course Objectives: This course enables the students:

COB1	To introduce C-Language and it's basic.
COB2	Understand functions, array and pointers.
COB3	Understand MAT Lab basic concept.
COB4	To classify operators and control flow.

Course Outcomes: After the completion of this course the student will be:

COC1	Able to analysis C-Programming.
COC2	Able to write programs in C-Language.
COC3	Able to know the difference between c and MAT Lab.
COC4	Able to write MAT Lab Programmes.

UNIT I:

Introduction to programming in C: Then input and output operator, comments, Data types, Variables, objects and their declarations, keywords and identifiers chained assignments Integer types, simple arithmetic operators, operator precedence and associativity, the increment and decrement operators, compound assignment expressions,, simple programs.

The if statement, the if……. else statement, Relational operators, Compound Statements, The while statement, the do……...while statement, for statement break statement, continue statement, the go to statement, the Switch Statement, Enumeration types.

UNIT II:

Function, Arrays and pointers: Function declaration & definitions, local variables & functions, void functions, passing by reference and passing by value, passing by constant reference, Array declaration and initializing, processing Arrays, passing an Array to a function, the Linear search and Bubble sort algorithm, binary search algorithm, using arrays with enumeration types, Multidimensional Arrays.

Pointers declaration, pointer operator, address operator, pointer arithmetic's References, Derived types, Arrays & pointers, the new operator, the delete operator, dynamic arrays, Arrays of pointers and pointers to Arrays, Pointers to Pointers. Pointers to functions call by value, call by References.

UNIT III:

MATLAB Environment: MATLAB as a calculator – variables – Functions – Display formats – Complex numbers – Matrices and Vectors – Strings – Input and Output statements – Simple plotting in MATLB – MATLAB package environments.

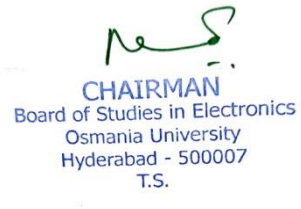
MATLAB operators and Control flow: Relation operations – Logical operations – Elementary math functions – Matrix functions - Characters and strings – IF-END, IF-ELSE-END, ELSE-IF, SWTCHCASE, FOR Loops, WHILE Loops

Interactive Computations: Matrices and Vectors, Matrices and Array operations, Vectorization, Command line functions, Using Built – in functions.

Plotting in MATLAB: Line styles, Markers and colors, important plotting commands, Obtaining Numerical values from graphs, Different plot types, three dimension plots, Handle Graphics, Saving plotting graphs.

Recommended Books:

1. Programming with C by Balaguruswamy
2. Programming in C by Kerningham and Ritchie
3. C programming by Raja Raman
4. Programming in MATLAB by Marc E. Hermitter, Thomson Brooks
5. MATLAB programming by Rudra pratap.
6. Let us 'C' – Kanitkan



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Semester – I
Practical –P101: Circuit Analysis Lab

I. Experiments (analog) - Hardware

1. RC – coupled Amplifier
2. Colpitt's Oscillator
3. WeinBridge Oscillator
4. Hartley Oscillator
5. Phase shift Oscillator
6. Schmitt Trigger
7. Astable Multivibrator(Using transistors and 555 timer)
8. Monostable Multivibrator (Using transistors and 555 timer)
9. Bistable Multivibrator (Using transistors and 555 timer)

II. Study of RL, RC and RLC circuits for different input excitations (Using MULTISIM)

10. Circuits involving verification of Kirchhoff's voltage and current Laws.
11. Steady state response (frequency response & Phase response) of series .RL circuit.
12. Steady state response (frequency response & Phase response) of series .RC circuit.
13. Steady state response (frequency response & Phase response) of series RLC circuit
14. Steady state response (frequency response & Phase response) of parallel RLC circuit.
15. Transient response of RL circuit.
16. Transient response of RC circuit.
17. Transient response of Series RLC circuit
18. Transient response of parallel RLC circuit.

III. Filters

1. Experiments on Filters
2. Low pass RC RL filters
3. High pass RC RL filters
4. Band pass RC RL filters
5. Band stop RC RL filters

Note: Minimum 10 experiments to be performed

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Semester – I
Practical –P102: Communication Lab

Hardware experiments using kits and using Multisim Software

1. Amplitude modulation and Demodulation
2. Frequency modulation and Demodulation
3. Pulse Code Modulation and Demodulation
4. Differential Pulse Code Modulation and Demodulation
5. Delta Modulation and Demodulation
6. Amplitude Shift Keying.
7. Phase Shift Keying.,
8. Frequency Shift Keying.
9. Binary Phase Shift Keying.
10. Differential Phase Shift Keying.
11. Quadrature Phase Shift Keying.
12. Analog Multiplexing

Note: Minimum 10 experiments to be performed.

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Semester – I
Practical –P103: Digital Lab

1. Construction of Logic gates (all) using Discrete components
2. Design of Flip-Flops(R-S/ J-K and Master-Slave J-K) and verifying the truth tables.
3. Data conversion (serial to parallel & parallel to serial)
4. BCD to 7-segment display decoder /driver (IC-7447)
5. Counters (Construction of different Modulo counters/ Ring Counter)
6. Multiplexer and De-Multiplexer
7. Shift registers with flip flops and using IC-7495.
8. Encoder and Decoders
9. Adders and Subtractors with single digital design and 2's compliment method.
10. Multiplexers, Demultiplexers
11. Comparator.
12. Binary to Gray and Gray to Binary conversion.
13. Binary to Excess-3 code conversion and vice-versa.
14. ALU (74181/CD 4581).
15. ADC DAC, R-2R ladder network

Note : Minimum 10 experiments to be performed.

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Semester – I
Practical –P104: Computer Programming Lab

Programming with C and Matlab

- Simple programs illustrating the use of arithmetic, relational and logical operators, loops.
- Arrays and their implementation through pointers, matrix manipulation.
- Matrix - Addition, Multiplication and Inverse.
- Numerical Methods
    - solution of algebraic and Transcendental equations
    - Bisection Method.
    - Secant Method.
    - Newton Raphson Method.
    - Regula Falsi Method.
    - Newton's Interpolation.
- Numerical Solution of ODEs
        - Euler's Method.
        - RungeKutta Method.

Note : Minimum 10 experiments to be performed.

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Semester – II

S.No.	Paper code	Paper	Paper Title	Instructions Hrs/Week	Credits	Marks
THEORY						
1	E 201T	Core Paper – I	Microwave Systems and Antennas	3	3	100*
2	E 202T	Core Paper – II	Feedback Control Systems	3	3	100*
3	E 203T	Core Paper – III	Microprocessors and Interfacing	3	3	100*
4	E 204T	Core Paper – IV	Digital Signal Processing and Processors	3	3	100*
PRACTICALS						
5	Practical -P 201		Microwave Lab	4	2	50
6	Practical -P-202		Control System Lab	4	2	50
7	Practical -P-203		Microprocessor Lab	4	2	50
8	Practical -P-204		DSP-Lab	4	2	50
	TOTAL				20	600

*** Out of 100 Marks for each theory paper 30 Marks are allotted for internals and 70 for University exam. There shall be no internal assessment examinations for practicals. Practical Examinations will be conducted at the end of each semester.**

Pattern of Question Paper: The question paper consists of two parts, each covering all the **three units**. Part –A consists of FIVE short answer questions, carrying 5 marks each. The student has to answer all the questions. Part –B consists of THREE essay type questions with an internal choice. Each question carries 15 marks.

