## EC 35008 : MICROPROCESSORS AND MICROCONTROLLERS

**COURSE OUTCOMES:**

**Students should be able to**

1. Interpret basic architecture of 8-bit microprocessors and their operation using assembly language programming and interfacing concepts.
2. Distinguish the properties of 8-bit and 16 microprocessors with their programming and interfacing models.
3. Explain the internal design of the 8051 microcontrollers along with the features and the programming.
4. Apply the interfacing and programming knowledge of microcontroller for the real-time problem-solving.
5. Design processor and controller-based applications using compatible peripherals.

| Hours / Week | | | Maximum Marks | | | | Total Marks | Credits | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Theory | | Practical | | | | | |
| L | T | P | End Sem | CW | SW | End Sem | | Th | Pr | Total |
| 3 | - | 2 | 70 | 30 | 40 | 60 | 200 | 3 | 1 | 4 |

**Unit 1**: Architecture of 8085 microprocessor, instructions sets, assembly language programming, interfacing with memory and I/O devices, interrupts systems.
**UNIT 2**: Introduction to 16 bits microprocessors, Architecture of 8086 microprocessor, instruction sets, addressing modes, assembly language and interrupt handling.
**UNIT 3**: Architecture of 8051 microcontroller, SFR's, instruction sets, assembly language programming, timers and counters, serial communication in 8051.
**UNIT 4**: Interfacing of 8051: A/D, D/A converter, external memory, LCD, Keyboard, DC and stepper motor
**UNIT 5**: Introduction to peripheral interface ICs such as PID 8155, PPI 8255, DMA controller and their interfacing with microprocessors and microcontrollers. Real time applications design.

**ASSESMENT:** Mid-term test, Assignment, Tutorial, Quiz and End semester exam

**PRACTICALS:**

**S.No. List of Programs**

1) Write an assembly language program for the addition of two 16 bit numbers. (Use consecutive memory location technique for data and result storage)
2) Write an assembly language program for the multiplication of two 8 bit numbers. (Use consecutive memory location technique for data and result storage)
3) Write an assembly language program for the division of two 8 bit numbers. (Use consecutive memory location technique for data and result storage)
4) Write an assembly language program for multiplication of a 16 bit hex number with 8 bit hex number.
5) Write an assembly language program to find largest number out of the ten 8 bit numbers.
6) Write an assembly language program with subroutine to find out positive, negative and zero in a given series of ten hex data stored at 3000H location.
7) Write an assembly language program to find out square root of a number by subtracting odd integer.
8) Write an assembly language program to XOR data without using XRA instruction.
9) Write an assembly language program with subroutine technique to assembly and

disassembly a given 8 bit words. (Hint: Data 98H can be disassembled as 09H and 08H)

10) Write an assembly language program to add a series of five hex numbers in BCD.
11) Write an assembly language programs to add, subtract, multiply & divide two 8 bit nos. stored in register R0 & R1 of register bank 0 of 8051 microcontroller, store the results of various operations in different registers of register bank 2.
12) Write an assembly language programs convert given 8 bit binary no. in accumulator to 3 digits BCD, store 100 R2, 10 digit in R1 & 1s digit in R0 of register bank 1.
13) Write an assembly language programs to find smallest no. in a given array. Array is stored at location starting from address 3000H.
14) Write an assembly language programs to implement a Boolean logic Y=(A+B).C Use bit addressable area of internal RAM .A,B & C are Boolean variables
15) Write an assembly language programs to generate a square wave of 8O% duty cycle on bit 3 of port 1.
16) Write an assembly language programs to swap lower & upper nibble of any 8 bit data stored in a register without using SWAP instruction.
17) Write an assembly language programs to find square root of a no. using subtraction of successive odd integers.
18) Write an assembly language programs to calculate value of function $f(x) = x^2 + x + 1$. Where $x$ is an 8 bit binary number.
19) Write an assembly language programs assuming that INT 1 pin of 8051 is connected to a switch that is normally high. Whenever it goes low it should turns on an LED connected to P1.3 which is normally off. It should stay ON for few seconds and then go down.
20) Write an assembly language program to display a string of characters on LCD.

