B.Sc. PART I - SEMESTER I

(Analogue and Digital Electronics - I)

Course Outline

Unit I

Definition, types, identification and uses of electronic components: Resistors, Capacitors, Inductors, Switches, Transformers and Relays.

Introduction to semiconductors: Concept of energy band diagram (Conductor, Semiconductor, Insulator) , Intrinsic and extrinsic semiconductor (P type, N type), diffusion junction, depletion layer, Barrier potential, Avalanche and Zener effect.

Unit II

Ideal Voltage and Current sources (Internal impedance of battery and its effect on its performance), Kirchoff's current and voltage laws, Voltage and current divider circuits.

Superposition, Thevenin, Norton, Maximum power transfer theorems (Statement and simple numerical based on DC circuits only).

Block diagram of C. R. O.

Unit III

Construction, working, characteristics and applications of PN Junction diode, Zener diode, and Light Emitting diode.

Construction and working of BJT, Modes of B.J.T. (CE, CC, CB), transistor equation; α, β and their relationship, junction biasing, Input, output and transfer characteristics of BJT in CE mode, Transistor Biasing (Voltage divider and emitter biasing only), DC load line, Q point, transistor as switch.

Unit IV

Number Systems: Decimal, Binary, Octal, Hexadecimal, representation of integer, fraction and mixed numbers, Mutual conversions, Binary addition, Complement of binary numbers, Binary subtraction using 1's and 2's complement method, SM representation of binary numbers.

Binary codes- BCD, 8421, Excess 3, Parity and Gray code.

Logic gates: Logic, symbol and truth table of OR, AND, NOT, NAND, NOR, XOR and XNOR gates.

Unit V

Boolean algebra: Boolean Laws, double inversion, Duality and De Morgan's theorems, Use of NAND and NOR gate as universal building blocks.

Karnaugh Maps: Pair, Quads, Octets , minterm, maxterm in K Map, K-map for 2,3 and 4 variables, Concept of SOP and POS, Simplification of SOP and POS logic expressions using K-map, Design of binary to Gray code converter and Gray to binary code converter using K-map.

Unit VI

Combinational Logic Circuits: Half Adder, Full adder, Half subtracter and Full subtracter, Concept of Encoder , Concept of Decoder: BCD to Gray converter, Parity generator and checker, 4-bit Full adder/ subtracter, Concept of multiplexer, 4:1 mux using gate , Concept of demultiplexer, 1:4 demultiplexer using gate.

B.Sc. PART I - SEMESTER II

(Analogue and Digital Electronics - II)

Course Outline

Unit I

Amplifier parameters, notations, concept and definition of h-parameters, open circuit and short circuit tests, Introduction to input impedance, output impedance, current, voltage and power gains using h parameters, classification of amplifiers (Descriptive ideas only).

Construction, working, characteristics and applications of FET and MOSFET (depletion and enhancement type), Parameters of JFET and their relationship parameters of MOSFET and their relationship.

Unit II

Introduction to power transistor, difference between Voltage and power amplifiers, transformer coupled class A power amplifier and its efficiency, class B Push-pull amplifier, derivation for efficiency, complementary symmetry power amplifier with two power supplies.

Unit III

Construction, working, characteristics and applications of Silicon Controlled Rectifier (SCR), DIAC, TRIAC , UJT and UJT as relaxation oscillator.

Unit IV

Sequential Logic Circuits- Concepts of Edge and Level Triggering, Propagation Delay, Set up time, Hold time, R-S Flip Flop, Clocked R-S Flip Flop, Limitations of R-S FF, D FF, JK FF, preset and clear , Limitations of JK FF: Race around Condition, JKMS FF.

Unit V

Counters: Asynchronous, Up/down, Decade, Synchronous, Modified counter, Ring Counter, Johnson counter (Truth tables and timing diagrams up to 4 bit).

Registers: Left shift, Right shift, SISO, SIPO, PISO and PIPO Registers.

Unit VI

Introduction to memories, classification, Memory expansion (word size and word capacity).

Logic Families: Characteristics of digital ICs, construction and working of TTL NAND and NOR gates, construction and working of CMOS NAND and NOR gates, Tristate logic, comparison of TTL and CMOS logic families with respect to propagation delay, power consumption, noise immunity, noise margin, fan in and fan out.