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Semester – II
Core Paper – I: Microwaves and Antenna Systems

Course Code	Course Title
E-201T	Microwaves and Antenna Systems

Course Objectives: This course enables the students:

COB1	To understand Waveguides.
COB2	Understand coupling techniques of waveguides.
COB3	Understand microwave sources.
COB4	To classify the different type of antenna systems.
COB5	To know about parameters of antennas.

Course Outcomes: After the completion of this course the student will be:

COC1	Able to calculate wave length and cut off frequencies.
COC2	Able to know the properties of wave guides.
COC3	Able to know the sources of microwaves.
COC4	Able to know antennas designing properties.

UNIT - I:
Wave guides Introduction – parallel plane wave guide – cutoff wave length – cutoff frequency – group and phase velocity in wave guides – rectangular wave guides – circular wave guides - different modes – field patterns. Wave guide coupling – methods of exiting wave guides – direct coupling to coaxial lines – choke coupling, tuning. Directional couplers, circulators, cavity resonators, Hybrid junctions. Microwave propagation in magnetic materials, Faraday rotation in Ferrites – Gyrators, phase shifters.

Unit II:
Microwave Sources Klystron – two cavity klystrons – velocity modulation – Bunching – output power – Beam heading - efficiency of klystron – power required to bunch the electron Reflex klystron – velocity modulation – power output – efficiency.
Magnetron – cylindrical magnetron - magnetic equations and cutoff voltage equations – cyclotron angular frequency – power output – efficiency.
Traveling Wave Tube – Slow wave structure – amplification process. Other Microwave tubes- Cross field amplifier – Backward wave Oscillator –Miscellaneous tubes. BARATT, Gun diode.

Unit - III:
Antennas antenna equivalent circuits – isotropic radiator – power gain of an antenna –effective area of an antenna – effective length of an antenna. Hertzian dipole – Half wave dipole vertical antennas – folded elements loop and ferrite rod receiving antennas – rhombic antenna.

Driven arrays – Broad side array – end-fire array parasitic reflectors – Parasitic directors – Yagi-Uda array – Plane reflector arrays. UHF antennas – Discone Omni- Helical antenna.
Microwave antennas – Horns – Parabolic reflector antenna – variations on the parabolic reflector – Dielectric lens antennas

Recommended Books :

1. R.F. Circuit Design - Theory and Applications - Reinhold Ludwig & Pavel Bretchko - Pearson Education Asia
2. Networks lines and fields – Ryder
3. Microwave engineering with wireless applications - Pennok& Shepherd
4. Microwave devices and circuits – Samuel Y. Liao
5. Microwave integrated circuits by K.C.Gupta.
6. Fundamentals of microwave engineering by R.E.Collin
7. Antenna theory – K.D.Prasad.
8. Classical electrodynamics – J.D. Jackson , 2edition, Ed. Wiley
9. Classical electrodynamics – S.P. Puri, Tata McGraw Hill
10. Electronic communications – D. Roddy & J. Coolen 4th edition (PHI)
11. Electronic communication systems – Kennedy & Davis – 11th Chapter for Unit IV

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Semester – II
Core Paper –II: Feedback Control Systems

Course Code	Course Title
E-202T	**Feedback Control Systems**

Course Objectives: This course enables the students:

COB1	To understand open loop and closed control systems.
COB2	Understand signal flow graphs.
COB3	Understand Time domain control systems.
COB4	To know design control systems.

Course Outcomes: After the completion of this course the student will be:

COC1	Able to draw different type of transfer network functions.
COC2	Able to know design mechanical systems.
COC3	Able to know time domain analysis of control systems.
COC4	Able to know PD, PI and PID control systems.
COC5	Able to calculate by using signal flow and reduction techniques.

Unit – I

General concepts and Mathematical techniques: Introduction, Open loop control system, Closed loop control systems, Transfer function concept, transfer function of common networks (RC, RL & RLC), , Block Diagram Representation of Control System, Block Diagram reductions, Signal Flow Graph and Masons Gain formula, Reduction of signal flow Graphs, Applications of signal flow Graph -

Unit – II

Time domain analysis of control systems: Typical Test Signals for the Time Response of Control Systems – Steady State Error – Unity Feedback Systems. Steady State Error For A Unity Feedback System With Step Input, Ramp Input And Parabolic Input – Unit Step Response And Time Domain Specifications – Transient Response of a Prototype Second Order System – Effect Of Adding Poles And Zeros To Transfer Functions

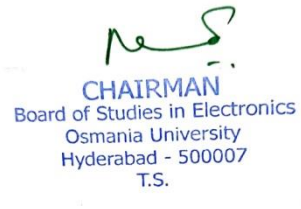
The Concept of Stability – Routh Hurwitz Stability Criterion - The Stability of State Variable Systems – Root Locus method, Root Locus Concept – Properties and Construction of Root Loci – Frequency Plots – Polar and Bode plots – Frequency Domain Specifications – resonant peak , resonant angular frequency and band width of 2^{nd} Order System - Nyquist Stability Criterion – Applications.

Unit – III

Design of Control Systems – Design with PD controller – Time Domain interpretation of PD controller – Design with PI controller – Time domain interpretation and design of PI controller – Design with PID controller – Design with phase lead controller – Time domain interpretation and design of phase lead controller – Design with phase lag controller – Time domain interpretation and design of phase lag controller – Design with lead and lag controller – Polo zero cancellation compensation.

Recommended Books

1. Automatic Control systems – Benjamin C. Kuo, (PHI)
2. Modern Control systems – Richard C.Dorf and Robert H. Bishop, Addison Wesley Publications
3. Control systems principles and design - by M.Gopal 2nd edition 2002 (MGH)
4. Control and Systems Engineering – I J Nagarath and M Gopal, (New Age Int Pub)
5. Control systems --- A Anand Kumar – PHI
6. Modern control engineering – Katsuhiko Ogata –PHI
7. Control systems – NagoorKhani
8. Control systems – Stanley.M.Shinners
9. Principles of control systems - Xavier- S Chand
10. Control systems - by Ashok Kumar 1st edition (MGH)



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Semester – II
Core Paper – III: Microprocessors & Interfacing

Course Code	Course Title
E-203T	**Microprocessor and Interfacing**

Course Objectives: This course enables the students:

COB1	To understand 8086 microprocessor concepts.
COB2	Understand architecture, address modes and instructions.
COB3	Understand programming of 8086.
COB4	To know about Peripheral devices.
COB5	To know about I/O, serial buses.

Course Outcomes: After the completion of this course the student will be:

COC1	Able to draw architecture and pin diagram of 8086.
COC2	Able to know different type of instruction set and addressing modes.
COC3	Able to write assembly language program of 8086
COC4	Able to know interface PPI with 8086 like Keyboard, stepper motor etc.,
COC5	Able to understand different Pentium processors.

Unit – I

The 8086 Microprocessor - Detailed Architecture of 8086, Addressing Modes, Instructions, Assembly Language Programming, Programming Examples. The 8086-Based System Design - Pins and Signals, System Components, Interfacing Memory, I/O Devices, Data Converters, Stepper Motor Interrupts.

Unit – II

Peripheral Interfaces and Interfacing with 8086 : Parallel I/O Methods, Programmable Peripheral Interface (8255 A), Key Board /Display interface (8279), Priority Interrupt Controller (8259 A), DMA Controller (8237), Programmable Interval Timer (8254), UART PC16550D, ROM BIOS Services.

