TUMKUR UNIVERSITY

SYLLABUS

ELCTRONICS (UG)

(UNDER CBCS SCHEME)

w.e.f. 2016-17

Semester	PAPER	TITLE OF THE PAPER	Hrs/ week	CREDITS	IA Marks	SEE Marks	Max. Masrks
I	I	NETWORK ANALYSIS, ANALOG and DIGITAL ELECTRONICS	T 4	4	10	90	100
	Practical	NETWORK ANALYSIS ANALOG and DIGITAL ELECTRONICS LAB	P 4	2	…	50	50
II	II	LINEAR AND DIGITAL INTEGRATED CIRCUITS	T 4	4	10	90	100
	Practical	LINEAR AND DIGITAL INTEGRATED CIRCUITS LAB	P 4	2	…	50	50
III	III	COMMUNICATION ELECTRONICS	T 4	4	10	90	100
	Practical	COMMUNICATION ELECTRONICS LAB	P 4	2	…	50	50
IV	IV	MICROPROCESSOR AND C-PROGRAMMING	T 4	4	10	90	100
	Practical	MICROPROCESSOR AND C-PROGRAMMING LAB	P 4	2	…	50	50
V	V	8051 MICROCONTROLLER AND INTERFACING	T 3	3	10	90	100
	Practical	8051 MICROCONTROLLER AND INTERFACING LAB	P 3	1.5	…	50	50
	VI	PHOTONIC DEVICES AND POWER ELECTRONICS	T 3	3	10	90	100
	Practical	PHOTONIC DEVICES AND POWER ELECTRONICS LAB	P 3	1.5	…	50	50
VI	VII	ELECTRONIC INSTRUMENTATION AND VERILOG	T 3	3	10	90	100
	Practical	ELECTRONIC INSTRUMENTATION AND VERILOG LAB	P 3	1.5	…	50	50
	VIII	TRANSMISSION LINES, ANTENNA AND WIRELESS NETWORKS	T 3	3	10	90	100
	Practical	LAB and PROJECT WORK	P 3	1.5	…	50	50

SEMESTER- I

PAPER-I: NETWORKANALYSIS , ANALOG and DIGITAL ELECTRONICS

(Credits: Theory-04, Practicals-02) **Theory: 60 Lectures**

UNIT-I

Circuit Analysis:

Concept of Voltage and Current Sources, .Kirchhoff's Current Law, Kirchhoff's Voltage Law., Voltage and current division rule, Mesh Analysis, Node Analysis, Star and Delta networks, Inter conversion of star and delta networks.[problems]. Principle of duality, Superposition Theorem, Thevenin's theorem, Norton's theorem, Reciprocity Theorem, Maximum Power Transfer Theorem, Two Port Networks: Introduction(*Mention only*). (*Theorems- Only DC Analysis, Numerical Examples*) . **(15hrs)**

UNIT-II

Junction Diode and its applications:

PN junction diode (Ideal and practical)-constructions, Formation of Depletion Layer, Diode Equation and I-V characteristics. Idea of static and dynamic resistance, dc load line analysis, Quiescent (Q) point, .Zenerdiode, Reverse saturation current, Zener and avalanche breakdown, Qualitative idea of Schottkydiode, .Regulated Power Supply- Block diagram, **Rectifiers**- Half wave rectifier, Full wave rectifiers (center tapped and bridge), circuit diagrams, working and waveforms, ripple factor and efficiency. **Filter**-Shunt capacitor filter, its role in power supply, output waveform, and working, .**Regulation**- Line and load regulation, Zener diode as voltage regulator, and explanation for load and line regulation. (*Numerical problems on rectifiers and regulator*) **(18 hrs)**

UNIT-III

Bipolar Junction Transistor:

Review of the characteristics of transistor in CE and CB configurations, Regions of operation (active, cut off and saturation), Current gains α and β., Relations between α and β., dc load line and Q point.

Amplifiers: Transistor biasing and Stabilization circuits- Fixed Bias and Voltage Divider Bias. Thermal runaway, stability and stability factor S. Transistor as a two portent work, h-parameter equivalent circuit .Small signal analysis of single stage CE amplifier. Input and Output impedance, Current and Voltage gains. Class A, B and C Amplifiers, .circuit and analysis. **(12hrs)**

UNIT-IV

Number System and Codes:

Decimal, Binary, Octal and Hexadecimal number systems, base conversions. Representation of signed and unsigned numbers, BCD codes [8421 code, XS - 3-code, ASCII-code, other coded sysytems], Binary, octal and hexadecimal arithmetic operations; Addition and subtraction by 2's complement method,.

