ST. JOSEPH'S COLLEGE (AUTONOMOUS) BANGALORE- 560027

DEPARTMENT OF ELECTRONICS

Semester	Paper Code	Title
First	EL 118	**Basic Electronics**
Second	EL 218	**Amplifiers And Oscillators**
Third	EL318	**Digital Electronics**
Fourth	EL 418	**Verilog HDL**
Fifth	EL 5118	**Data Acquisition and Instrumentation**
Fifth	EL 5218	**Microprocessor and Interfacing**
Sixth	EL 6118	**Communication Electronics**
Sixth	EL 6218	**Intel 8051 Microcontroller and Embedded Systems**

EL-118 BASIC ELECTRONICS

UNIT 1: Electronic Passive components and their response to AC and DC (09 Hrs)

Review of Passive components, R, L and C, color coding of resistors, Transformer principle, Voltage and Current sources ideal, non ideal

Review of AC: terms like Vrms, Vdc, Vp, phase lead, phase lag, frequency. AC applied to R, C, L, RC, RL circuits, RLC in series and parallel - resonance, Q-factor

Phasor representation – rectangular to polar & vice versa

Transient Analysis of RC & RL circuit – charging, discharging RC circuit, voltage in RL circuit, time constant graph(derivation)

UNIT 2: Network Theorems (10Hrs)

Ohms law, Kirchoff's laws, Voltage divider Rule, Current divider rule, Numerical problems with resistors in series and parallel in circuits

Kirchoff's Law analysis/ Mesh Analysis

Superposition theorem, Thevenine's Theorem, Norton's theorem, Maximum power transfer theorem: statement and explanation. Derivation for maximum power transfer, circuit efficiency.

Maximum power transfer in AC circuits, numerical problems (DC only).

UNIT 3: Semiconductor diode and applications (10Hrs)

Review of semiconductors, doping, n, p-type, pn junction.

V-I characteristics of pn junction DC and AC forward resistance, knee voltage, PIV, avalanche breakdown, power rating.

Diode applications:

Rectifier: half wave rectifier, full wave rectifier - center tapped & bridge;

Vrms, Vdc, ripple factor, efficiency, output frequency comparison

Filters – C, L, LC, Π, working & response.

Clippers: positive, negative, biased, combinational clippers.

Clampers: positive, negative, biased clampers.

Voltage multipliers: Doubler, Tripler, Quadrapuler.

Zener diode, characteristics, Zener breakdown, equivalent circuit, Zener regulator.

Light Emitting diode – Applications, 7 Segment display.

UNIT 4: Bipolar Junction Transistor (10Hrs)

Transistor construction pnp, npn, working, different regions, currents relation, leakage currents**,** **Transistor configurations,** α, β, γ relation. Transistor characteristics in CE, CB mode, with Ri, Ro, β, calculation.

Need for biasing; Fixed bias with emitter resistor, voltage divider bias circuit, derivation for Q point & stability factor, Thermal runaway.

UNIT 5: Small Signal Amplifiers (13 Hrs)

CE amplifier, working, ac load line, ac, dc equivalent circuit, re model, gain, Zi, Zo, Ai deviation, frequency response. CB amplifier circuit working. CC amplifier: circuit & working, mention of Zi, Zo. CC as emitter follower & buffer explanation.

Introduction To FET & MOSFET

Construction & working of JFET, advantages over BJT. Drain and transfer characteristics, Pinch off voltage, Shockley's equation. CS amplifier – gain(derivation) & frequency response. MOSFET depletion & enhancement type – construction, working, characteristics.

Self Study: **(08 Hrs)**

Nodal analysis, T – Π and Π – T inter conversion, diode approximations, Heat Sinks, Classification/Comparison between Amplifiers, CMOS Technology, Types of CMOS, Advantages, Comparison.

