# EC-507 Optical Communication Systems

Max. Marks: 100
Time Allowed: 3 Hrs

*Note: Eight questions of equal marks to be set covering the whole syllabus and any five to be attempted.*

**1. Introduction to optical fibers**
Wave propagation Dispersion and its limitations, losses and non-linear effects

**2. Optical transmitters**
LEDs Semiconductor lasers and their characteristics. Transmitter Design

**3. Optical receiver**
Photo detectors and their characteristics. Receiver Design. Noise and Sensitivity in Optical Receivers Sensitivity degradation

**4. Optical Amplifiers**
Semiconductor Optical Amplifier Raman Amplifier. EDFA

**5. Dispersion management**
Need Pre-compensation Schemes Best Compensation Techniques. Dispersion Compensatory Fibers Optical Filters Fiber Bragg Grating

**6. Multichannel Systems**
WDM Light wave Systems WDM Components System Performance tissues TDM. CDM

**7. Solution Systems**
Fiber Solutions Soliton based Communications Loss Managed Solitons Dispersion - Managed Solitons High Speed Soliton Systems WDM Soliton Systems

***Books Recommended:***

1. Fiber-Optic Communication Systems - by GP Aggarwal - John Wiley & Sons
2. Fiber-Optic Communication Systems - by Mynbev - John Wiley & Sons
3. Related IEEE/IEE publications

# EC-508 Digital Speech & Image Processing

Max. Marks: 100
Time Allowed: 3 Hrs

*Note: Eight questions of equal marks to be set covering the whole syllabus and any five to be attempted.*

**1.** Review of Filter design. Linear phase FIR filters. Methods of FIR filter design. Methods of IIR filter design. Applications of FIR & IIR filters in speech, image, seismic, medical and other areas.

**2. Speech Processing**

Review of human speech and Acoustic theory, nature of sound, harmonics, resonance measurement, virtual display. Music theory, pitch, duration, intervals, rhythm. Human speech production, the vocal tract, the Larynx, the source filter. Speech signal processing-the phasor mode, Fourier transfer, DFT, FFT. The hardware use of FIR & IIR filters. Software, Elements of speech Synthesis-speech Recognition-speech in the computer-human interface.

**3. Image Processing**

Characterization of images as two-dimensional discrete fields, unitary transforms—DFT. Hadamard, slant and cosine transforms, compression schemes-Karhunen Loeve compression predictive coding schemes. Image enhancement-gray scale modification, edge enhancement, restoration-Wiener filtering, constrained deconvolution, recursive filtering. Segmentation, edge detection, thresholding, textural properties, geometry and shape description.

***Books Recommended:***

1. Digital Signal Processing - by Proakis & Manolakis
2. Speech and Audio Processing for multimedia PC's - by Iain Murray
3. Digital Image Processing - by Keenneth R Castleman, Pearson Education Society.
4. Digital Image Processing - by Rafact Gonzalez and Richard E. Woods, Pearson Education Society.
5. Related IEEE/IEE publications

# EC-509 Information Theory & Coding

Max. Marks: 100
Time Allowed: 3 Hrs

*Note: Eight questions of equal marks to be set covering the whole syllabus and any five to be attempted.*

**1. Elements of information theory**
Source coding theorem, Huffman coding, Channel coding theorem, channel capacity theorem, Shenonfano theorem, entropy

**2. Sampling Process**
Base band and band pass sampling theorems reconstruction from samples, Practical aspects of sampling and signal recovery TDM

**3. Waveform Coding Techniques**
PCM Channel noise and error probability DPCM and DM Coding speech at low bit rates Prediction and adaptive filters. Base band shaping for data transmission, PAM signals and their power spectra Nyquist criterion ISI and eye pattern Equalization.

**4. Digital Modulation Techniques**
Binary and M-ary modulation techniques, Coherent and non-coherent detection, Bit Vs symbol error probability and bandwidth efficiency. Bit error analysis, using orthogonal Signaling

**5. Error Control Coding**
Rationale for coding Linbear block codes, cyclic codes and convolution codes Viterbi decoding algorithm and trellis codes.

***Books Recommended:***

1. Principles of digitals communication: J. Dass. , S.K. Malik & P.K. Chatterjee, 1991.
2. Introduction to the theory of Error correcting codes: Vera Press, 1992
3. Information Theory and Reliable Communication: Robert G. Gallanger Mc Graw Hill, 1992
4. Related IEEE/IEE publications

# EC-510 Advanced Microprocessor & Embedded Systems

Max. Marks: 100
Time Allowed: 3 Hrs

*Note: Eight questions of equal marks to be set covering the whole syllabus and any five to be attempted.*

**1. Microprocessor Architectural Concepts**

Review of 16-bit Microprocessor Architecture, Word Lengths, Addressable Memory, Microprocessor Speed, Architecture Characteristics, Registers, Instructions, Memory Addressing Architecture, ALU, GPR's, Control Logic And Internal Data Bus, Introduction to Pentium Architecture.