B.Sc. PART II - SEMESTER III

(Op-Amp, Power Supply, IC 555 and Circuit Maker)

Course Outline

Unit I

Introduction to DC amplifier, difference amplifier, Need of two power supplies, working of difference amplifier, differential mode gain, common mode gain, C.M.R.R., IC OP-AMP (block diagram), parameters of OP AMP and characteristics of an ideal OP AMP

Unit II

OP AMP as an inverting amplifier, concept of virtual ground, non-inverting amplifier, unity gain amplifier, adder, subtractor, integrator, differentiator, comparator, zero crossing detector, Schmitt trigger.

Unit III

Half wave rectifier, full wave rectifier, bridge rectifier; concept of filter (capacitive). Unregulated, regulated PS, power supply parameters – ripple factor, efficiency, line regulation, load regulation, Zener regulator, Regulated power supply design using series pass transistor, short circuit protection.

Unit IV

General features of IC regulators, design of fixed and variable power supply, 78xx,79xx , LM 317, design of dual power supply, LM 317 as variable regulator, Limitations of linear regulator, Switching regulator- (SMPS), Concept of Low Drop Out regulator (LDO).

Unit V

Timer IC 555: Pin and functional diagrams of IC 555, description of functional diagram, Monostable multivibrator using IC 555, applications in monostable mode (missing pulse detector, linear ramp generator, frequency divider and pulse width modulation) and Astable multivibrator using IC 555, Applications in astable mode (FSK generator, pulse position modulator), Schmitt trigger using IC 555.

Unit VI

Introduction to circuit maker, basics, accessing tools & features, saving schematic options, file management, drawing a schematic, creating simple RC circuit, setting up the analysis, running the simulation, mix signal simulation example. Digital logic simulation, setting of parameters, analysis of simple circuits.

B.Sc. PART II - SEMESTER IV
(OP-AMP Applicatios & Electronic Instrumentation)

Course Outline

Unit I

Feedback: Type, positive and negative feedback, Barkhausen criterion,Oscillators, types (AF and RF), basic oscillator action, L-C oscillator: Colpitts oscillator, RC oscillator using OP Amp ,Phase shift oscillator, Wein bridge oscillator, Oscillator stability, Crystal oscillator, NOT gate based crystal oscillator.

Unit II

Study of OP AMP as: Astable multivibrator (asymmetric and symmetric), Monostable multivibrator (simple circuit) , Concept and working of sample and hold circuit, concept of Instrumentation Amplifier (three OP Amp circuit) and working.

Unit III

D/A converter, Parameters: Range,Resolution, Linearity and speed, Weighted type D/A, limitations of weighted type D/A, R-2R D/A using Op Amp, limitations, types of D/A output (voltage , current, differential).

Need for A/D conversion, parameters: Range, Resolution and speed, Single slope A/D converters, Dual slope A/D converter, Counter type, Successive approximation type, Flash type, Sampling theorem.

Unit IV

Block diagram for electronic system, Defining the system characteristics, Analog, Digital, Real, virtual, Dedicated, Versatile, Stand alone, PC based instruments. Concept of calibration, Standards for calibration.

Unit V

Sensors, Actuators, Transducers, Active and passive transducers, characteristics,
Passive : Thermister (NTC & PTC), LM35, L.D.R., Photo-transistor
Active : Piezo-electric transducer
Digital: Pressure sensor (MPXV4006DP).

Block diagram of temperature measurement using thermister, Temperature measurement using LM35, Advantage over thermister, Lux meter using LDR, Colorimeter using LDR, Insect repellent using piezo buzzer .

Unit VI

Man-Instrument system components, Introduction to physiological system, generation of bio potential, Block diagram and working of EEG, ECG and EMG, Electrical shock hazards, Precautions, Safety codes in biomedical instrumentation.

B.Sc. II (SEM IV) ELECTRONICS PRACTICALS

Students are expected to perform at least 5 experiments from section A and 5 experiments from section B.

Section A

1. Study of OP-amp based Wein bridge oscillator.
2. Study of OP-amp based Phase shift oscillator.
3. Study of Colpitt's oscillator.
4. Study of Op-amp as astable multi vibrator.
5. Study of Op-amp as Mono stable multi vibrator.
6. Study of Instrumentation amplifier.
7. Study of successive approximation ADC.
8. Study of Flash type ADC.
9. Study of Single slope ADC.
10. Study of Dual slope ADC.
11. Study of Binary weighted DAC.
12. Study of ladder type DAC
13. Study of NOT gate based crystal oscillator.
14. Study of Sample and hold circuit.