Drives - Principles of Magnetic Storage, Hard Disk Drive, IDE Interface, SCSI Interface, CD-ROM Drive, BIOS Disk Drive Services.

Unit – III

I/O Buses, Ports and Universal Serial Bus - ISA, MCA, EISA, PCI Buses; Local Buses, VL Bus, AGP. Parallel and Serial Ports.USB - USB System, USB Transfer, USB Controller.

Advanced Microprocessors - Protected Mode Operation, The 80286, 80386, 80486, Pentium, Pentium-Pro and Pentium I - IV Microprocessors.(Block diagram approach only)

Recommended Books

1. Microprocessors, PC Hardware and Interfacing - By N. Mathivanan, PHI, 2003

2. The Intel Microprocessors 8086/8088, 80186/80188, 80286,80386,80486, Pentium, Pentium Pro Processor, Pentium II, Pentium III, Pentium 4, Architecture, Programming, and Interfacing - By Barry B. Brey, 6th Ed., PHI / PEA, 17th Reprint, 2003

3. The 8086 Microprocessor : Programming & Interfacing the PC - By Kenneth J. Ayala Penram International Publishing, 1995

4. Advanced Microprocessors and Peripherals - Architecture, Programming and Interfacing - By A K Ray and K M Bhurchandi, TMH, 2000

5. Advanced Microprocessors and Interfacing - By Badri Ram, TMH, 2nd Reprint 2002

6. Microprocessors and Interfacing, Programming and Hardware - By Douglas V. Hall, TMH, 2nd Ed., 18th Reprint, 2003

7. The 8088 and 8086 Microprocessors - Programming, Interfacing, Software, Hardware and Applications - By Walter A Triebel and Avtar Singh, PHI, 4th Ed., 2002

8. Microcomputer Systems : The 8086/8088 Family, Architecture , Programming, and Design By Yu-cheng Liu and Glenn A. Gibson, PHI, 2nd Ed., 1986.

9. Microprocessors – Data Hand Book, BPB.

10. IBM PB and Clones Hardware, Trouble shooting and Maintenance -By B.Govindarajalu - TMH, 2nd edition. 2002.

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Department of Physics, Osmania University, Hyderabad-500 007
M.Sc. (Electronics)
(With effect from: 2022-2023)

Semester – II
Core Paper –IV: Digital Signal Processing and Processors

Course Code	Course Title
E-204T	**Digital Signal Processing and Processors**

Course Objectives: This course enables the students:

COB1	To understand Discrete time signals.
COB2	Understand Z-transforms and its properties..
COB3	Understand Fast Fourier transform.
COB4	To know about digital signal processing.
COB5	To know about pipelining in C5X.

Course Outcomes: After the completion of this course the student will be:

COC1	Able to calculate discrete time signals.
COC2	Able to know different between linear and convolution transforms.
COC3	Able to verify different of filter systems.
COC4	Able to draw architecture of TMS320C5X and its properties.
COC5	Able to write assembly language programs.

Unit-I

Discrete- Time signal and linear systems- classification of signals – Signal representation-standard signals Discrete – time signals –Operation on signals Discrete-time-system-classification of discrete time system-convolution-correlation of two sequences-Inverse systems and De convolution Frequency analysis of Discrete time signals – systems –

Z transform- Introduction- ROC –Properties of ROC- Z- Transform Inverse Z- Transform Discrete Fourier Transform-Discrete -DFT-Properties-Distinguish between linear and circular convolution.

Unit-II

Fast-Fourier Transform-Direct evaluation of DFT-Decimation-in-Time and Frequency, Differences and similarities between DIT-DIF-IDFT using FFT-IIR filters-Introduction-Design of Digital filters from analog filters-analog Low pass Filter design-Butterworth, Chebyshev filters-Design of IIR filters from analog filters- realization of Digital Filters.

FIR Filter- Introduction –Linear Phase FIR filters, Their Frequency response-Location of the Zeros of LPFIR filters-Fourier series method of designing FIR filter-Design of a FIR filter using windows – Frequency sampling method of designing FIR filters-Realization of FIR filters Effect of finite word length in Digital filters – Co-Efficient of quantization effect in direct form, realization in IIR, FIR filters- Quantization errors in the computation of DFT.

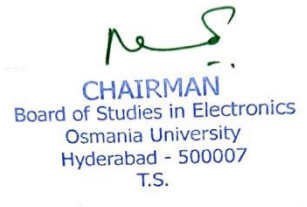
Unit-III

Digital Signal Processor- Architecture of TMS320C5X - Bus structure-Central Architecture Logic Unit (CALU)-Auxiliary Register (AR)-Index register (INDX)-ARCR-Block move address register Block Repeat register-parallel logic unit – memory mapped registers-Program controller-Some flags in status registers - on chip memory – on chip peripherals.

TMS320C5X language - Assembly Language syntax, Addressing modes-Instructions –Load/store –Addition /Subtraction- Move –Multiplication NORM- Program Control- Peripheral control. Instruction pipelining in C5X - Pipeline structure – operation.

Recommended Books

1. Digital signal processing by Prokaies (PHI)
2. Digital Signal Processing – S Salivahanan,AVallavaraj and Gnanapriya (TMH)
3. Digital Signal Processors- B.VenkataRamaniand M.Bhaskar (TMH).
4. Digital Signal Processors – Sen M Kuo&Woon-Seng Gan, Pearson Education
5. Digital signal processing by Oppenheim &Schafer (EEE)
6. Digital signal processing by White .
7. Discrete time signal processing by Oppenheim and Schafer (EEE)
8. Digital Signal Processing-Syed Amjad Ali
9. Digital Signal Processing-SanjitK.Mitra
10. Digital Signal Processing-Nagoorkani
11. Digital Signal Processing-Ronal Scefer
12. Digital Signal Processing-Ananth and Padmanabham
13. Digital Signal processing theory and analysis and digital filter design by B.Somanadh Nair –(EEE)
14. Digital signal processing by Ramesh babu --Sci-Tech Pub



Department of Physics, Osmania University, Hyderabad-500 007
M.Sc. (Electronics)
(With effect from: 2022-2023)

Semester – II
Practical –P201: Microwave Lab

1. **Microwaves(Laboratory experiments with Microwave trainer)**
    1. Characteristics of Microwaves (X-band)
        a) Measurement of wavelength and frequency
        b) Measurement of attenuation
        c) Measurement of VSWR
        d) Measurement of Impedance
    2. Characteristics of Reflex Klystron
    3. VI-Characteristics of Gunn diode
    4. Testing Microwave (passive) components (Bends, Tees and Direction coupler)

2. Microwave bench:

5. Impedance Measurements.
6. Dielectric Measurements.
7. Antennas (Horn and Parabolic).

3. Passive Microstrip circuits:

1. Power dividers.
2. Couplers:
    a) 90 degrees coupler.
    b) 180 degrees coupler.
    c) Lange couplers.
    d) Dual direction couplers.
    e) Magic Tee.
3. Microwave Filters:
    a) Low pass Filter.
    b) High Filter.
    c) BandPass Filter.
    d) Band elimination Filter
4. Printed Antennas:
    a) long periodic Antenna.
    b) Spiral Antenna.
    c) Patch Antenna.
    d) Slot Antenna.

Note: Minimum 10 experiments to be performed.