Logic Gates and Boolean algebra: Truth Tables of OR, AND, NOT, NOR, NAND, XOR and XNOR gates, construction of gates by using diodes and transistors, Universal Gates, implementation of basic gates by using universal gates. Basic postulates and fundamental theorems of Boolean algebra. Boolean laws and theorems, DeMargon's theorems. Boolean expression and implementation **(15hrs)**

Reference Books:

1. Electric Circuits, S. A. Nasar, Schaum's outline series, Tata McGraw Hill (2004)
2. Electrical Circuits, M. Nahvi& J. Edminister, Schaum's Outline Series, TataMcGraw-Hill (2005)
3. Electrical Circuits, K.A. Smith and R.E. Alley, 2014, Cambridge University Press
4. Network, Lines and Fields, J.D.Ryder, Prentice Hall of India.
5. Electronic Devices and Circuits, David A. Bell, 5th Edition 2015, Oxford University Press.
6. Electronic Circuits: Discrete and Integrated, D.L. Schilling and C. Belove, TataMcGraw Hill
7. Electrical Circuit Analysis, Mahadevan and Chitra, PHI Learning
8. Microelectronic circuits, A.S. Sedra, K.C. Smith, A.N. Chandorkar, 2014, 6th Edn.,Oxford University Press.
9. J. Millman and C. C. Halkias, Integrated Electronics, Tata McGraw Hill (2001)
10. J. J. Cathey, 2000 Solved Problems in Electronics, Schaum's outline Series, TataMcGraw Hill (1991)
11. Digital Principles and Applications, A.P. Malvino, D.P.Leach and Saha, 7th Ed., 2011,Tata McGraw
12. Fundamentals of Digital Circuits, Anand Kumar, 2nd Edn, 2009, PHI Learning Pvt. Ltd

ELECTRONICS LAB [4 hrs/week]

SEMESTER- I: NETWORK ANALYSIS, ANALOG and DIGITAL ELECTRONICS LAB

AT LEAST 08 EXPERIMENTS FROM THE FOLLOWING

To familiarize with basic electronic components (R,C,L,diodes, transistors), digitalMultimeter, Function Generator and Oscilloscope..

1. Verification of (a) Thevenin's theorem and (b) Norton's theorem.
2. Verification of (a) Superposition Theorem and (b) Reciprocity Theorem.
3. Verification of the Maximum Power Transfer Theorem.
4. Study of the I-V Characteristics of (a) p-n junction Diode, and (b) Zener diode.
5. Study of (a) Half wave rectifier and (b) Full wave rectifier (FWR).
6. Study the effect of (a) C- filter and (b) Zener regulator on the output of FWR.
7. To plot input and output characteristics of a transistor in C-E mode and to calculate its Parameters..
8. Study of Fixed Bias and Voltage divider bias configuration for CE transistor.
9. Design of a Single Stage CE amplifier of given gain and to study the frequency response..
10. Verification of truth table of logic gates/solving Boolean equations.
11. DTL logic gates.[AND, OR, NOT, NAND, NOR]
12. Universal Property of NAND and NOR gates,

SEMESTER- II

PAPER-II: LINEAR AND DIGITAL INTEGRATEDCIRCUITS

(Credits: Theory-04, Practicals-02) **Theory: 60 Lectures**

UNIT-I

Operational Amplifiers (Black box approach): Characteristics of an Ideal and Practical ,Operational Amplifier (IC 741), Open and closed loop configuration, ,equivalent circuit, Frequency Response. CMRR, Slew Rate and concept of Virtual Ground.

Applications of Op-Amps:

(1) Inverting and non-inverting amplifiers, (2) Summing and Difference Amplifier, (3) Differentiator, (4) Integrator, (5) phase shift **and** Wien bridge oscillator,(6) Comparator and Zero-crossing detector, and (7) Active low pass and high pass Butterworth filter (1st order only) Related problems **. (15 hrs)**

UNIT-II

Cascaded Amplifiers: Two stage RC Coupled Amplifier and its Frequency Response.

Feedback in Amplifiers: Concept of feedback, negative and positive feedback,, advantages of negative feedback, . Expression for voltage gain. Effect of negative feedback on input impedance,, output impedance, band width ,distortion and noise.(Qualitative only).

Sinusoidal Oscillators: Barkhausen criterion for sustained oscillations. Phase shift and Colpitt's oscillator. Determination of Frequency and Condition of oscillation

Unipolar Devices: JFET. Construction, working and I-V characteristics (output and transfer), Pinchoff voltage. C-S amplifier and expression for voltage gain .

UJT, basic construction, working, equivalent circuit and I-Vcharacteristics.UJT relaxation oscillator expression for frequency, **(15hrs)**

UNIT-III

Combinational Logic Analysis and Design: Standard representation of logic functions (SOP and POS), Minimization Techniques (Karnaugh map minimization up to 4variables for SOP and implementation using basic and NAND gate).

Arithmetic Circuits: Binary Addition and subtraction. Half and Full Adder. Half and Full Subtractor, (Basic gate logic circuit and NAND gate circuit) , 4-bit binary Adder,

Data processing circuits: comparators, Multiplexers (4:1, 8:11:16.), De-multiplexers (1:4, 1:8, 1:16), Decoders (BCD to decimal, 7-segment driver), Encoders (decimal to BCD, priority encoder) (Mention corresponding ICs) **(15hrs**)

UNIT-IV

Sequential Circuits: SR, D, and JK Flip-Flops. Clocked (Level and Edge Triggered) Flip-Flops. Preset and Clear operations. Race-around conditions in JK Flip-Flop. Master-slave JK Flip-Flop.

Shift registers: Serial-in-Serial-out, Serial-in-Parallel-out, Parallel-in-Serial-out and Parallel-in-Parallel-out Shift Registers (only up to 4 bits).