Section B

1. Study transfer characteristics of NTC type thermister
2. Study resolution in characteristics of NTC type thermister
3. Study transfer characteristics of LM 35
4. Study transfer characteristics of Water heater (around 300W)
5. Study of ON/ OFF type thermo-state using LM 35
6. Study transfer characteristics of LDR
7. Study transfer characteristics of Piezo-electric transducer

PROPOSED SYLLABUS FOR B.Sc. PART III (ELECTRONICS)

(SEMESTER V & VI)

Aim of the Course

To equip the students with the basic analog, digital and fiber optics communication, Fundamentals of 8 bit microprocessor and assembly language programming, high level programming language, C and theory and applications of microcontrollers.

Objectives of the Course

1. To study the different types of digital communication techniques,
2. To study the different types of modulation Techniques,
3. To study principles of fiber optic communication,
4. To study architectural features of 8085, Microprocessor initiated operations, Assembly Language Programming techniques.
5. Achieving competency in C programming
6. To study architectural features of 8051, Microcontrollers initiated operations, Assembly Language Programming techniques.

B.Sc. PART III - SEMESTER V
(Electronic Communication & Fundamentals of Microprocessor)

Course Outline

Unit I

Introduction to Electronics communication, block diagram of communication

system, Types of communication: analog, digital; simplex, duplex; baseband, modulated, concept of modulation, need for modulation, types of modulation (AM, FM, PM).

Unit II

Propagation modes of signals: ground waves, sky waves, Ionosphere and satellite; antenna fundamentals, basic principles and types.

Unit III

Digital communication: Introduction, synchronous, asynchronous transmission, Shannon theorem, ASK, FSK, and PSK modulation.

Fiber optic communication system, Advantages of FOC, concept of Fax,

concept of cellular telephone, block diagram of cellular telephone, advantages

Unit IV

Block diagram of Intel 8085, ALU, Timing and control unit, General purpose registers, Accumulator, PC, SP, IR, ID, Interrupt, Address and Data bus multiplexing, Flags. Instruction Cycle: T-states, Fetch operation, Execute operation, Machine cycle.

Unit V

Addressing modes, instruction Set: Data transfer group, Arithmetic group, Logic group, Branch control group, I/O and machine control group, stack and subroutines, simple programs based on above instructions.

Unit VI

Need for interfacing, modes of data transfer, synchronous and asynchronous, interrupt driven, DMA, PPI 8255- Block diagram, modes, control word format.

B.Sc. III (SEM V) ELECTRONICS PRACTICALS

Students are expected to perform at least 5 experiments from section A and 5 experiments from section B.

Section A

1. Study of Half duplex communication system using PC/μC (2 wire interface),
2. Study of Full duplex communication system using PC/μC (3 wire interface),
3. ASK using op-Amp,
4. FSK using op-Amp,
5. Study of AM detector,
6. Study of narrow band amplifier using op-amp/ Transistor,
7. Study of intensity characteristics of LASER diode,
8. X-bee interface using PC/ μC / field strength study,
9. IR Link study,
10. Wire impedance measurement.

Section B

1. Program for data transfer instruction,
2. Program for addition of 8-bit numbers (Hex and decimal),

3. Program for addition of 16-bit numbers (Hex and decimal),
4. Program for 8"bit subtraction,
5. Program for 8-bit multiplication,
6. Program for l's and 2's complement of 8 bit numbers,
7. Program for masking of 4 most and least significant bits of a 8-bit numbers,
8. Program for finding the least number from a series of numbers,
9. Program for finding the largest number from a series of numbers,
10. Program for arranging a series of numbers in ascending order,
11. Program for arranging a series of numbers in descending order,
12. Study of 8255.

REFERENCE BOOKS

1. Electronic communication system, John kennedy ,Tata McGraw Hill
2. Communication Electronics, Principles and Application, Frenzel, Tata McGraw Hill.
3. Fundamentals of Microprocessor and Microcomputers, B.Ram, Dhanpat Rai publications
4. Microprocessor Architecture, programming and applications with 8085/8080A,
5. Ramesh S. Gaonkar, Wiley eastern ltd.
6. Introduction to Microprocessor, A. P. Mathur, Tata McGraw Hill,
7. Microprocessor and Interfacing, D. V. Hall, Tata McGraw Hill,
8. Introduction to Microprocessors, Vilas Ghodki and Satish Sharma

Web Resources

Students are advised to make use of the resources available on the internet. Some useful links related to electronics are given below.