**ASSESMENT:**

Internal viva, Continuous evaluation of experiments, Journal write-up, and Additional experiments conducted, Quiz, End semester exam

**TEXT BOOKS RECOMMENDED:**


1. Gaonkar, Introduction to Microprocessor. 2nd ed., 2004, Prentice Hall.
2. Sridhar and Ghosh, Computer Organizations and Architecture, 2nd ed., 2003,PHI.
3. Mazidi,8051 Microcontroller and Embedded Systems, 2nd ed. 1998, Pearson Edu.
4. Ayala, The 8051 Microcontroller, 2nd ed. 2001, Penram Publ.


**REFERENCE BOOKS RECOMMENDED:**


1. Rey Bhurchandi, Advanced Microprocessor Architecture, 2nd ed. 2001, TMH.
2. Bray, The Intel Microprocessors: Architecture, Programming and Interfacing, 2nd ed., 2003 PHI.

## EC 35009: ANTENNA & WAVE PROPAGATION

**COURSE OUTCOMES:-**

At the end of this course students will demonstrate the ability to:

1. Explain the radiation mechanism of EM waves by antennas and their radiation patterns.
2. Interpret the relationships between antenna performance parameters.
3. Design and analyze different antennas and antenna arrays.
4. Analyze and distinguish different type of antennas.
5. Discuss atmospheric structure and its impact on radio wave propagation.

| Hours / Week | | | Maximum Marks | | | | Total Marks | Credits | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Theory | | Practical | | | | | |
| L | T | P | End Sem | CW | SW | End Sem | | Th | Pr | Total |
| 3 | - | 2 | 70 | 30 | 40 | 60 | 200 | 3 | 1 | 4 |

**Theory:**

**Unit 1:** **Antenna Fundamentals**: Retarded Potential, Radiation Equation. Radiation Mechanism of Antennas. Radiation Integral and Auxiliary Potential Functions. Radiation from Linear Wire Antennas i.e. Infinitesimal Dipole, Small Dipole, Finite Length Dipole and Half Wave Dipole.

**Unit 2:** **Antenna Performance Parameters**: Radiation pattern i.e. Isotropic, Directional, and Omnidirectional Patterns, Radiation Intensity and Power density, Gain & Directivity, Effective area and Aperture, Band width and beam width, Antenna impedance, Antenna Efficiency, Polarization. Friis Transmission Equation and reciprocity. Antenna Radar Cross Section and SAR.

**Unit 3:** **Antenna array and Fundamentals:** Linear, planar and circular**.** End fire & broad side arrays, Two and multielement arrays, Technique of multiplication of patterns, Binomial and Dolph Chebycsheff arrays, Phased array, Smart antennas and Beam forming techniques. Antenna Synthesis and techniques.

**Unit 4:** **Types of Antennas and Analysis**: Linear wire antenna and dipole, MF & HF antennas, Tower antenna, VHF & UHF antenna, GSM antennas, Loop Antenna, Rhombic antenna, Aperture antennas, Broad band antennas, Equiangular and Conical equiangular spiral antenna, Frequency independent antennas, Log periodic antenna, Reflector and Horn antennas, Micro strip antennas, measurement and Design approach.

**Unit 5:** **Radio Wave Progation:** Ground wave propagation, reflection from earth's surface, Space wave and sky wave propagation, Tropospheric wave and tropospheric scattering, Duct propagation. Ionosphere propagation, Structure of ionosphere and atmosphere, various parameters like Critical frequency, Maximum usable frequency, Least usable frequency, & Virtual heights etc.