Counters (4 bits): Ring Counter, Asynchronous counters, Decade Counter, .Synchronous Counter.

D-A and A-D Conversion: 4 bit binary weighted and R-2R D-A converters, circuit and working. Accuracy and Resolution, .A-D conversion characteristics, successive approximation ADC. (Mention of relevant ICs for all). **Clock and Timer (IC 555)**: Introduction, Block diagram of IC 555, Astable and Mono stable multivibrator circuits, Voltage Controlled Oscillator. **(15hrs)**

Reference Books:

1. OP-Amps and Linear Integrated Circuit, R. A. Gayakwad, 4th edition, 2000, Prentice Hall
2. Operational Amplifiers and Linear ICs, David A. Bell, 3rd Edition, 2011, OxfordUniversity Press.
3. Digital Principles and Applications, A.P. Malvino, D.P.Leach and Saha, 7th Ed., 2011,Tata McGraw
4. Fundamentals of Digital Circuits, Anand Kumar, 2nd Edn, 2009, PHI Learning Pvt. Ltd.
5. Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.
6. Digital Systems: Principles & Applications, R.J.Tocci, N.S.Widmer, 2001, PHI Learning.
7. Thomas L. Flyod, Digital Fundamentals, Pearson Education Asia (1994)
8. R. L. Tokheim, Digital Principles, Schaum's Outline Series, Tata McGraw- Hill (1994)

ELECTRONICS LAB [4 hrs /week]

SEMESTER- II: LINEAR AND DIGITALINTEGRATED CIRCUITS LAB

AT LEAST 10 EXPERIMENTS FROM THE FOLLOWING [5 from each section]

Section-A: Op-Amp. Circuits (Hardware)

1. UJT characteristics' and Relaxation oscillator.
2. FET characteristic and C-S amplifier.
3. (a) To design inverting amplifier using Op-amp (741,351) & study its frequency response
   (b) To design non-inverting amplifier using Op-amp (741,351) & study frequency response
4. (a) To add two dc voltages using Op-amp in inverting and non-inverting mode
   (b) To study the zero-crossing detector and comparator.
5. To design an integrator and differentiator using op—amp..
6. To design a Wien bridge and phase shift oscillator for given frequency using an op-amp.
7. Design a Butterworth Low Pass and High Pass active Filter (1st order) & study Frequency Response
8. Design a digital to analog converter (DAC) of given specifications.
9. To design a Monostable and AstableMultivibrator using IC 555 Timer.

Section-B: Digital circuits (Hardware)

1. (a) To design a combinational logic system for a specified Truth Table.
   (b) To convert Boolean expression into logic circuit & design it using logic gate ICs.
   (c) To minimize a given logic circuit.
2. Half Adder and Full Adder.[using differenent IC's]
3. Half Subtractor and Full Subtractor.[using different IC's]
4. 4 bit binary adder and adder/subtractor using Full adder IC.
5. To design a seven segment decoder.
6. To build Flip-Flop (RS, Clocked RS, D-type and JK) circuits using NAND gates.
7. To build JK Master-slave flip-flop using Flip-Flop ICs
8. To build a Counter using D-type/JK Flip-Flop ICs and study timing diagram.
9. To make a Shift Register (serial-in and serial-out) using D-type/JK Flip-Flop ICs

SEMESTER- III

PAPER-III: COMMUNICATION ELECTRONICS

(Credits: Theory-04, Practicals-02) **Theory: 60 Lectures**

UNIT-I

Electronic communication: Introduction to communication – means and modes. Needfor modulation. Block diagram of an electronic communication system. Brief idea offrequency allocation for radio communication system in India (TRAI).Electromagneticcommunication spectrum, band designations and usage.Channels and base-band signals.Concept of Noise, signal-to-noise (S/N) ratio. **(8 Lectures)**

UNIT-II

Analog Modulation: Amplitude Modulation, modulation index and frequency spectrum.Generation of AM (Emitter Modulation), Amplitude Demodulation (diode detector),Concept of Single side band generation and detection. Frequency Modulation (FM) andPhase Modulation (PM), modulation index and frequency spectrum, equivalencebetween FM and PM, Generation of FM using VCO, FM detector (slope detector),Qualitative idea of Super heterodyne receiver

(12 Lectures)

Analog Pulse Modulation: Channel capacity, Sampling theorem, Basic Principles-PAM, PWM, PPM, modulation and detection technique for PAM only, Multiplexing **.(9 Lectures)**

UNIT-III

Digital Pulse Modulation: Need for digital transmission, Pulse Code Modulation,Digital Carrier Modulation Techniques, Sampling, Quantization and Encoding. Conceptof Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Phase Shift Keying(PSK), and Binary Phase Shift Keying (BPSK). **(10 Lectures)**

UNIT-IV

Introduction to Communication and Navigation systems:

Satellite Communication– Introduction, need, Geosynchronous satellite orbits,geostationary satellite advantages of geostationary satellites. Satellite visibility,transponders (C - Band), path loss, ground station, simplified block diagram of earth station. Uplink and downlink.