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(With effect from: 2022-2023)

Semester – II
Practical –P202: Control Systems Lab

Using TUTSIM software

1. Study of Linear Feedback control system for unit step, ramp and parabolic inputs.
2. Studying the effect of adding poles and zeros to the transfer function.
3. Study the second order prototype control system for various values of zeta (damping factor).
4. Transient response of a second order system and mechanical system.
5. Transient response of a second order system with proportional integral (PI) control.
6. Transient response of a second order system with proportional derivative (PD) control.
7. Transient response of a second order system with PID control.
8. Transient response of a 3rd order system.
9. Study the effect of compensating networks in feedback control systems.
10. Study the response of actuaters.
11. Study of root-locus of second order system.
12. Study of Bode plots.
13. Study of Polar plots.

Note : Minimum 10 experiments to be performed.

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Department of Physics, Osmania University, Hyderabad-500 007
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Semester – II
Practical –P203: Microprocessor (8085) Lab

Experiments With 8085 kit

1. Addition of two 16-bit numbers.
2. Multiplication of two 16-bit numbers.
3. Subtraction of two 16-bit numbers.
4. Division of two 16-bit numbers.
5. Factorial of a Number.
6. Decimal Point Division.
7. Centigrade to Fahrenheit Conversion.
8. Fahrenheit to Centigrade Conversion.
9. Code conversion (Binary to Gray).
10. Picking of the Smallest & Largest number.
11. Ascending and Descending order.
12. Sum of Series of number.
13. Square of a number.
14. Finding the Prime number.
15. Interfacing of DAC.
16. Interfacing of ADC.
17. Interfacing of Stepper Motor.
18. To display a message on LCD Display.

Note: Minimum 10 experiments to be performed.

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(With effect from: 2022-2023)

Semester – II
Practical –P204: DSP Lab

I. DSP Experiments Using DSP Hardware Kit
(Based on Texas Instruments – DSP, TMS 320C5X or equivalent)

1. Linear Convolution.
2. Circular Convolution.
3. Impulse responsea) First order b) second order.
4. Frequency response of system
   a) Given in transfer function form.
   b) Given in differential equation form.
5. Division of two numbers
6. Transfer of words from data memory to program memory
7. FIR Filters
   a) Low pass filter using windows functions:
      I. Using rectangular window
      II. Using triangular window.
   b) High pass filter using windows functions:
      I. Using rectangular window
      II. Using triangular window.
8. IIR Filters
   a) Design Low pass Butterworth filter.
   b) Design High pass Butterworth filter.
9. Convolution of two sequences.
10. Waveform generation (Square, Triangle, Staircase and Saw-tooth).

II. DSP using MATLAB Software:

1. Review of representing basic signals (Unit step, unit impulse, ramp, exponential, sine and cosine).
2. To develop program for discrete convolution.
3. To develop program for discrete correlation.
4. To understand stability test.
5. To understand sampling theorem.
6. To design digital IIR filters (low-pass, high pass, band-pass, band-stop).

Note: Minimum 10 experiments to be performed.

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Department of Physics, Osmania University, Hyderabad
M.Sc. Electronics
(Offered at affiliated colleges)
Proposed scheme for Choice Based Credit System
(With effect from : 2023-2024)

Semester - III

S.No.	Paper code	Paper	Paper Title	Teaching Hours	Credits	Marks
1	E-301T	Core Paper – I	Digital System Design using VHDL	3	3	100
2	E-301T	Core Paper – II	Embedded Systems and Applications	3	3	100
3	E-301T	Elective Paper – I	Data Communications	3	3	100
4	E-301T	Elective Paper– II	Embedded 'C' and RTOS	3	3	100
5	Practical-P-301		VHDL Lab	4	2	50
6	Practical-P-302		Embedded System Lab	4	2	50
7	Practical-P-303		Elective – I Lab (Data Communications Lab)	4	2	50
8	Practical-P-304		Elective – II Lab (Embedded 'C' and RTOS Lab)	4	2	50
	TOTAL				20	600

*** Out of 100 Marks for each theory paper 30 Marks are allotted for internals and 70 for University exam. There shall be no internal assessment examinations for practicals. Practical Examinations will be conducted at the end of each semester.**

Pattern of Question Paper: The question paper consists of two parts, each covering all the **three units**. Part –A consists of FIVE short answer questions, carrying 5 marks each. The student has to answer all the questions. Part –B consists of THREE essay type questions with an internal choice. Each question carries 15 marks.

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DEPARTMENT OF PHYSICS, OSMANIA UNIVERSITY
M.Sc. (Electronics)-Semester –III Syllabus
(For the batch admitted from 2023-2024 on words)

Core Paper-I **DIGITAL SYSTEM DESIGN USING VHDL**

Course Code	Course Title	L	T	P	C
E-301T	**Digital System Design Using VHDL**	**3**	**0**	**0**	**3**

Course Objectives: This course enables the students:

COB1	A hardware description language that can be used to model a digital system.
COB2	Understand the simulation versus Synthesis environment
COB3	VHDL can be used to simulate gate level.
COB4	To classify the different type of modeling techniques.
COB5	To understand writing the test bench.
COB6	To know about Finite state machine.

Course Outcomes: After the completion of this course the student will be:

COC1	Able to write the program in different model.
COC2	Able to know different objectives, data types etc.,
COC3	Able to write test bench
COC4	Able to know understand the finite state machines.
COC5	Able to identify the difference of Moore, Melay FSM.

Unit -I:
Basic Language Elements: Identifiers, Data objects, Data types, Operators. Behavioral Modeling: Entity declaration, Architecture body, Process statement, Variable assignment statement, Signal assignment statement, Wait statement, If statement, Case statement, Null statement, Loop statement, Exit statement, Next statement, Assertion statement, Report statement, other sequential statements, Multiple processes, Postponed processes.

Unit – II:
Data Flow Modeling: Concurrent signal assignment statement, Concurrent versus sequential signal assignment, Delta delay revisited, Multiple drivers, Conditional signal assignment statement, selected signal assignment statement. The unaffected value block statement, concurrent assertion statement, Value of a signal.
Structural Modeling: An Example, Component declaration, Component instantiation and examples, Resolving signal values.
Generics: Configuration specification, Configuration declaration, Default rules, Conversion functions, Direct instantiation, Incremental binding.

Unit–III: Subprograms and Overloading: Subprograms - Subprogram overloading, Operator overloading, Signatures, Default values for parameters.
Packages and Libraries: Package declaration, Package body, Design file, Order of analysis, implicit visibility, explicit visibility.
Advanced Features: Attributes, More details on block statements, Shared variables, Groups, More details on ports.

Model Simulation: Simulation - Writing a Test Bench, A test bench example - Initializing a memory -Variable file names.

Hardware Modeling Examples: State machine modeling, Interacting state machines, modeling a Moore FSM, Modeling a Measly FSM.

Recommended Books :

1. A VHDL Primer- By J.Bhasker., Pearson Education Asia, 11th Indian Reprint, 2004.
2. VHDL Programming by Example - By Douglas L. Perry, 4th Ed., TMH., 2002.
3. Introductory VHDL : From Simulation to Synthesis-By SudhalarYalamanchili., Pearson Education Asia 2001.
4. The Designer‟s Guide to VHDL-By Peter.J.Ashenden, 2nd Ed., 1st Indian Reprint, Harcourt India Pvt., Ltd., 2001.