**2. Microprocessor Instructions And Communications**

Instruction Set, Mnemonics, Basic Instruction Types, Addressing Modes, Interfacing I/O Microprocessor, Polling And Interrupts, Interrupts And DMA.

**3. Microprocessor I/O**

Data Communication, Parallel I/O Serial Communication, Serial Interface And UART, Modem, I/O Devices, D/A & A/D Interface, Interface, Special I/O Devices.

**4. Embedded Controllers & Systems**

Architecture of 80186 & 80188 CPU subsystems, Addressing Modes, Instruction set, Basic IO subsystems, Memory Subsystem, Example embedded controllers.

***Books Recommended:***

1. Intel Series Of Microprocessors: By Berry B. Bray, TMH.
2. 8086 microprocessor & Architecture by Liu, Gibson; PHI.
3. Embedded Microprocessor System Design by Kenneth L. Short, Pearson Education.
4. Embedded Controllers by Berry B. Bray Pearson Education.
5. Related IEEE/IEE publications

# EC-511 VLSI Design

Max. Marks: 100
Time Allowed: 3 Hrs

*Note: Eight questions of equal marks to be set covering the whole syllabus and any five to be attempted.*

**1. Overview**

Overview of combinational and sequential circuits, timing analysis of combinational and sequential circuits, meta-stability, methods to eliminate meta-stability single synchronizer and double synchronizer, MTBF Clocking strategies.

**2. Sequential Machine Design**

State diagram, state minimization, state assignments, design of mealy and Moore machines, design of RAM, SDR, SRAM, DRAM, ROM. Charge Coupled Devices (CCD's).

**3. Programmable logic Devices**

Basic concepts, programmable logic array (PLA), Programmable Array Logic (PAL), Structure of standard PLD's Complex (PLD's), Complex PLD's (CPLD), Xilinx Xc-9500. Introduction to field programmable gate arrays-types of FPGA's, Configurable logic Block (CLB) Input/ Output Block (IOB). Introduction to Xilinx series. FPGA, XC4000 family, Implementation of Design in PLD's.

**4. VHDL**

Need for HDL's, Design flow, overview of VHDL, data types, Logic Operators, Data flow Modeling, Structural Modeling, Behavioral Modeling, Mixed Modeling, Modeling of combinational and sequential circuits.

**5. Verilog**

Verilog as HDL, HDL model abstraction-behavioral, RTL, structural, switch model, verification, Modeling of combinational logic, sequential logic, tasks and functions, Advanced Modeling concepts, User defined primitives.

***Books Recommended:***

1. Fundamentals of Digital Design - by Charles. H. Roth, Jr., Jaico Publishing House
2. Digital Design Principle & Practice – by John. F. Wakerly, PHI
3. VHDL Analysis & Modeling of Digital Systems – by Z Navabi, Mc. Graw Hill
4. An Engg. Approach to Digital Design - by William. I. Fletcher
5. Verilog HDL: Digital Design & Synthesis – by Samir Palnitker
6. Documents of Xilinx]
7. Related IEEE/IEE publications

## EC-512 Reliability of Electronics & Communication Systems

Max. Marks: 100
Time Allowed: 3 Hrs

*Note: Eight questions of equal marks to be set covering the whole syllabus and any five to be attempted.*

**1. Concept of reliability**
Failures of systems and its modes. Measure of Reliability, Reliability function, Hazard rate MTBF and their interrelations.

**2. Reliability Data and Analysis**
Data sources. Data collection, use of Reliability Data, Reliability Analysis, Performance Parameters, calculation of failure rate, Application of Weibill distribution.

**3. System Reliability and Modeling**
Series systems, Parallel system, series parallel systems. Time dependence, Reliability Determination, Stand by systems, r out of n, Configurations, Methods of tie set and cut sets of Or reliability evaluation, simulation and Reliability prediction. Monte Carlo method, concepts of network topology. Overall reliability evolution.

**4. Maintainability and Availability**
Maintainability and its equation. Factors Affecting maintainability. Measures of Maintainability, Mean Down Time, Availability Intrinsic availability equipment availability & Mission availability. Replacement processes and Policies.

**5. Life Testing of Equipments**
Non-destructive tests, destruction tests and their Mathematic modeling. Quality and Reliability, Measurement & prediction of Human Reliability, Reliability and safety, safety margins in critical Devices, case studies.

**6. Value Engineering**
Techniques in value Engg; Structure of value Engg. Reliability Management.

***Books Recommended:***

1. Reliability Engg. By Govil, 1992.
2. Reliability Engg. By Dr.A.K.Aggarwal, 1992.
3. Related IEEE/IEE publications

# EC-513 Multimedia Communication Systems

Max. Marks: 100
Time Allowed: 3 Hrs

*Note: Eight questions of equal marks to be set covering the whole syllabus and any five to be attempted.*

**1. Multimedia Communications**
Introduction to various multimedia comm. Techniques, Applications, Networks, Protocols and Standards, bandwidth and compression issues.