(10 Lectures)

Mobile Telephony System – Basic concept of mobile communication, frequency bandsused in mobile communication, concept of cell sectoring and cell splitting, SIM number,IMEI number, need for data encryption, architecture (block diagram) of mobilecommunication network, idea of GSM, CDMA, TDMA and FDMA technologies,simplified block diagram of mobile phone handset, 2G, 3G and 4G concepts (qualitativeonly). **(10 Lectures)**

GPS navigation system (qualitative idea only) **(1 Lecture)**

Reference Books:

1. Electronic Communications, D. Roddy and J. Coolen, Pearson Education India.
2. Advanced Electronics Communication Systems- Tomasi, 6th edition, Prentice Hall.
3. Modern Digital and Analog Communication Systems, B.P. Lathi, 4th Edition, 2011,Oxford University Press.
4. Electronic Communication systems, G. Kennedy, 3rd Edn., 1999, Tata McGraw Hill.
5. Principles of Electronic communication systems – Frenzel, 3rd edition, McGraw Hill
6. Communication Systems, S. Haykin, 2006, Wiley India
7. Electronic Communication system, Blake, Cengage, 5th edition.
8. Wireless communications, Andrea Goldsmith, 2015, Cambridge University Press

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ELECTRONICS LAB [4 hrs /week]
SEMESTER- III: COMMUNICATIONELECTRONICS LAB

AT LEAST 08 EXPERIMENTS FROM FOLLOWINGUSING .

1. To design an Amplitude Modulator using Transistor
2. To study envelope detector for demodulation of AM signal
3. To study FM - Generator and Detector circuit
4. To study AM Transmitter and Receiver
5. To study FM Transmitter and Receiver
6. To study Time Division Multiplexing (TDM)
7. To study Pulse Amplitude Modulation (PAM)
8. To study Pulse Width Modulation (PWM)
9. To study Pulse Position Modulation (PPM)
10. To study ASK modulator
11. To study PSK modulator
12. To study FSK modulator

Reference Books:

1. Electronic Communication systems, G. Kennedy, 1999, Tata McGraw Hill.
2. Electronic Communication system, Blake, Cengage, 5th edition.

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SEMESTER- IV

PAPER-IV: MICROPROCESSOR AND C-PROGRAMMING

(Credits: Theory-04, Practicals-02) **Theory: 60 Lectures**

UNIT-I

Microcomputer Organization:

Input/Output Devices,. Data storage (idea of RAM and ROM).Computer memory, .Memory organization & addressing, Memory interfacing, memory expansion, MemoryMap, different types of memory,. **(5 Lectures)**

8085 Microprocessor Architecture: Main features of 8085. Block diagram. Pin-out diagram of 8085. Data and address buses, .Registers, .ALU. Stack memory. Program counter. Stack pointer, **(8 Lectures)**

UNIT-II

8085 Programming :

Instruction classification, Instructions set (Data transfer including stacks, .Arithmetic, logical, branch, and control instructions). Routines, delay loops, .Timing& Control circuitry, .Timing states, .Instruction cycle, Timing diagram for M/R, M/W, IOR, IOW and for specific functions like MOV and MVI. Hardware and software interrupts, standard delay programs, General programs on all [at least 15 general programs].

(17 Lectures)

Unit- III

Introduction to 'C' Language: Overview of 'C' Language, Character set, Identifiers, Built-in Data Types, Variable Definition, Declaration, C Key Words-Rules & Rules for NamingVariables, operators and Expressions- Precedence and Order of Evaluation and Constants, Basic input/output statement, Simple 'C' programs. **(10 Lectures)**

Unit-IV: Decision making, Branching and Looping

Decision making within a Program, **if** statement, **if-else** statement and Nested **if** Statement, Switch statement, Loop statements- **for** Loop, **while** loop, **do-while** Loop, **break**, **continue**, **goto statements.**

(8 Lectures)

Unit- VI: Arrays and Functions

Arrays -What is an Array? Declaring an Array, Initializing an Array. One dimensional arrays-Linear search and sorting (Bubble sort), Multidimensional Arrays

Functions- Definition of Functions, Library of C functions, Elements of function, types of functions based on return type and arguments, Pointers **(12 Lectures)**

TEXT BOOKS:

1. Microprocessor Architecture Programming & applications with 8085, 2002, R.S.Goankar, Prentice Hall.
2. Programming with ANSI-C, E.Balaguruswami - Fourth Edition, Tata Mcgraw Hill
3. Problem Solving with C, M.T.Somashekar- Eastern Economy Edition (PHI)

REFERENCE BOOKS:

1. Fundamentals of Microprocessors and Microcontrollers (Seventh Revised Edition):B.Ram – DhanpatRai Publications (P) Ltd.
2. Let us C, YashwantKanetkar, BPB Publication, New Delhi.
3. Programming with C, Byron Gottfried , Second Edition, Tata Mcgrawhill, 2000
4. Programming with ANSI & Turbo C, A. Kamthane , First Edition, 2002, Pearson Education.
5. Computer Concepts and Programming Techniques, A M Padmareddy

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ELECRONICS LAB
SEMESTER- IV: MICROPROCESSOR AND C-PROGRAMMING LAB

At least 06 experiments each from Section-A and Section-B

Section-A: Programs using 8085 Microprocessor

1. Addition and subtraction of numbers using direct addressing mode
2. Addition and subtraction of numbers using indirect addressing mode
3. Multiplication by repeated addition.
4. Division by repeated subtraction.
5. Handling of 16-bit Numbers.
6. Use of CALL and RETURN Instruction.
7. Delay program
8. Block data handling.
9. Search a number in the array
10. Finding largest/smallest number
11. Ascending/Descending order
12. Other programs (e.g. Parity Check, using interrupts, etc.).