Recommended Books

1. Principles of Electronics, A.P Malvino, TMH, 6th edition, 2005.
2. Introductory circuit analysis, Robert L Boylestad, Universal Book Stall Fifth edition, 2003.
3. A Text book of Applied Electronics, R.S.Sedha, Chand and Company Ltd. New Delhi, Edition 2005

Reference Books

1. Electronic Devices and circuits, T.F. Bogart, Beasley, Pearson Education, 6th Edition, 2004.
2. Basic Electronics and Linear Circuits. N.N. Bhargava, D.C Kulshreshta, and S.C Gupta, TMH, 40th Reprint, 2005.
3. Electronics Devices and circuit theory, Robert Boystead and Louis Nashelsky, Pearson Education, 8th edition, 2004
4. Electronic Devices and circuits, T.L.Floyd, PHI, fifth edition, 2005.

EL 1P1: Practical

List of experiments

Study of resistance color code, soldering practice, test and measuring instruments and Ohm's Laws (1 practical class)

1. Charging and discharging of capacitor
2. Superposition Theorem
3. Thevenin's Theorem
4. Maximum Power Transfer Theorem
5. Semiconductor diode and Zener diode characteristics
6. Center tap full wave rectifier with and without capacitor filter
7. Voltage tripler using diodes
8. Zener regulator- Line and Load regulation
9. Fixed bias circuit with emitter resistor
10. Voltage divider bias circuit
11. CE amplifier- Frequency response

SEMESTER- II
EL-218 AMPLIFIERS AND OSCILLATORS

UNIT 1: Amplifiers (10 hrs)

Multistage Amplifiers: Need & use of multistage amplifiers, overall gain, cascade vs cascode. RC coupled amplifier. Darlington amplifier – circuit, current gain, Zi, Zo, advantages.
Power amplifiers: Voltage Vs Power amplifiers, need for power amplifiers,
Classification Class A, Class C (mention only)
Class B: push pull amplifier, working, efficiency (derivation), cross over distortion, harmonic distortion, complimentary symmetry (transformer less). Comparison.
Tuned amplifiers: need for single tuned and double tuned, working, frequency response curve, advantages & disadvantages, note on coupling.

UNIT 2: FEEDBACK AMPLIFIERS AND OSCILLATORS (14 hrs)
Feedback: Types of Feedback, Block Diagram, Effect of Feedback on Av, BW, Zi, and Zo.

Need for oscillators; positive feedback, Tank circuit – oscillations, resonant frequency. Barkhausean criterion for oscillation, LC tuned oscillator - Colpitts and Hartley oscillator, frequency of oscillation (derivation), minimum gain, advantages & disadvantages, RC Oscillators - phase shift & Wein bridge oscillator, frequency and minimum gain, crystal oscillator, piezoelectric effect, equivalent circuit, series & parallel resonant circuits, Q factor.
Non Sinusoidal oscillators: Astable Multivibrator, Working waveforms, frequency formula (mention only), Monostable multivibrator, bistable multivibrator (flip flop concept).

UNIT 3: Integrated circuits (06 hrs)

IC555 block diagram & pin diagram. IC555 Application – Astable, Monostable (derivation), Voltage controlled oscillator. Schmitt trigger. IC Regulators: LM317, IC78XXX, 79XX series (block diagram)

UNIT 4: Differential Amplifier (08hrs)
Circuit configurations – working, dc & ac analysis of dual input balanced output differential amplifier – Av, Ri & Ro, Common mode gain, CMRR, current mirror – circuit & working differential amplifier with current mirror.

UNIT 5: OP. Amp. Theory and Applications (14 hrs)
Op Amp block diagram, pin diagram IC741,specifications, characteristics of ideal and practical op amp parameters-input bias current, input offset voltage, output offset voltage, CMRR, slew rate SVRR, offset null, open loop op.amp. limitations, Closed loop op. amp. Block Diagram of negative series feedback amplifier, Inverting and non-inverting feedback circuit-negative gain, Rif, Rof, Virtual ground, unity gain bandwidth.

Applications: Adder inverting and non-inverting, subtractor, scale changer, buffer, integrator, differentiator(ideal and practical). Comparator, zero crossing detector, Active filters-Butterworth first order low pass, high pass, band pass, band stop, all pass filters.