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DEPARTMENT OF PHYSICS, OSMANIA UNIVERSITY
M.Sc. (Electronics) Semester – III syllabus
(For the batch admitted from 2023-2024 on words

Core Paper-II **EMBEDDED SYSTEMS AND APPLICATIONS**

Course Code	Course Title	L	T	P	C
E-302T	**Embedded Systems and Applications**	**3**	**0**	**0**	**3**

Course Objectives: This course enables the students:

COB1	To introduce the Building Blocks of Embedded System.
COB2	To Introduce Assembly language programming and Input/output interfacing.
COB3	To impart knowledge in various Microcontrollers.
COB4	Acquire knowledge and skills to design interfacing applications using microcontrollers.

Course Outcomes: After the completion of this course the student will be:

COC1	Understand the concept of embedded system, microcontroller, different components of microcontroller and their interactions.
COC2	Explain architecture, data transfer and different addressing modes in microcontrollers.
COC3	Get familiarized with Assembly language programming environment to develop embedded solutions.
COC4	Understand the key concepts of PIC Microcontrollers.
COC5	Explore the features and functionality of Atmel Microcontrollers.

U n i t - I :

8051 Microcontroller: MCS-51 Architecture – Registers, Pin Description, Connections, Parallel I/O Ports, Memory Organization. Addressing Modes, Instruction Set with Examples, Stack Pointer.

Assembly Language Programming, Development Systems and Tools, Software Simulators. Interrupts, Timers and Counters, Serial Communication. Addition of Two16–bit Numbers, Unsigned 32- bit Addition, Subtraction of two 16 –bit numbers, Conversion of8 bit signed number into a 16-bit signed number. 16-bit Signed Addition, Binary to BCD Conversion, Interfacing of - Keyboard, 7- Segment Displays, LCD Interfacing, ADC and DAC with 89C51 Microcontrollers. D C Motors and Stepper Motors.

Unit – II:

PIC Microcontrollers : Overview and Features, PIC 16C6X/7X Architecture (PIC 16C61/C71), Registers, Pin diagram, Reset action Memory Organization, Instructions, Addressing Modes, I/O Ports, Interrupts, Timers, Analog-to- Digital Converter (ADC). Pin Diagram of PIC 16F8XX Flash Microcontrollers, Registers, Memory organization, Interrupts, I/O Ports and Timers. Master Synchronous Serial Port (MSSP) Module, Universal Synchronous Asynchronous Receiver Transmitter (USART).

Unit – III:

Design with Atmel Microcontrollers: Architectural Overview of Atmel 89C51 and 89C2051 – Pin Description, Power Saving Modes. Applications of MCS- 51 and Atmel 89C51 and 89C2051 microcontrollers – Square wave generation, Rectangular Waves, Pulse Generation, Pulse Width Modulation, Staircase Ramp Generation, Sine Wave Generation, Pulse width Measurement.

Recommended Books:

1. Microcontrollers – Theory and Applications – By Ajay V Deshmukh, TMH, 2005
2. The 8051 Microcontrollers and Embedded Systems – By Muhammad Ali Mazidi and Janice Gillispie Mazidi,Pearson Education Asia, 4th Reprint, 2002
3. The 8051 Microcontroller - architecture, programming & applications – By Kenneth J. Ayala, Penram International Publishing, 1995
4. Design with PIC Microcontrollers - By J B Peatman, MH,Pearson Education Asia, 2003

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M.Sc. (Electronics) Semester–III syllabus
(for the batch admitted from 2023-2024 onwards

Elective Paper – I **DATA COMMUNICATIONS**

Course Code	Course Title	L	T	P	C
E-303 T	**Data Communications**	**3**	**0**	**0**	**3**

Course Objectives: This course enables the students:

COB1	To study about communication techniques.
COB2	To discuss about different type of multiplexing.
COB3	To study different protocols
COB4	To find the difference between TCP and OSI
COB5	To study different net works interfacing.

Course Outcomes: After the completion of this course the student will be:

COC1	Able to evaluate about design of communication system.
COC2	Capable to evaluate interfacing different networking system.
COC3	Able to understand different protocols and principles.
COC4	Able to work about TCP and OSI model

Unit – I:

Digital Data Communication Techniques: Asynchronous transmission, Synchronous transmission. Error Detection: Parity Check, Cyclic Redundancy Check (CRC), Line Configurations: Topology, Full Duplex ad Half Duplex. Interfacing: EIA-232-Finterface.
Flow control: Stop and wait flow control, Sliding window flow control.
Error Control: Stop and wait ARQ, Go back N ARQ and Selective Reject ARQ.
Multiplexing: Frequency division multiplexing, Synchronous Time Division multiplexing and Statistical Time division multiplexing. ASDL and xDSL.

Unit – II:

Asynchronous Transfer Mode (ATM): Protocol Architecture, ATM Logical Connections, ATM Cells, Transmission of ATM Cells: Cell based physical layer, SDH based physical layer.
ATM Service categories: Real time services and Non real time services. ATM adaptation layer. CONGESTION CONTROL IN ATM NETWORKS: Effects of congestion. Ideal performance, Practical performance. ATM Traffic Management: Requirements for ATM traffic and congestion control, Latency/speed effects, cell delay variation, Traffic and congestion control frame work, Traffic management and Congestion control techniques ATM– GFR Traffic management.

Unit – III:

Local Area Networks: Topologies and Transmission media, LAN protocol architecture. Ethernet. Token ring.
Protocol Architecture: The need for protocol architecture. Open Systems Inter connection (OSI) Model: Standardization within the OSI framework, Service primitives and parameters. Functions of layers in the model.TCP/IP Model: The TCP/IP suit, functions of layers in the model, addressing.

INTERNET WORK PROTOCOLS and OPERATION: Basic protocol functions, Connectionless internetworking,
Internet Protocol: IP services, IP datagram format, IP addresses, Subnet and Subnet masks, Internet control message protocol (ICMP),
IPV6: motivation for new version, IPV6 (structure, addresses and headers)
Routing protocols: Autonomous systems, Approaches to routing, Border Gateway Protocol (BGP) and Open Shortest Path First (OSPF) Protocol.
TRANSPORT PROTOCOLS: Connection Oriented Transport Protocol Mechanisms for unreliable network service,
TCP: TCP services, TCP header format, TCP mechanisms.
TCP congestion control: Retransmission Timer Management and window management. UDP.

Recommended Books:

1. Data and Computer Communications by William Stallings(PH Publications) 7th Edition
2. Data Communications and Networking by Behrouz A. Forouzan, (TMH) thirdedition
3. TCP/IP Protocol Suite By Berouz A. Forouzan(TATA McGraw hill publications)

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DEPARTMENT OF PHYSICS, OSMANIA UNIVERSITY
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Elective Paper – II EMBEDDED 'C' AND RTOS

Course Code	Course Title	L	T	P	C
E-303 T	**Embedded 'C' and RTOS**	**3**	**0**	**0**	**3**

Course Objectives: This course enables the students:

COB1	An embedded ' C 'can be used for embedded systems.
COB2	Understand the concept of ANSIC 'C' and Embedded 'C'.
COB3	To understand about difference between compiler and cross compiler.
COB4	To classify the different type of operating systems.
COB5	To understand RTOS and its functions.
COB6	To know about the applications of RTOS

Course Outcomes: After the completion of this course the student will be:

COC1	Able to write the code for embedded systems by using Embedded 'C'.
COC2	Able to know different types of compilers and types operating systems.
COC3	Able to Understand Kernel and shell concept.
COC4	Able to understand the functions and applications of RTOS.
COC5	Able to understand the different types of services of RTOS.