Section-B: Experiments using C-programming

1. program to find the largest/smallest of ‘n’ numbers
2. program to find the roots of a quadratic equation
3. program to generate sine series
4. program to generate fibanocci series
5. program to calculate factorial of a given number
6. program to convert binary to decimal & vice versa
7. program to verify truth tables of logic gates
8. program to find the effective resistance of series and parallel connection
9. program to find maximum power in resistive circuit using maximum power transfer theorem
10. program to accept the changes in the current I_B, I_C, and I_E of a transistor and calculate the current amplification factors in cases of common-base, common-emitter configurations
11. other programs on matrices

SEMESTER- V

PAPER-V: 8051 MICROCONTROLLER AND INTERFACING

(Credits: Theory-03, Practicals-1.5) **Theory: 45Lectures**

Unit-I: Introduction toicrocontrollers **(3Lectures)**

Introduction, Microprocessors and Microcontrollers, Basic building block of Microcontroller, Comparison of Microprocessors and Microcontrollers, Types of Microcontroller, RISC & CISC CPU Architectures, Harvard & Von- Neumann CPU architecture.

Unit-II: 8051 Microcontroller **(12Lectures)**

8051 Architecture: Introduction (Salient features of 8051), Architecture of 8051(basic block diagram of 8051), Pin description- functions of various pins of 8051, Basic Oscillator circuit and Timing,Program Counter and Data Pointer, A, B and CPU register, Flags & PSW, SFRs (Special Function Registers) - bit addressable SFRs and byte addressable SFRs in 8051, brief description of each SFR.

Memory Organization – data and program memory. Structure of internal data (RAM) memory-description of register banks, bit addressable RAM area and general purpose RAM in 8051. Brief description of external data memory and associated signals, block diagram representation. Program memory structure – internal program memory, block diagram representation, address range and associated signals. External program memory, block diagram representation, address range and associated signals. Block schematic of interfacing of external program memory. Stack and Stack Pointer.

Unit-III:Instruction Set and Assembly Language Programming **(14Lectures)**

Addressing Modes: Introduction, Immediate, Register, Direct, Register Indirect, indexed and implied addressing modes, definition and example for each addressing mode.

Instruction set: Data transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Subroutine instructions, Bit manipulation instruction, brief description of each instruction with examples.

Assembly language program examples: Data transfer operations with internal and external memory, 8 and 16 bit arithmetic operations; addition, subtraction, multiplication and division. Logical operations, truth table verification, sorting of numbers in an array, to find largest and smallest number in an array.*8051 programming using 'C'.*

Unit-IV:8051Interrupts,Timers/counters and Serial Communication **(6Lectures)**

Interrupts- Basics of interrupts, 8051 interrupt structure and their vectors (ISR address), Timer Flag interrupts, Serial port interrupts, External interrupts, Reset, Interrupt control, Initializing interrupts (enable/disable), Interrupt priorities, Interrupt Destinations and Software generated Interrupts.**Timers and Counters-** Qualitative description of timer/counters

Serial Communication - Data communication, Basics of Serial Data Communication, 8051 Serial Communication – Serial data transmission modes i.e Mode 0 (Shift register mode) , Mode 1 (Bud Rate) , Serial data mode 3 and Connections to RS-232.

Unit-V: Interfacing and Applications **(10 Lectures)**

Introduction to interfacing -General structure of I/O Ports in 8051.Internal structures of Port0, Port1, Port2 and Port3, schematic representation, brief description of each.

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

Interfacing Examples- Interfacing LED to 8051, circuit diagram, assembly language program to flash LED with a suitable time delay, .Interfacing , Keyboard, Interfacing 7-segment display unit- Assembly language program to display numbers. Interfacing DAC and ADC, Interfacing Stepper motor. Core features of PIC microcontroller, Overview of various PIC microcontroller series.

Reference Books:

1. "The 8051 Microcontroller Architecture, Programming & Applications", Kenneth J. Ayala
2. "The 8051 Microcontroller", V.Udayashankar and MalikarjunaSwamy,.
3. "Microcontrollers: Architecture, Programming, Interfacing and System Design", Raj Kamal,
4. "The 8051 Microcontroller and Embedded Systems – using assembly and C"-, Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D.