Self study: **(08 hrs)**

Parameters based Classification of Amplifiers, Feedback Amplifiers: Types, Advantages, Circuits Classification of integration, construction, Types of IC: Analog and Digital, 3D Integrated Circuit (Introduction Only), level translator. Second order Butterworth filter-mention only all the filter response and frequency responses (gain derivation for LPF and HPF).

Recommended Text Books

1, Operational amplifier and linear circuits, Ramakanth Gayakwad PHI, 3rd Edition, 2005.

Reference Books

1. Electronic Devices and circuits, T.F. Bogart and Beasley, Pearson Education, 6th Edition, 2004.
2. Electronics Principle-AP Malvino, Tata McGraw-Hill, 6th edition, 2005.
3. Electronic Devices and Circuits, T. L. Floyd, PHI, 5ht Edition 2005.
4. Micro electronics Circuits, Sedra and Smith, 5th Edition, Oxford University Press
5. Basic Electronics- A Text Lab Manual, Paul B Zbar, A.P. Malvino, TMH, 7th Edition,1995.

EL2P1: PRACTICALS

List of experiments

1. Colpitts Oscillator
2. Construction of regulated power supply using IC 7805 and IC 7905
3. Op-amp Adder, subtractor and scale changer
4. Phase-shift oscillator using IC 741
5. Wien-Bridge oscillator using IC 741
6. Op-amp comparator
7. Hartley Oscillator
8. Astable multivibrator using transistors
9. Current and voltage regulation using IC LM 317
10 Op - amp inverting amplifier
11 Crystal oscillator

SEMESTER-III

EL-318 DIGITAL ELECTRONICS

UNIT 1: Number System Codes (8 hrs)

Binary, Octal, Hexadecimal numbers & inter conversions, addition, subtraction, multiplication of binary and hexadecimal numbers, signed numbers, 1's compliment, 2's compliment, 2's compliment subtraction. Codes: 8421, BCD, Excess-3, Gray code. Binary to Gray & vice versa conversion. ASCII & EBCDIC Bar code. Excess-3 self complementing property. Parity codes. BCD addition.

UNIT 2: Logic gates and Boolean algebra (12 hrs)

Positive and negative logic, basic logic gates, AND, OR and NOT, NOR & NAND gates, - circuit, working and truth table. De-Morgan's theorem, Boolean laws, Duality theorem. XOR & XNOR gates. Simplification of Boolean expression & logic gates. NAND, NOR as universal gates. SOP & POS expressions and Simplification. K-map – 3 & 4 variables.

UNIT 3: Logic families & Pulse characteristics (12 hrs)

Logic families – classification of logic families. TTL NAND gate. TTL IC terminology (74HXX,74LXX) & characteristics. MOS logic, CMOS inverter gate. CMOS characteristics, interfacing CMOS to TTL & vice versa. Pulse characteristics: ideal & non ideal pulses. Characteristics of pulses, rise time, fall time, pulse duration in non ideal pulses.

UNIT 4: Combinational logic circuits (15hrs)

Half adder, half subtractor, full adder, full subtractors. Two bit and 4-bit magnitude comparators, IC 7485- pin diagram, Multiplexers-4: 1, 8:1 and 16:1 multiplexers, logic diagram and truth table of each, applications, Demultiplexers-1: 4, 1:8 and 1:16 de-multiplexers & IC's associated with them. (74150/74154)Decoder – 7446/47 BCD to seven segment decoder/driver, Encoder, priority encoder, Decimal to BCD encoder-circuit & priority encoder IC. Logic diagram, explanation & truth table.

UNIT 5: Sequential logic circuits (15 hrs)

Latches & Flip- flops(NAND and NOR latches), Clock pulses, edge triggered versus level triggered. RS, D, JK. JK master slave, T flip flops. Circuits, working & truth table. Preset & clear functions in flip flops, timing diagram. IC7476, IC7473.

Registers: SISO, SIPO, PISO & PIPO circuit, working, truth table, timing diagram. IC7476/73.