1. M.I.T. open course ware video lectures are available athttp://ocw.mit.edu/OcwWeb/Electrical-Engineering-and-Computer-Science/6-002Spring-2007/VideoLectures/index.htm
2. www.electronics-tutorials.com
3. http ://electronics .howstuffworks .com
4. www.science-ebooks.com/electronics
5. http://computer.howstuffworks.com

6. www.geocities.com/CapeCanaveral/1221/elec1.htm
7. http://101 science.com/eleclinks.htm
8. www.electro-tech-online.com/blogs/gayan-soyza/23-useful-electronic-links.html
9. www.discovercircuits.com/resources/tutorials.html
10. www.electronics-lab.com/
11. www.glolab.com/links/links.html etc

B.Sc. PART III - SEMESTER VI
(Programming in "C" & Microcontroller 8051)

Course Outline

Unit I

Constant, Variables and Operators: Character set, C tokens, constant, Keyword, identifiers, variables, data types, declaration of variables, Arithmetic, relational logical, assignment, increment, conditional, bitwise, operators, Arithmetic expression, evaluation of expression, precedence of operators, input/output functions.

Unit II

Control Structures & Arrays: if- statements, if-else statement, switch statement, go-to statement, while statement, do-while statement, for statement, one dimensional array.

Unit III

User Defined Functions, Types of functions, return values and their types, scope and lifetime of variables in function; basic concept of structure and unions, difference between structure and union.

Pointers: Basic concept, expression, variables Defining and opening file, closing a file, I/O operations on file, command line arguments, port interfacing.

Unit IV

Architecture and features, Internal and External memory, Flags, SFR Map, SFR Function, Accumulator, Register B, Port registers (P0, P1, P2 and P3), Power Management (PCON).

Unit V

Instruction set: Data transfer, logical, arithmetic, interrupt handler, Addressing Modes .

Subroutine and Stack, Need for Subroutine LCALL and RETURN Instructions, ACALL Instructions, Nesting of subroutine, Stack Operation and Stack Instruction, Branching (Jump Instruction), simple programs .

Unit VI

Interfacing with Keyboard, display - LCD (16 x 2), ADC and DAC, LED Matrix and Serial communication with personal computer.

B.Sc. III (SEM VI) ELECTRONICS PRACTICALS

Students are expected to perform at least 5 experiments from section A and 5 experiments from section B.

Section A

1. Programs based on use of Variables, Operators, Input Output function
2. Programs based on Control Structure using if, if-else, switch, goto, while & do while
3. Programs based on use of one dimensional Array , Operations on array
4. Programs based on function writing, Use of structure and Union
5. Programs based on pointer operation, file operation
6. Programs based on communication with external data source like Printer & serial port.

Section B

1. LED Blink
2. Relay interface
3. Stepper Motor Interface
4. 16x2 Interface
5. Study of bit operation on port(A,B,C,D)
6. LED Blink using timer
7. Frequency Generator using timer
8. External frequency counting timer
9. Interrupt driven operation
10. Single blink on key I/P
11. Opto- triac interface
12. Key to clk/CC
13. Serial interface with PC
14. ADC 0808 interface
15. DAC 0808 interface
16. IIC interface using R.T.C.

REFERENCE BOOKS

1. Let us C ,Y.Kanetkar
2. Gate to C programming, Kishor S. B., Vilas Ghodki and Madhavi
3. C in depth, Shrivastava, BPB publication
4. Programming in ANSI C, E Balgurusamy, Tata McGraw Hill
5. Programming with C Byron Gottfried Schaums outline series, TMH. 8051 microcontroller, V. Udayshankara, Mallikarjuna Swamy,Tata McGraw Hill
6. Microcontroller: Theory and Applications, A.V.Deshmukh Tata McGraw Hill
7. Microcontroller, Rajkamal, Pearsons
8. Microcontroller, Mazidi and Mazidi

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1. M.I.T. open course ware video lectures are available athttp://ocw.mit.edu/OcwWeb/Electrical-Engineering-and-Computer-Science/6-002Spring-2007/VideoLectures/index.htm
2. www.electronics-tutorials.com
3. http ://electronics .howstuffworks .com
4. www.science-ebooks.com/electronics
5. http://computer.howstuffworks.com
6. www.geocities.com/CapeCanaveral/1221/elec1.htm
7. http://101 science.com/eleclinks.htm
8. www.electro-tech-online.com/blogs/gayan-soyza/23-useful-electronic-links.html
9. www.discovercircuits.com/resources/tutorials.html
10. www.electronics-lab.com/