ELECTRONICS LAB

PAPER-V: 8051 MICROCONTROLLER AND INTERFACING

At least 10 experiments to be conducted

1. ALP to add, subtract, multiply and divide two 8-bit numbers
2. ALP to transfer a block of data from one location to another location
3. ALP to exchange two blocks of data stored in memory.
4. ALP to add/subtract two 16-bit numbers
5. ALP to add two BCD numbers
6. ALP to count the number of 1's in a given data byte.
7. ALP to multiply a 16 bit number by an 8 bit number
8. ALP to find the average of 10 numbers
9. ALP to find the square/cube of a given number
10. ALP to arrange a set of data in ascending/descending order
11. Program to find the GCF of two numbers
12. Program to generate Fibonacci series.
13. Program to find LCM of two numbers
14. Program to search an element in an array of N numbers
15. ALP to find the largest/smallest of N numbers.
16. ALP to implement BCD counter to count from 0 to 9 / 9 to 0
17. ALP to implement BCD counter to count from 99 to 00/ 00 to 99
18. ALP to convert a hexadecimal number to ASCII number
19. ALP to convert hexadecimal number to a decimal number
20. ALP to convert an ASCII number to hexadecimal number
21. ALP to generate a delay

Interfacing programs

22. Program to generate Square, Triangular, Ramp, Sine wave using DAC interface to 8051.
23. Program to rotate Stepper motor in clockwise/anticlockwise direction.
24. Program to interface keyboard.
25. Program to display a string(numbers) on seven segment display interface
26. Interfacing traffic light controller

SEMESTER- V

Paper-VI: PHOTONIC DEVICES AND POWERELECTRONICS

(Credits: Theory-03, Practicals-1.5) **Theory: 45 Lectures**

UNIT-I: Photonic Devices

Classification of photonic devices.Interaction of radiation and matter, Radiativetransition and optical absorption.Light Emitting Diodes- Construction, materials andoperation. Semiconductor Laser- Condition for amplification, Laser diode. **(8 Lectures)**

UNIT-II

Photodetectors: Photoconductor. Photodiodes (p-i-n, avalanche) and Photo transistors,quantum efficiency and responsivity.Photomultiplier tube. **(5 Lectures)**

Solar Cell: Construction, working and characteristics **(2 Lectures)**

LCD Displays: Types of liquid crystals, Principle of Liquid Crystal Displays,applications, advantages over LED displays. **(4 Lectures)**

Introduction to Fiber Optics: Evolution of fiber optic system-Advantages, Element of an OpticalFiber Transmission link- Ray Optics-Optical Fiber Modes and Configurations **(8 Lectures)**

UNIT-III: POWER ELECTRONICS

Power Devices: Need for semiconductor power devices, Power MOSFET (Qualitative).Introduction to family of thyristors. Silicon Controlled Rectifier (SCR)- structure, I-Vcharacteristics, Turn-On and Turn-Off characteristics, ratings, Gate-triggering circuits.Diac and Triac- Basic structure, working and V-I characteristics. Application of Diacasa triggering device for Triac. **(8 Lectures)**

UNIT-IV

Insulated Gate Bipolar Transistors (IGBT): Basic structure, I-V Characteristics,switching characteristics, device limitations and safe operating area (SOA). **(2 Lectures)**

Applications of SCR: Phase controlled rectification, AC voltage control using SCR andTriac as a switch. Power Invertors- Need for commutating circuits and their varioustypes, dc link invertors, Parallel capacitor commutated invertors, Series Invertor,limitations and its improved versions, bridge invertors. **(8 Lectures)**

Reference Books:

1. J. Wilson & J.F.B. Hawkes, Optoelectronics: An Introduction, Prentice Hall India (1996)
2. S.O. Kasap, Optoelectronics & Photonics, Pearson Education (2009)
3. , Introduction to fiber optics, Cambridge Univ. Press (1998)
4. Power Electronics, P.C. Sen, Tata McGraw Hill
5. Power Electronics, M.D. Singh & K.B. Khanchandani, Tata McGraw Hill
6. Power Electronics Circuits, Devices & Applications, 3rd Edn., M.H. Rashid,Pearson Education
7. Optoelectronic Devices and Systems, Gupta, 2nd edn., PHI learning.
8. Electronic Devices and Circuits, David A. Bell, 2015, Oxford University Press.

PRACTICALS

PAPER-VI: PHOTONIC DEVICES AND POWERELECTRONICS LAB

At least 08 experiments from the following

1. To determine wavelength of sodium light using Michelson's Interferometer.
2. Diffraction experiments using a laser.
3. Study of Electro-optic Effect.
4. To determine characteristics of (a) LEDs, (b) Photo voltaic cell and (c) Photo diode.
5. To study the Characteristics of LDR and Photodiode with (i) Variable Illumination intensity, and (ii) Linear Displacement of source.
6. To measure the numerical aperture of an optical fiber.
7. Output and transfer characteristics of a power MOSFET.
8. Study of I-V characteristics of SCR
9. SCR as a half wave and full wave rectifiers with R and RL loads.
10. AC voltage controller using TRIAC with UJT triggering.
11. Study of I-V characteristics of DIAC
12. Study of I-V characteristics of TRIAC

Reference Books:

1. AK Ghatak& K Thyagarajan, Introduction to fiber optics, Cambridge Univ. Press (1998)
2. Power Electronics, M.D. Singh & K.B. Khanchandani, Tata McGraw Hill
3. Power Electronics Circuits, Devices & Applications, 3rd Edn., M.H.Rashid, PearsonEducation
4. A Textbook of Electrical Technology-Vol-II, B.L. Thareja, A.K. Thareja, S.Chand.