**2. Digital Communication basics**
Source encoding, Channel encoding, Circuit switched Networks; Packet switched networks, ATM, Frame Relay.

**3. Multimedia Information Representation**
Different types of multimedia information, Information representation.

**4. Compression Techniques**
Encoding and decoding techniques, Text compression techniques, Image compression techniques, Audio and Video Compression, Standards for Multimedia Compression, Huffman, Run length, Variable length, Lossy/ Lossless compression.

**5. Multimedia File Formats**
Various files formats for multimedia and their applications, BMP, PNG, TIFF, JPEG, DFX, AVI, MPEG Audio/ Video Standards, Challenges for encryption and decryption.

**6. World Wide Web**
The Internet, Internet Multimedia Applications, Enterprise networks, Entertainment Networks, High Speed Modems, Application Support Functions, Audio/ Video Streaming, Video Conferencing.

***Books Recommended:***

1. Multimedia Communications by Fred Halsall, Prentice Hall.
2. Digital Communication by Proakis, Prentice Hall.
3. Internet Resources.
4. Related IEEE/IEE publications

# EC-514 Parallel Processing

Max. Marks: 100
Time Allowed: 3 Hrs

*Note: Eight questions of equal marks to be set covering the whole syllabus and any five to be attempted.*

**1.Theory Of Parallelism**

Parallel computer models - the state of computing, Multiprocessors and Multicomputers and Multivectors and SIMD computers, PRAM and VLSI models, Architectural development tracks. Program and network properties Conditions of parallelism, Program partitioning and scheduling, Program flow mechanisms, System interconnect architectures. Principles of scalable performance - performance matrices and measures, parallel processing applications, speedup performance laws, scalability analysis and approaches.

**2. Hardware Technologies**

Processor and memory hierarchy advanced processor technology, superscalar and vector processors, memory hierarchy technology, virtual memory technology, bus cache and shared memory - backplane bus systems, cache memory organisations, shared memory organisations, sequential and weak consistency models.

**3. Pipelining And Superscalar Technologies**

Parallel and scalable architectures, Multiprocessor and Multicomputers, Multivector and SIMD computers, Scalable, Multithreaded and data flow architectures.

**4. Software And Parallel Programming**

Parallel models, Languages and compilers, Parallel program development and environments, UNIX, MACH and OSF/1 for parallel computers.

***Books Recommended:***

1. Kai Hwang, "Advanced Computer Architecture", McGraw Hill International, 1993.
2. William Stallings, "Computer Organization and Architecture", Macmillan Publishing Company, 1990.
3. M. J. Quinn, "Designing Efficient Algorithms for Parallel Computers", McGraw Hill International, 1994.
4. John L. Hennessy and David A. Patterson, Computer Architecture A Quantitative approach, Morgan Kaufman Publishers. Inc., 1990.
5. D.P. Siewiorek, G.G. Bell, A. Newell, Computer Structures, Principle and Examples, McGraw Hill, 1982.
6. Related IEEE/IEE publications

# EC-515 Peripheral System Design & Interfacing

Max. Marks: 100
Time Allowed: 3 Hrs

*Note: Eight questions of equal marks to be set covering the whole syllabus and any five to be attempted.*

**1. Bus system**
Bus systems in microcomputers $S_T$ 100 bus, Multi bus, EISA, PCI Bus, HP IB/GPIB Bus, Bus and their applications. I/O

**2. Interface**
Standard I/O interfaces RS-232 C, RS-232 D Centronics interface, current loop interface, and RS-449 communication interface.

**3. Design criterion with PCs**
Application of PC buses (ISA, EISA, PCI, VESA-VL) and associated signals, Handshakes, I/O and Interrupt map, Programming methodology for input/output application, GPIB signals and GPIB programming techniques operating system calls.

**4. Peripherals**
Peripherals like CRT controller, Communication controllers, DMA controller, Programmable keyboard/Display interfaces and Associated circuitries.

**5. Controllers**
PID controllers, Programmable logic controllers, PC based data acquisition system, Interfacing PC to various cards- Stepper motor milli volts, Milliamps.

**6. Development tools**
Microprocessor development system, cross compilers, Simulator In circuit emulators, Automated test equipments etc.

***Books Recommended:***
1. Intelligent Instrumentation by George C. Barney, PHI.
2. Student Reference Manual For Electronics Instrumentation Labs by Stanley wolf and Richard F.M. Smith, PHI.
3. Instrumentation for Engg. Measurement by James W. dally, William F. Riley, John Wilay and Sons
4. Interfacing A Laboratory Approach by Deonzo, PHI
5. Related IEEE/IEE publications

## EC-516 Lab-II

Max. Marks: 100
Time Allowed: 2hrs

At least ten experiments are to be performed related to the subjects taught in 2nd semester.