Counters: Asynchronous counters; mod 4, mod 8, mod 16, Decade Counters, glitches, truncated counters like mod 3, 5, 6, 7.Asynchronous up – down counters. IC7490, mod 4, 8, 16, decade counters, Synchronous counters.

Advantages & disadvantages between asynchronous & synchronous counters, Johnson & Ring counters.

Self study: **(10 hrs)**

Interfacing of TTL with sub families, Realization of Multiplexers 32:1 using 16:1, Demultiplexers 1:32, Left and right rotate using shift registers, designing counter using K-map, Synchronous counters mod 4,8, 16.

Books Recommended:

1. Digital fundamentals: T.L.Floyd , Universal Book Stall,8th edition,2005.

2. Modern digital electronics R.P Jain –TMH publication, 3rd edition, 2003.

Reference books:

1. Fundamentals of digital circuits: A Anand Kumar, PHI, 3rd edition 2004
2. Experiments in Digital Electronics: Malvino and Leach – TMH, 2000
3. Digital Lab Primer- K A Krishnamurthy, Pearson education 2003

EL 3P1: Practical III

List of experiments

1. Realization of Basic gates using diode and transistor
2. Realization of Basic gates using NAND gates using IC 7400
3. Realization of Basic gates using NOR gates using IC 7402
4. Half Adder and Half Subtractor using NAND gates
5. Full Adder using IC 7486 and IC 7400
6. Binary to Gray code and Gray code to Binary conversion
7. Clocked RS, D Flip-flops using NAND gates
8. 4 –bit binary ripple up counter using IC 7476/74107
9. Decade counter using IC 7490.
10. Study of De-Multiplexer using IC 74154
11. Study of Multiplexer using IC 74150

Semester IV

EL418: Verilog HDL

Unit I: Introduction to Verilog and Gate Level Modeling (10 hours)

Introduction, design flow, Use of Verilog, hierarchical modeling concepts, design methodology, Introduction to modules, instances, Basic Concepts: Lexical Conventions, data types: value set, nets, registers, vectors, arrays, parameters, memories, strings. System tasks and compiler directives.
Introduction to modules, instances, Modules and Ports, hierarchical names.
Gate level modeling: Gate types- AND/OR, BUF/NOT, multiplexer, full adder, Gate delays: Rise, Fall, Turn off delays, min/typ/max values.

Unit II: Data Flow and Behavioral Modeling (15 Hours)

Data flow modeling: Continuous assignments, delays, expressions, operators and operands, operator types with examples.

Behavioral modeling: Structural procedure, procedural assignments, Timing controls: Delay Based, Event Based, Level Sensitive, conditional statements, loops, sequential and parallel blocks

Unit III: Structural Modeling Concepts (02 Hours)

Tasks and Functions: Introduction to Tasks, Introduction to Functions, Differences between Tasks and Functions.

Self Study: (03 Hours)

Named Event Timing Control in behavioral modeling.
Structural Modeling: Generate Statement: Generate - loop, Generate- Conditional, Generate-case.

Books Recommended:

1. Verilog HDL: A Guide to Digital Design and Synthesis – Samir Palnitkar

EL – 4P1 PRACTICAL

List of Practical

1. Write a Verilog program to implement basic gates.
2. Write a Verilog program to implement 1-bit full adder.
3. Write a Verilog program to implement 4 bit ripple carry adder.
3. Write a Verilog program to implement 4 to 1 mux.
4. Write a Verilog program to implement 2 to 1 mux.
5. Write a Verilog program to implement two bit comparator.
6. Write a Verilog program to implement 1 to 4 demux.
7. Write a Verilog program to implement D- Flip Flop.
8. Write a Verilog program to implement JK- Flip Flop.
9. Write a Verilog program to implement 4 bit ripple carry counter.