Unit–I:

Keil Cx51 Compiler and compilercontroldirectives.Cx51Language extensions: Keywords, memory types, memory models. Embedded „C":Cx51 Language extensions: data types, bit manipulation, etc. Preprocessor and preprocessor directives. Cx51 Compiler Library reference.

Unit–II:

RTOS: Introduction to RTOS: Introduction, What is an RTOS, RTOS Scheduler, objects, services, Key characteristics of an RTOS. Commercially available RTOS (PSOS, ThreadX, VXWorks, Nucleus, WinCE), Introduction to VxWorks. RTOS: Tasks: Introduction, Defining a task, task states and scheduling, task structures, synchronization, communication and concurrency. Kernel objects: Semaphores, queues, pipes, event registers, signals, and condition variables.

Unit–III:

Exceptions and interrupts: Introduction, Exception v/s Interrupt, Applications of exceptions and interrupts. RTOS: Timer and timer services: Introduction, Real-time clock and system clock, Programmable interval timers, Timer ISRs, Timing wheels, soft timers. I/O subsystem: Basic I/O concepts, The I/O subsystem. Memory Management: Introduction, Dynamic memory allocation in Embedded systems, Fixed-size memory allocation, blocking v/s nonblocking memory functions, H/W memory management units.

Recommended Books:(Embedded 'C')

1. The C Programming Language, Second Edition, Kernighan & Ritchie, PrenticeHall,Inc.
2. KeilCx51compilerandlibraryreference:user"sguide,KeilSoftware.
3. C:AReferenceManual,SecondEdition,Harbison&Steel,Prentice-Hall
4. SoftwareSeries39
5. C and the 8051:Programming and Multitasking, Schultz, PTR Prentice-Hall,Inc.

Recommended Books: (RTOS)

1. Real-Time Concepts for Embedded Systems, QingLi, CarolineYao , CMPBooks.
2. An Embedded Software Primer, DavidE.Simon, Addison-Wesley.
3. Patterns for Time-Triggered Embedded Systems: Building Reliable Applications with the 8051 Family of Microcontrollers (with CD-ROM), Michael J. Pont, Addison-Wesley
4. Embedded C (With CD-ROM), MichaelJPont, Addison-Wesley.
5. Embedded Systems Building Blocks: Complete and Ready-To-Use Modules in C,JeanJ. Labrosse, CMP Books.

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Department of Physics, Osmania University, Hyderabad-500 007
M.Sc. (Electronics)

(With effect from: 2023-2024)
Semester – III
Practical –P301: VHDL Lab

VHDL –Program entry, simulation & implementation (CPLD/ FPGA) using appropriate HDL Software for the following circuits.

1. All types of logic gates (Data Flow)
2. Half adder (Data flow, Structural and Schematic)
3. Full adder (Data flow, Structural and Schematic)
4. Half subtractor (Data flow, Structural and Schematic)
5. Full subtractor (Data flow, Structural and Schematic)
6. Two control input Mux – using case
7. Two control input Mux – using conditional signal assignment
8. Two control input Mux – using selected signal assignment
9. Two control input Demux - using case
10. BCD to seven segment decoder (schematic)
11. Modeling a RS-FF with assertion, report & different levels of severity (Behavioral)
12. Modeling a BCD Counter (Top level behavioral)
13. Writing a Test Bench for a Half adder
14. Writing a Test bench for Full Adder

Note: Minimum 10 experiments to be performed.

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Department of Physics, Osmania University, Hyderabad-500 007
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(With effect from: 2023-2024)

Semester – III
Practical –P 302: Embedded System Lab

I. Using Microcontroller 8051 Kit.

1. Write an assembly language program to perform
   a) Addition of two 8-bit numbers.
   b) Addition of two 16-bit numbers.
2. Write an assembly language program to perform
   a) Subtraction of two 8-bit numbers.
   b) Subtraction of two 16-bit numbers.
3. Write an assembly language program to perform
   a) Multiplication of two 8-bit numbers.
   b) Verify the result using repeated addition/counter method.
4. Write an assembly language program to perform
   a) Division between two 8-bit numbers.
   b) Verify the result using repeated subtraction/counter method.
5. Write an assembly language program to pick up largest numbers of a series.
6. Write an assembly language program to pick up smallest numbers of a series.
7. Write an assembly language program to arrange the series of numbers in ascending order.
8. Write an assembly language program to arrange the series of numbers in descending order.
9. Write an assembly language program to exchange 10 bytes of data stored in memory location.
10. Write an assembly language program to perform
    a) Average of (5/10) numbers.
    b) Sum of 'n' natural numbers.
    c) Square of a number.
11. Write an assembly language program to convert
    a) Fahrenheit to Centigrade.
    b) Centigrade to Fahrenheit.
    c) Binary to ASCII.
    d) Packed to Unpacked binary number.

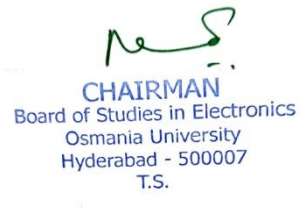
II. Interface Programs:

1) Write a program to interface Seven Segment Display.
2) Write a program to interface with LED
   i) Toggle port pins continuously.
   ii) Send a byte to specified port.
3) Write a program to interface with push buttons.
4) Write a program to interface ADC.
5) Write a program to interface DAC.
6) Write a program to interface Stepper Motor.
7) Write a program to interface DC Motor.

III. **Using Keil Software:**

1) 8-bit addition.
2) 16-bit addition.
3) 8-bit subtraction.
4) 16-bit subtraction.
5) 8-bit Multiplication.
6) 8-bit Multiplication by counter method.
7) 8-bit division.
8) 8-bit division by counter method.
9) Choosing a largest/smallest number from given set of numbers.
10) Arranging the given numbers in ascending/ descending order.
11) Conversion from Centigrade to Fahrenheit value.
12) Conversion from Fahrenheit to Centigrade value.
13) Exchange of memory contents.

Note : Minimum 10 experiments to be performed.



Department of Physics, Osmania University, Hyderabad-500 007
M.Sc. (Electronics)
(With effect from: 2023-2024)

Semester – III
Practical – P303: Elective – I (Data communication Lab)

I Experiments in Internetworking:

1) Testing of RJ-45 Cable (Straight/ Cross)
2) Introduction to LAN cable and Hub.
3) Verifying physical and logical address.
4) Sending data/ Data transfer from system to system.
5) Concept of HTTP.
6) File transfer FTP.
7) Introduction to server and client.
8) Introduction to network IP address.
9) Identification of NET ID using masks.
10) Mail transfer using SMTP.
11) Encryption (plain text to Hypertext).
12) Study of Router configuration.
13) Study of two networks between LAN and LAN/ MAN and MAN/ WAN and WAN.
14) Introduction to network devices.
15) Static Routing.
16) Basic RIP (observe RIP routers and understand the commands)
17) RIP V2.
18) OSPF (Open Shortest Path First)

II Experiments in Data Communication.

1) Study of serial communication.
2) Study of protocol in communications.
3) Study of Fiber optic communications.
4) Study of wireless communications.
5) Study of parallel communication.

Note: Minimum 10 experiments to be performed.

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Semester – III
Practical –P 304: Elective – II (Embedded 'C' and RTOS Lab)

I Experiments using Keil micro vision software.