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SEMESTER- VI

PAPER-VII: ELECTRONIC INSTRUMENTATION AND VERILOG

(Credits: Theory-03, Practicals-1.5) **Theory: 45 Lectures**

Unit I: **Fundamentals of Measurement and Transducers** **(12Lectures)**

Need for Measurements, Block diagram of electronic measuring system, performance characteristics, Signal conditioning circuits, Electrical transducers-classification- Static and dynamic characteristics, Basic requirement of a transducer - selection of a transducer. Resistance and Inductance Transducers, Capacitive and Piezo-electric Transducers, Optical transducers, sound, flow, motion sensors, Temperature and pressure transducers: Principle and Applications, Advantages and Disadvantages.

Unit-II: Measuring Instruments **(12Lectures)**

DC Galvanometer, PMMC mechanism, DC/AC voltmeters, Ammeters, Extending range of meters, Loading effect of voltmeter, Analog and Digital multimeters-Block diagram.

Function generator, Oscilloscope; Bio-medical instruments. DC bridges, AC bridges.

Unit-III: Verilog (12Lectures)

HDL- Brief history, structure of HDL, Module, VHDL and Verilog –comparison,

Verilog- Module, delays, Brief description of modeling styles (structural level, dataflow, behavioural, mixed), Language Elements-Data types, Nets, Register, parameters, Expressions,

Gate-Level Modelling- Built-in primitive gates, multi input and tristategates, pull gates, MOS switches, Bidirectional switches, gate delay, Array instances, implicit nets, Programs- Combinational and sequential circuits

Unit-IV: Data flow and Behaviouralmodelling (9 Lectures)

Data flow modelling- Continuous assignment, net declaration assignments, net delays, programming examples , **Behaviouralmodelling**- Procedural constructs, timing controls, block statement, procedural assignment, conditional statement, loop statements, procedural-continuous assignment, Programming examples.

Reference Books:

1. Instrumentation-Devices and Systems- C.S Rangan, G.R. Sharma and V.S.V. Mani-TMH –1983
2. Electronic Instrumentation and Measurement Techniques-W.D. Cooper, A.D. Helfrix - PHI-1988.
3. Principles of Industrial Instrumentation- D. Patranabis
4. Electrical and Electronic Measurements and Instrumentation-A.K. Sawnney-DhanpatRai and Sons 1978.
5. Handbook of Biomedical instrumentation : R.S Khandpur -Tata McGraw Hill (2001)
6. Biomedical instrumentation and measurement (2nd Edition) - Cromwell, wiebell, Pfeiffer. PHI ,Delhi (1996)
7. Electronics Measurement & Instrumentation by B.H.Oliver&J.M.Cage (McGraw Hill, 1971).
8. Electronic Instrumentation - H. S. Kalsi,2nd Edition,tataMcgraw Hill
9. Electronic Instrumentation and Measurements - Bell PHI
10. A Verilog HDL Primer BS Publications 3rd Edition - J. Bhaskar

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PRACTICALS
PAPER-VII:ELECTRONIC INSTRUMENTATION AND VERILOG

At least five (Instrumentation) + five (Verilog) experiments to be conducted

1. Measurement of resistance by Wheatstone bridge
2. Measurement of self-inductance by – Maxwell and Anderson Bridge.
3. Measurement of Capacitance by desautys and Schering Bridge.
4. Voltmeter- Extending range
5. Ammeter- Extending range
6. Study of Loading Effect of a Voltmeter- Avoiding loading effect using OP-AMP
7. Characteristics of capacitance transducer-changing area and distance.
8. Characteristics of Thermistor and Finding melting point of Wax using thermistor
9. LDR to sense light and control devices (Relay Based)
10. DAC using OP-AMP
11. Analog to Digital Conversion
12. *Comparator and Schmitt Trigger using OP-AMP*
13. Study of ADC 0809/ DAC 0808 or Equivalent
14. Study of opto-coupler
15. **VERILOG Programs**

SEMESTER- VI

PAPER-VIII: TRANSMISSION LINES, ANTENNA AND WIRELESSNETWORKS

(Credits: Theory-03, Practicals-1.5)Theory: 45 Lectures

UNIT-I

Electromagnetic Wave Propagation: Propagation in Good Conductors, Skin Effect,Reflection of uniform Plane Waves at normal incidence, Plane Wave reflection at ObliqueIncidence, Wave propagation in dispersive media, concept of phase velocity and groupvelocity. **(8 Lectures)**

UNIT-II

Transmission Lines: Typical Transmission lines- Co-axial, Two Wire, Microstrip, Coplanarand Slot Lines, Transmission Line Parameters, Transmission Line Equations, Wavepropagation in Transmission lines, lowloss, lossless line, Distortionless line, InputImpedence, Standing Wave Ratio ,Power. and lossy lines, Shorted Line, Open-CircuitedLine, Matched Line, Smith Chart, Transmission Line Applications.