SEMESTER V

EL 5118: Data Acquisition and Instrumentation

UNIT 1: SENSORS/TRANSDUCERS (15 hrs)

Introduction, Definition of Sensor/Transducer, classification of transducers- Passive, active, digital and analog types, definition and examples, Electrical transducers/sensors advantages. Selecting a transducers, Resistive transducers- Thermistor- construction, types, resistance- temp characteristics, applications, Resistance thermometer – construction, advantages, limitations, Thermocouple-Seebeck Effect, principle of operation, advantages and disadvantages, Inductive transducers - Reluctance type - construction, working Linear variable differential transformer (LVDT) -construction, working, advantages. Pressure transducer, Capacitive transducer, Resistance transducer, Strain Gauge: Principle, construction, working, Photo electric transducers, Photovoltaic cell, photo diode and photo transistor- working principle, applications. Piezo electric transducer, working principle, applications. Applications: pressure sensor, flow meters, vibration, speed sensors.

UNIT 2: DATA ACQUISITION AND CONVERSION (06 hrs)

Introduction, general data acquisition system (DAS), objective of DAS, Single channel and multi channel DAS block diagrams qualitative description. Digital to Analog converter - R-2R ladder and binary weighted ladder circuits, brief analysis. D to A using op-amp summing amplifier. Analog to Digital converter- Successive approximation method, Flash ADC, block diagram explanation.

UNIT 3: MEASURING INSTRUMENTS (12 hrs)

Digital voltmeter- features, advantages and performance characteristics, digital voltmeter types, ramp type digital voltmeter, dual slope type digital voltmeter,- block diagram, working principle, advantages and disadvantages, Digital multimeter, Electronic Counter, Frequency meter, capacitance meter- Block diagram, working and applications, resolution and sensitivity of digital multimeter, Oscilloscopes-analog dual trace type, block description and principle of operation, signal generator (Block diagram of IC 8038 signal generator).

UNIT 4: DISPLY DEVICES (07 hrs)

Principle, Working Mechanism and Applications: Seven Segment Display and its types, Liquid Crystal Display, LED Display, Touch Screen (Resistive and Capacitive), Plasma Display, OLED Display, DLP.

Self Study: (05 hrs)

MEMS, NEMS, FBGS (Brief Review)
General Block Diagram of Medical Instrumentation System, Types of Medical Electrodes, (Introduction and Block Diagram) ECG Machine, MRI uses.

Book Recommended:

1. Electronic Instrumentation - H.S.Kalsi, 2nd Edition, TMH, 2005
2. Sensors and Transducers – D Patranabi
3. Bio Medical Instrumentation System – Khandpur

Reference Books:

1. Electronic Instrumentation and measuring Techniques, W.D. Cooper, A.D. Helfrick 3rd Edition, PHI, 2000
2. A Course in Electrical, Electronics Measurement and Instrumentation, A.K. Sawhney, Dhanpat Rai & sons, 1996.
3. Instrumentation devices and systems, C.S.Rangan, G.R.Sarma, VSV Mani, TMH, 1998
4. Sensors and Transducers – Ian R. Sinclair

ELE 5P1: Practical

List of Experiments:

1. Op-amp Integrator –Frequency response & waveforms.
2. Op-amp Differentiator –Frequency response & waveforms.
3. Finding unknown capacitance using IC555.
4. Flash ADC – IC Quad op-amp.
5. Study of Instrumentation amplifier.
6. Study of DAC using binary weighted resistors.
7. Current to voltage convertor.
8. Voltage to current convertor.
9. Finding unknown resistance using Wheatstone bridge.
10. Study of R-2R ladder network.
11. Study of loading effect of voltmeter and correction using Op-Amp buffer.
12. Characteristics of Photodiode and phototransistor.

SEMESTER V

EL5218: Microprocessors

UNIT 1: Introduction to Computer Architecture (05 hours)

Introduction to Microprocessor, Buses. Introduction: Parallel Architectures: SIMD, MMID, Multicore Processor, Hyper Threading Technology, ARM Architecture

UNIT 2: Introduction and Architecture of Microprocessor 8086 (10 hours)

Microprocessor Overview, Intel 8086 Microprocessor: Register Organization, Architectural block diagram: Bus interface unit, Execution unit, pipelining, pin configuration, flags, data and address bus demultiplexing, Generation of 20-bit Address, modes of operation: - minimum mode and maximum mode. Accessing odd and even memory bank, instruction cycle, fetch-execute cycles, timing diagrams - memory read, write, I/O write.