1. C program to print "ELECTRONICS WORLD".
2. C program to store the data in the accumulator.
3. C program to send values 00-FF to port 1.
4. C program to send hex values for ASCII characters 0, 1, 2, 3,4,5,6,7,8,9, A, B, C, D, E, F to port 1.
5. C program to toggle all the bits of P1 continuously.
6. C program to toggle bit D0 of P1 30,000 times.
7. C program to generate a square wave for 5ms delay.
8. C program to send the data serially.
9. C program to receive the data serially.
10. C program to convert packed BCD 0x29 to ASCII and display the output on P1 and P2.
11. C program to covert the hex to decimal and display the data on P0, P1 and P2.

II RTOS LAB:

1. Task and Queue programming.
2. Timers.
3. Event groups.
4. Seamphore.
5. Mutex.

Tools: 1. Keil micro vision IDE-4. 2. RTOS Simulator.

Note : Minimum 10 experiments to be performed

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Department of Physics, Osmania University, Hyderabad
M.Sc. Electronics
(Offered at affiliated colleges)
Proposed scheme for Choice Based Credit System
(With effect from : 2023-2024)

Semester - IV

S. No.	Paper code	Paper	Subject	Teaching Hours	Credits	Marks
1	E-401	Core Paper – I	VLSI Design	3	3	100
2	E-402	Core Paper – II	Electronic Instrumentation	3	3	100
3	E-403	Elective Paper – III	A. Optical Fiber Communication B. ARM Programming and Embedded Communication Protocols	3	3	100
4	Practical - P – 401		VLSI – Lab	4	4	100
5	Practical - P – 402		Instrumentation – Lab	4	2	50
6	Project work				5	150
	TOTAL				20	600

*** Out of 100 Marks for each theory paper 30 Marks are allotted for internals and 70 for University exam. There shall be no internal assessment examinations for practicals. Practical Examinations will be conducted at the end of each semester.**

Pattern of Question Paper: The question paper consists of two parts, each covering all the **three units**. Part –A consists of FIVE short answer questions, carrying 5 marks each. The student has to answer all the questions. Part –B consists of THREE essay type questions with an internal choice. Each question carries 15 marks.

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(For the batch admitted from 2023-2024 on words)

Core Paper – I **VLSI DESIGN**

Course Code	Course Title	L	T	P	C
E-401T	**VLSI Design**	**3**	**0**	**0**	**3**

Course Objectives: This course enables the students:

COB1	To study about different IC fabrication techniques.
COB2	To understand different steps of IC design.
COB3	To discuss about voltage and current relations.
COB4	To Study Design rules and stick diagrams
COB5	To understand about complex circuits design

Course Outcomes: After the completion of this course the student will be:

COC1	Able to evaluate IC Fabrication.
COC2	Able to design stick diagrams
COC3	Able to evaluate difference design of different complex circuits.
COC4	Able to evaluate design flow methods.

Unit – I:
Introduction: Introduction to IC technology MOS, PMOS, NMOS, CMOS and BiCMOS technologies – Oxidation – Lithography – Diffusion – Ion implantation – Metallization – Encapsulation – Probe testing – Integrated resistors and capacitors. Basic circuit concepts –Sheet resistance R_s and its concept to MOS – Area capacitance units.

Unit – II:
Basic electrical properties: Basic electrical properties of MOS and biCMOS circuits – I_{ds} v/s V_{ds} relationships – MOS transistor threshold voltage – g_m – g_{ds} – figure of merit ω_o- Pass transistor – NMOS inverter – Various pull-ups – CMOS inverter analysis and design – BiCMOS inverters.

Unit – III:
VLSI ckt design processes: VLSI design flow – MOS layers – Stick diagrams – Design rules and layout – 2 μm CMOS design rules for wires – Contacts and transistors layout diagrams for NMOS and CMOS inverters and gates– Scaling of MOS circuits–Limitations of scaling- Gate level design and Semiconductor IC design : Logic gates and other complex gates– Switch logic– Alternate gate circuits –PLAs, FPGAs, CPLDs – Standard cells – Programmable array logic – Design approach.

Recommended Books:

1. Essentials of VLSI circuits and systems Kamran Eshraghian, Eshraghian Dougles and A. Pucknell, PHI – 2005 edition.
2. Principles of CMOS VLSI design–Weste and Eshraghian, Pearson education– 1999.
3. Introduction to VLSI circuits and systems– JohnP.Uyemura, Johnwiley– 2003.
   Modern VLSI design –Waynewolf, Pearsoneducation

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DEPARTMENT OF PHYSICS, OSMANIA UNIVERSITY
M.Sc. (Electronics) Semester – IV Syllabus
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Core Paper-II **ELECTRONIC INSTRUMENTATION**

Course Code	Course Title	L	T	P	C
E-402T	**Electronic Instrumentation**	**3**	**0**	**0**	**3**

Course Objectives: This course enables the students:

COB1	To study different type of measurements
COB2	To study about transducers
COB3	To study about different measurement devices
COB4	To study about Digital and analog devices.
COB5	To study about advance instruments

Course Outcomes: After the completion of this course the student will be:

COC1	Able to evaluate different characteristics
COC2	Able to work with Transducers
COC3	Able to use different type of digital and analog instruments.
COC4	Able to evaluate advance techniques like DAS and Data loggers.

Unit-I:

Qualities of Measurement: Introduction – Performance characteristics – static characteristics – Error in measurement – Types of error – Dynamic characteristics –Response of first and second order systems to step, ramp and impulse inputs – Frequency response of first and second order systems.

Classification of Electrical Transducers: Basic requirement of a transducer – Active and passive transducers – Resistive (strain gauge) Inductive (LVDT) and capacitive transducers – PZT and thermocouple.

Unit–II:

Signal Conditioning: Instrumentation amplifiers - Chopper amplifiers – voltage to frequency converter – Frequency to voltage converter – frequency multiplier – Isolation amplifier – S/H Circuits – Phase lock loop – Lock-in amplifier.

Signal Analyzers: Basic wave analyzer – Frequency selective wave analyzer – Heterodyne wave analyzer – Harmonic distortion analyzer

Unit–III:

Digital Instruments: Digital voltmeter – Digital multimeter – Digital frequency meter– Digital storage Oscilloscope.

Data Acquisition: Introduction – Objectives of DAS – Signal conditioning of the inputs – Single channel DAS – Multichannel DAS – Data loggers – Basic operation of a data logger – Compact data logger.

Computer Controlled Test System: Introduction – Instruments used in computer controlled instrumentation – IEEE 488 electrical interface – Synthesized signal generator interfaced with IEEE 488 – Adjustable AC supply with IEEE 488 bus.

Recommended Books:

1. Modern Electronic Instrumentation and Measurement Techniques– By Albert D.Helfrick and William D.Cooper, PHI.
2. Instrumentation Devices & Systems–By C.S. Rangan, G.R.Sarma and V.S.V Mani, 2nd Ed.,TMH, 7th Reprint, 2002.
3. Electronic Instrumentation– By H.S.Kalsi, TMH,13thReprint, 2002.
4. Electrical and Electronic measurement &Instrumentation-By A.K Sahney.

Reference Books:

1. Electronic Instrumentation and Measurements–By DavidA.Bell, 2nd Ed.,PHI,1997.
2. Transducers and Instrumentation–By D.V.S.Murthy, PHI
3. Introduction to Instrumentation and Control –By A.K.Ghosh, PHI
4. IndustrialInstrumentationandControl–BySK.Singh,2ndEd.,TMH,2003
5. Sensors and Transducers –By D.Patranabis, PHI

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Elective Paper – III (A)
OPTICAL FIBER COMMUNICATION

Course Code	Course Title	L	T	P	C
E-403A T	**Optical Fiber Communication**	**3**	**0**	**0**	**3**

Course Objectives: This course enables the students:

COB1	To study the optical fiber communication.
COB2	To study the reflection and refraction pattern.
COB3	To study the optical characteristics.
COB4	To study the fiber losses.
COB5	To study the LED power and efficiency.