(10 Lectures)

UNIT-III

Radiation of electromagnetic waves: Concept of retarded potentials, Antenna Parameters:Radiation Mechanism, Current Distribution on a Thin Wire Antenna, Radiation Pattern,Radiation Power Density, Radiation Intensity, Beamwidth, Directivity, Antenna Efficiency,Gain, Beam Efficiency, Bandwidth, Polarization, Input Impedance Antenna RadiationEfficiency, Effective Length and Equivalent Areas, Maximum Directivity and MaximumEffective Area, Friis Transmission Equation and Radar Range Equation

Types of Antenna: Hertzian dipole, Half wave dipole, Quarter-wave dipole, Yagi-Uda,microstrip, Parabolic antenna, Helical antenna, Antenna array. **(12 Lectures)**

UNIT-IV

Wireless Networks

Introduction: History of wireless communication, Wireless Generation and Standards,Cellular and Wireless Systems, Current Wireless Systems, Cellular Telephone Systems,Wide Area Wireless Data Services, Broadband Wireless Access, Satellite Networks,Examples of Wireless Communication Systems. Idea about Global Mobilecommunication system. **(8 Lectures)**

Modern Wireless Communication Systems: Second Generation (2G) CellularNetworks, Third Generation (3G) Wireless Networks, Wireless Local Loop (WLL),Wireless Local Area Networks (WLANs), Bluetooth and Personal Area Networks(PANs). Idea about Wi-Fi, 4G and LTE, and 5G

.(7 Lectures)

Reference Books:

1. M. N. O. Sadiku, Principles of Electromagnetics, Oxford University Press (2001)
2. Karl E. Longren, Sava V. Savov, Randy J. Jost., Fundamentals of Electromagneticswith MATLAB,PHI
3. W. H. Hayt and J.A. Buck, Engineering Electromagnetics, Tata McGraw Hill (2006)
4. D. C. Cheng, Field and Wave Electromagnetics, Pearson Education (2001)
5. J. A. Edminster, Electromagnetics, Schaum Series, Tata McGraw Hill (2006)
6. N. Narayan Rao, Elements of Engineering Electromagnetics, Pearson Education(2006)
7. G. S. N. Raju, Antennas and Propagation, Pearson Education (2001)
8. Ballanis, Antenna Theory, John Wiley & Sons, (2003) 2nd Ed.
9. Jordan and Balmain, E. C., Electro Magnetic Waves and Radiating Systems, PHI,1968 Reprint (2003) 3rd Ed.
10. Andrea Goldsmith, Wirelerss communications, (2015) Cambridge University Press

11. D. Tse and P. Viswanathan, Fundamentals of Wireless Communication, (2014)Cambridge University Press.
12. Wireless communication and Networks, UpenaDala, 2015, Oxford University Press.
13. Antenna and Wave Propagation, Yadava, PHI Learning.
14. Haykin S. &Moher M., Modern Wireless Communication, Pearson, (2005) 3rd Ed.
15. Lee, William C.Y., Mobile Communciation Design and Fundamentals, (1999) 4th Ed

PRACTICALS

PAPER-VIII: TRANSMISSION LINES, ANTENNA AND WIRELESSNETWORKS

(Project work and Simulation based experiments)

(Scilab/MATLAB/OtherSimulation Software)

1. Program to determine the phase of forward propagating field
2. Program to determine the instantaneous field of a plane wave
3. Program to find the Phase constant, Phase velocity, Electric Field Intensity and Intrinsic ratio
4. Program to find skin depth, loss tangent and phase velocity
5. Program to determine the total voltage as a function of time and position in a loss less transmission line
6. Program to find the characteristic impedance, the phase constant an the phase velocity
7. Program to find the output power and attenuation coefficient
8. Program to find the power dissipated in the lossless transmission line
9. Program to find the total loss in lossy lines
10. Program to find the load impedance of a slotted line
11. Program to find the input impedance for a line terminated with pure capacitive impedance
12. Program to determine Directivity, Bandwidth, Beam width of an antenna
13. Program to determine diameter of parabolic reflector
14. Program to find out minimum distance between primary and secondary antenna

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OPEN ELECTIVE FOR OTHER DEPARTMENT STUDENTS
(In Semester-IV)
Paper- 4.9: Practical Electronics

(Credits: 02, Theory/Practicals) **Total: 30 Lectures**

Review of Electronic Components: Passive and Active components, ICs- 741, 555, Digital ICs, Regulator ICs, DMM, CRO.

(4 Lectures)

Computer Hardware: Memory, Types of computer, Parts of a computer, Application,

(**4 Lectures**)

Mobile Communication: Introduction to Communication Electronics, Cellular concepts, Hand-off, Enhancing capacity, Roaming, etc (**4 Lectures**)

Microphone, Loudspeaker, Powersupply,LDR, LED, Thermistor, Photodiode/phototransistor, LCD- 7-segment display unit, Fluorescent Tube/CFL, LED bulb.

(**4 Lectures**)

PRACTICALS

OPEN ELCTIVE: Practical Electronics [14 hrs]

1. Experiments using Passive Components
2. Experiments using Digital ICs
3. Transistor- Switch
4. Transistor amplifier
5. IC-555 based experiments
6. Power supply designing
7. Light detection
8. Rain Alarm
9. Fire alarm
10. Shadow sensing
11. Street light controlling
12. Characteristics of LDR
13. Characteristics of LED
14. Characteristics of Thermistor
15. Characteristics of photodiode/phototransistor

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