UNIT 3: Instruction Set and Programming of 8086 (15 hours)

Addressing modes:-Immediate, register and Memory addressing modes Instruction Sets - data transfer, arithmetic and logical, shift and rotate, branch and machine control group. Programming: Some examples; addition, subtraction, multiplication, division of two 8 bit numbers, one's compliment, two's compliment, to find the number of one's in a given byte, addition and subtraction of 16 bit numbers, Average of 10 numbers, Fibonacci series, count 00-99, program to generate ASCII equivalent values for decimal numbers 0 to 9, smallest and largest numbers, Delay program. Stack, Subroutine, Interrupts: - Types/classification of interrupts, Sources of 8086 interrupts, interrupt sequence and vector table, Priority interrupt controller (PIC - 8259)

Unit 4: Introduction to Advanced Microprocessors (05 hours)

Introduction to 80186, 80286, 80386, 80486 hardware features, additional instructions. Introduction to Pentium microprocessor, Special Pentium registers, Basic and additional features of Pentium Pro, Pentium II, Pentium III, Pentium IV.

Unit 5: Memory Devices (04 hours)

Need for memory devices, computer memory devices, Memory Hierarchy, primary and secondary, real and virtual memory, volatile and non-volatile, Memory write ability and storage permanence, Composing Memories, Types of semiconductor memories:- ROM, PROM, EPROM, EEPROM, Flash, RAM, SRAM, DRAM, PSRAM and NVRAM, cache memory.
Self-Study: (06 hours) Memory mapped I/O scheme, I/O mapped I/O scheme, DMA Intel 8257, Brief overview of iCore Processors, Overview of Artificial Intelligence.

Reference Books:

1. "Advanced Microprocessors and Peripherals"- A.K. Ray, K.M. Bhurchandi. Tata Mc. Graw Hill.
2. "Microprocessors and Microcontrollers"- B.P. Singh. Galgotia publications.
3. "Microprocessor theory and applications"- M. Rafiquizzaman, PHI.
4. "The 8088 and 8086 Microprocessors Programming, interfacing, software, hardware and Applications" - Waltier A. Triebel and Avtar Singh. PHI. "The Intel Microprocessors 8086/8088, 80186, 80386, 80486 Architecture, Programming
5. Upgrading and Repairing PCs by Scott Muller; Publishers: Techmedia.
6. 8051 Microcontroller: Internals, Instructions, Programming & Interfacing By Ghoshal Subrata 7. Advanced microprocessor and peripheral interfacing – Douglas V. Hall.

EL5P2: Practicals (Intel 8086 ALPs using MASM)

1. Addition and subtraction of 8-bit numbers.
2. Addition and subtraction of 16-bit numbers.
3. Multiplication of two given numbers.
4. Program for division.
5. To find the square and cube of a number.
6. To find the average of ten given 8-bit numbers.
7. 1's and 2's complement of 8-bit and 16-bit numbers.
8. Smallest and largest number in a data array.
9. To find the number of ones and zeros in a data.
10. To interchange the data present in two different memory locations.
11. To generate Fibonacci series.
12. Arranging a series of 8-bit numbers in Ascending and descending order

VI Semester

EL 6118: Communication Electronics

UNIT I Analog and Digital Modulation Techniques (12 hrs)

EM spectrum, wave propagation - ground, space and sky waves

Modulation – Need for modulation, types of modulation – AM, FM, PM. Amplitude modulation - definition, expression for instantaneous voltage, frequency spectrum, representation, modulation index, power relations, modulation by several sine waves, Generation of AM waves, Collector modulator, AM transmitter, types of AM.

Frequency modulation – Definition and wave representation, frequency deviation, carrier swing, modulation index, derivation of instantaneous voltage, note on Bessel functions, frequency spectrum, FM generation: principle - varactor diode modulator, FM transmitter, pre emphasis, de emphasis, AFC, comparison between AM & FM. Numerical problems.