Course Outcomes: After the completion of this course the student will be:

COC1	Able to evaluate different types of fibers and principles.
COC2	Able to calculate the numerical aperture.
COC3	Able to use methods minimize the fiber losses.
COC4	Able to work on different optical fiber preparation.
COC5	Able to understand and advantages of LED use.

Unit – I:

Introduction: Historical developments, advantages of optical fiber communication, total internal reflection, acceptance angle, numerical aperture, skew rays, cylindrical fiber, and single mode fibers. Transmission characteristics of optical fibers: Attenuation, material absorption losses in silicon glass fibers, linear scattering losses, non linear scattering losses, fiber bend loss.

Unit – II:

Mid-infrared and far-infrared transmission, intermodal and intra modal dispersion, overall fiber dispersion, polarization. Optical fibers and cables: preparation of Optical fibers, liquid phase (melting) techniques, vapour phase deposition techniques, fluoride glass fibers, optical fibers, optical fiber cables. Optical fiber connection: joints and couplers, fiber alignment and joint loss, splices, connectors, couplers. Optical sources and detectors: Absorption and emission of radiation.

Unit – III:

Einstein's relation, population inversion, optical emission from semiconductors, semiconductor injection laser, LED power and efficiency characteristics. Optical detection principles, absorption, quantum efficiency, responsivity, long wavelength cutoff, p-n photodiode, p-i-n diode, photo transistors. Optical fiber measurements: Fiber attenuation measurements, dispersion measurements, refractive index profile measurements, cut-off wavelength measurements, numerical aperture measurements.

Recommended books:

1. Optical fiber communications, Principles and Practice, John M.Senior, PHI.
2. Optical fiber systems: Technology, design and applications, Charles K Kao, McGraw Hill International Edition.
3. Optical fiber communications, G.Keiser, Mc-Graw Hill International Edition.
4. Optical fiber communication ,J.Gower, PHI

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(For the batch admitted from 2023-2024 onwards)

Elective Paper – III (B)

ARM PROGRAMMING AND EMBEDDED COMMUNICATION PROTOCOLS

Course Code	Course Title	L	T	P	C
E-403B T	**ARM Programming and Embedded Communication Protocols**	**3**	**0**	**0**	**3**

Course Objectives: This course enables the students:

COB1	An ARM programming can be used to develop processors and programming with advanced techniques.
COB2	Understand the programming versus communication protocol environment
COB3	The subject can be used to improve programming development skills.
COB4	To classify the different type of embedded communication techniques.
COB5	To understand writing the programs for embedded systems.
COB6	To know about embedded communication protocols.

Course Outcomes: After the completion of this course the student will be:

COC1	Able to write the program in different model.
COC2	Able to know different objectives, data types etc.,
COC3	Able to write the programs with ARM processor.
COC4	Able to know understand the Embedded Communication Protocols

Unit – I:
ARM instruction set, Thumb instruction set.ARM memory interface: Cycle Types, Address Timing, Data Transfer Size, Instruction Fetch, Memory Management, Locked Operations, Stretching Access Times, The ARM Data Bus, The External Data Bus.
ARM Debug Interface: Debug Systems, Debug Interface Signals, Scan Chain sand JTAG Interface, Reset, Pull-up Resistors, Instruction Register, Public Instructions, Test Data Registers

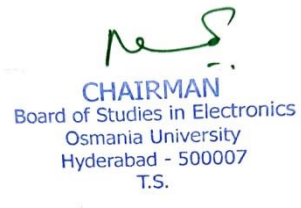
Unit – II:
ARM7TDMI Core Clocks, Determining the Core and System State, The PC's Behavior During Debug, Priorities / Exceptions, Scan Interface Timing, Debug Timing.

Embedded Communication Protocols:
Inter-Integrated Circuit (I2C) BUS: I2C bus specification, general characteristics, bus signals, Address mechanism, Extensions to the standard-mode I2C-bus specification, Applications.

Unit – III:
System Management Bus (SMBus): Introduction, General characteristics, Physical Layer, data link layer, Network layer, differences between SMBus and i2c, Device addressing. Controller Area Network (CAN): Specifications, basic concepts, Frame types, bus signals, Error handling, Addressing. Serial peripheral interface (SPI): Introduction, Specifications, master slave configuration, applications.

Recommended Books:

1. Real-Time Embedded Multi threading: Using ThreadX® and ARM®, Edward L.Lamie, CMP Books.
2. ARM System Developer's Guide:Designing and Optimizing System Software (The Morgan Kaufmann Series in Computer Architecture and Design), Andrew Sloss, Dominic Symes, Chris Wright.
3. ARM Architecture Reference Manual (2ndEdition), David Seal. Addison-Wesley.
4. ARM System-on-Chip Architecture (2ndEdition), Steve Furber, Addison-Wesley.



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Semester – IV
Practical –P401: VLSI Lab

1. Introduction to back- end Design Tools Microwind
2. Draw a layout of Resistive Load inverter & CMOS inverter using CMOS 0.12 um technology and simulate its transient characteristics
3. Draw a layout of CMOS NAND gate using CMOS 0.12 um technology and simulate its transient characteristics
4. Draw a layout of CMOS NOR gate using CMOS 0.12 um technology and simulate its transient characteristics
5. Draw a layout of CMOS half adder gate using CMOS 0.12 um technology and simulate its transient characteristics
6. Draw a layout of CMOS Full adder gate using CMOS 0.12 um technology and simulate its transient characteristics
7. Compare Transfer Characteristics of CMOS, Resistive load and NMOS Load inverter
8. Draw a layout of CMOS XOR gate using CMOS 0.12 um technology and simulate its transient characteristics
9. Simulate substrate Bias (Body) effect in CMOS inverter
10. Draw a layout of CMOS JK Flip flop using CMOS 0.12 um technology and simulate its transient characteristics
11. Draw a layout of CMOS Asynchronous counter CMOS 0.12 um technology and simulate its transient characteristics.

Tool : **Microwind 4.1**

Note : Minimum 10 experiments to be studied

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Semester – IV
Practical –P402: Instrumentation Lab

I Analog Experiments:

1. Power control by SCR using UJT and 555 characteristics.
2. PLL as FM detector (using IC 565).
3. Active high pass filter.
4. Active low pass filter.
5. Calibration of Strain gauge.
6. LVDT.
7. Bandpass and Butterworth filters

II Analog Simulation Experiments (S/W):

1) Active filters using Op-Amp.
2) Frequency modulation and detection.
3) Amplitude modulation and detection.
4) Solution of differential equation using analog computation (using TUTSIM).

III Digital Experiments (H/W & S/W)

1. Construction of synchronous Up/Down Counter using IC 74192 and display using 7-segment display.
2. Implementation of Boolean functions using multiplexer.
3. Construction of shift registers using IC7495.
4. Construction of an 8-bit full adder using two 4-bit adders.
5. Given a four variable Boolean function design and simulate the circuit using gates.
6. Simulate a 4-bit binary/BCD decade counter.
7. Simulate a full adder circuit using Decoder/ Demodulator.
8. Simulate a 4-bit shift register.
9. Simulate a Johnson counter.

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Note : Minimum 10 experiments to be studied

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