Introduction-sampling theorem, Pulse modulation types-PAM, PWM, PPM, brief description, waveforms, PCM-Quantization Digital communication systems –Introduction to digital modulations. FSK, BPSK and ASK- brief description, waveforms, Advantages and disadvantages of digital transmission. Applications. Characteristics of data transmission circuits-Shannon limit for information capacity Bandwidth requirements, data transmission speeds, Noise, Cross talk, Echo suppressors, Distortion and equalizer,

UNIT II Antenna and RADARS (08 hrs)

Radiation mechanism - dipole from open circuited transmission line, antenna equivalent circuits, wire radiators in space – resonant, antenna – radiation pattern and current distribution for different lengths and current distribution ($l=\lambda/2$, $2\lambda/2$,$3\lambda/2$), Non resonant antenna, Antenna parameters: definitions and expressions for gain, directive gain, power gain directivity, beam width, bandwidth, polarization, radiation resistance, derivation for total power radiated by an antenna and radiation resistance. Grounded antenna and ungrounded antenna.

RADAR: Introduction, principle, frequencies, block diagram of pulse radar system, function of each block, CW Doppler radar – working principle applications with block diagram, RADAR range equation derivation, factors influencing max range, Applications of RADAR (Brief explanation).

UNIT III Satellite Communication **(08 hrs)**

Introduction, satellite orbits, satellite system-block diagram of satellite sub systems (space segment), station keeping, attitude control, ground station (simplified block diagram of earth station), uplink, downlink, cross-link, Transponder (C-band multi channel), satellite band width, frequency reuse, micro strip antenna, Multiple access methods - TDMA, FDMA, and CDMA.GPS –services like SPS & PPS.

UNIT IV Optical Fiber Communications **(06 hrs)**

Introduction-need for optical fiber communication, Block diagram of OFC system, Core and clad concept, light propagation through optical fibre, Expressions for acceptance angle and numerical aperture. Modes of Propagation, Light sources - Requirements and examples. Construction and working of unguided LASER diode. Photo detector –PN photo diode PIN photo diode requirements and examples. Advantages and disadvantages of fibre optic communication, Losses in optical fiber.

Unit V Advanced Communication and Networking **(06 hrs)**

Internet, internet service telephone cable and satellite connections, high speed connections: ISDN, ADSL, cable modems, emails, mobile communication - block diagram, cell, cell splitting, frequency reuse, roaming and hand off. Simplified block diagram of cellular phone, Study of GSM & CDMA system: other wireless systems: LAN, Wi-fi, Bluetooth, NFC (mention only).

Introduction, history, network architecture, protocols and standards for data communication, layered network architecture, open systems, interconnection, different layers and functions data communication circuits, serial and parallel data transmission, data communication networks.

Self Study **(05 hrs)**

Modems - Classifications, modes of modem operation, AM Demodulation and FM Demodulation - Phase Discriminator, Block diagram **of** Super-heterodyne Receiver (AM and FM).

Books Recommended:

1. Electronic Communication ,Dennis Roddy &John Coolen –IVth edition-PHI, 2005
2. Electronic Communication systems, Kennedy &Davis IV the edition, 2005 TATA Mc GRAW Hill
3. Electronic Communication systems ,Wayne Tomas –Vth edition –Pearson education, 2005
4. Digital Communication Systems: Ronals J. Tocci
5. Computer Networks: Tanen Baum

Reference Books:

1. Handbook of experiments in electronics and communication-Poorna Chandra Rao & Sasikala, VIKAS Publising house, 2004
2.Basic Electronics -A text lab manual,-PaulB.Zbar,Albert P.Malvinu &Michael A.Miller-Tata Mc GRAW Hill, 1997.
3. Satellite communication-Agarwal-Khanna publishers, New Delhi, 2000
4. Communication Electronics, Frenzel, TMH, 3rd Edition, 1999.
5. Advanced Electronic Communication System,,Wayne Tomas I – , PHI,VI edition, 2005.

EL6P1: Practicals

List of Experiments:

1. Saw- tooth wave generator using IC 555
2. Voltage Controlled oscillator using IC 555
3. Schmitt Trigger using IC 555
4. Amplitude modulator and demodulator
5. Tuned amplifier
6. Pre emphasis and de emphasis circuits.
7. FM generator
8. IF amplifier
9. Antenna construction
10. PWM and PPM using IC 555
11. PAM
12. FSK modulation
13. ASK Modulation
14. Optical fiber experiment -Characterization of 660 nm LED
15. Setting up of Analog and Digital Link.
16. Frequency Multiplier using transistors
17. Frequency Mixer using IC 565
18. Losses in fiber.
19. Numerical Aperture of a given fiber
20. Band elimination filter.

SEMESTER VI

EL-6218: Intel 8051 Microcontroller and Embedded Systems

UNIT1: Introduction to Microcontrollers (03 hrs)

Definition, need, types, Classification, General block diagram, types of architecture: - Harvard Vs Princeton, RISC Vs CISC, Differences between Microprocessor and Microcontroller, Examples of popular microcontrollers, applications (mention only).

UNIT 2: Introduction to 8051 Microcontroller (08 hrs)

Microcontroller Overview, Features of 8051 microcontroller, Block diagram of 8051, pin description, Memory organization, data and program memory, System Clock, Special function register, bit addressable and byte addressable SFR, brief description of each SFR. Basic Oscillator circuit, reset circuit for 8051. Interrupt structure in 8051, I/O Ports, External Memory Connections, Counters and Timers.

UNIT 3: 8051 Instruction Set and Programming (14 hrs)

Addressing modes: Immediate, register, direct, register indirect, indexed and implied addressing modes, definitions and examples. Instruction set- Data transfer instructions, arithmetic instructions, logical instructions, branching operations, Subroutines and calls.

Assembly language program examples, Data transfer operation with internal and external memory, 8 bit and 16 bit arithmetic operations, addition, subtraction, multiplications, and division, Logical operations, truth table verifications, sorting of numbers in an array, Implementing BCD, Hex decimal Counters.

UNIT 4: Interfacing (06 hrs)

Intel 8255: Internal Block Diagram, Modes of Operation

Interfacing: LED, Relay, Stepper Motor, DAC, ADC, PWM, Traffic Light Control and LCD.

UNIT 5: Introduction to Embedded Systems (09 hrs)

Embedded Systems Overview, General block diagram, characteristics, Design Constraints – Optimizing Design Metrics, Embedded System processor technology: General Purpose processor, Single purpose processor and Application specific processor.
Standard Single Purpose Processors: Need, Overview: Timer, Keypad Controller, LCD controller, PWM, Stepper motor control, A/D converter, Real time clocks.
Custom Single purpose processor design, optimizing custom single purpose processor design.

Self Study: **(05 hrs)**

Serial Programming, Asynchronous Serial Communication, and Data framing, Serial Port Programming, Introduction to PIC Microcontrollers.

Reference Books:

1 “8051 Micro controller” - by Kenneth J.Ayala
2 “An Embedded Software Primer”-David E. Simon
3 “Embedded System hardware and software design ”- Frank Wahid
4 “Microcontroller and Programming and Applications”- Mazidi M.A and Mazidi J.G.

EL 6P2 Practical**:**

1. Program to add, subtract, multiply and divide two 8-bit numbers.
2. Program to add and subtract two 16 bit numbers.
3. Program to find 2’s complement of an 16-bit numbers
4. Program to find the sum of N 8-bit numbers.
5. Program to solve linear equation Y=mx+c.
6. Program to find largest and smallest of N numbers.
7. Program to interchange two blocks of data.
8. Program to verify the truth table of logic gates.
9. Program to find ones and zeros in a given byte and word.
10. Program to arrange the numbers in ascending order.
11. Program to convert a hexadecimal number into a decimal number and vice versa.
12. Program to find the square of a number from look-up table.
13. Program to find whether the given data is palindrome.
14. Interfacing peripheral devices.