**ASSESMENT:** Mid-term test, Assignment, Tutorial, Quiz and End semester exam

**PRACTICALS:**

The list of the experiments is as follows:

1. Familiarization and study of Advanced antenna measurement system and RF anechoic chamber.

2. Familiarization and calibration study of vector Network Analyzer (MSP2202).
3. Design and simulation of Microstrip patch antenna (Virtual lab).
4. Characterization of Circular polarization in MSA (Virtual lab).
5. Measurement of Radiation parameters of Microstrip antenna through VNA and anechoic chamber.
6. Measurement of Co-polarization and cross polarization of arbitrary test antenna using RF anechoic chamber and measurement system.
7. Measurement of insertion losses and cable losses using Vector network analyzer.
8. Calculation and generation of radiation pattern of RMSA (Microstrip) in azimuth & elevation plane.
9. Calculation and generation of radiation pattern of YAGI antenna (Microstrip) in azimuth & elevation plane.
10. Calculation and generation of radiation pattern of annular ring antenna (Microstrip) in azimuth & elevation plane.
11. Measure the variation of field strength/inverse square, power flow of arbitrary test antenna in RF anechoic chamber.

**ASSESMENT:**

Internal viva, Continuous evaluation of experiments, Journal write-up, and Additional experiments conducted, Quiz, End semester exam.

**TEXT BOOKS RECOMMENDED:-**


1. Antenna Theory**:** Analysis and Design, 2nd ed., 2000, Wiley Publication.
2. Kraus J.D., Antennas, 2nd ed., 2000, McGraw Hill.
3. Prasad K. D., Antenna & Wave Propagation, 2nd ed., 2001, Khanna Publication.


**REFERENCE BOOKS RECOMMENDED:-**


1. Collin R.E., Antennas & Wave Propagation, 3rd ed., 2001, McGraw Hill.
2. Chatterjee Rajeshwari, Antenna theory and practice, 2nd ed. 1998, New Age Publ.
3. Jordan & Ballman, Electromagnetic Wave & Radiation System, 2nd ed., 2006, PHI.

## EC 35010 : VLSI DESIGN

**COURSE OUTCOMES:**

At the end of this course students will demonstrate the ability to:

1. Study the basic VLSI design flow.
2. Write and simulate HDL code for basic combinational and sequential circuits. & understand the basics of synchronous finite state machines.
3. Analyze the static & dynamic characteristics of cmos inverter.
4. Design combinational & sequential logic circuits
5. Understand the basics of memory design and working of programing logic devies such as CPLD and FPGA.

| Hours / Week | | | Maximum Marks | | | | Total Marks | Credits | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Theory | | Practical | | | | | |
| L | T | P | End Sem | CW | SW | End Sem | | Th | Pr | Total |
| 3 | - | 2 | 70 | 30 | 40 | 60 | 200 | 3 | 1 | 4 |

**Theory:-**

**Unit 1:** Issues and Challenges in Digital IC Design: general overview of design hierarchy, layers of abstraction, integration density and Moore's law, VLSI design styles; MOSFET fabrication: basic steps of fabrication, CMOS p-well and n-well processes, layout design rules; Gajeski's Chart, PLD based design flow, synthesis, simulation, placement and routing, floor planning, verification, back annotation etc.

**Unit 2:** Finite state machine design: state machines, Mealy and Moore machines, state diagram, state table reduction techniques for state tables, transition tables, design of sequential circuits using FSM. Introduction to HDLs, their features, HDL based design, features of Verilog/VHDL and programming methodologies, various modelling styles in Verilog/VHDL, Digital designing with HDL, test benches, Verilog/VHDL coding for FSM.

**Unit 3:** Review of the basics of CMOS, operation of NMOS, PMOS, CMOS, MOS Capacitance; CMOS Inverter: MOS Device Model with Sub-micron Effects, VTC Parameters (DC Characteristics), CMOS Propagation Delay, Parasitic Capacitance Estimation, Layout of an Inverter, Switching, Short-Circuit and Leakage Components of Energy and Power; Interconnects: Resistance, Capacitance Estimation, delays, Buffer Chains, Low Swing Drivers, Power Distribution.

**Unit 4:** Combinational Logic Design: Static CMOS Construction; Performance Optimization of Digital Circuits by Logical Effort; Sizing; Ratioed Logic, Pass Transistor, Transmission Gate Logic, DCVSL, Dynamic Logic Design Considerations, noise considerations in dynamic design Power Dissipation in CMOS Logic, Domino and NORA designs; Sequential Circuits Design: Classification, Parameters, Static Latches and Register, Race Condition, Dynamic Latches and Registers, Two Phase vs. Single Phase clock designs; Design of arithmetic building blocks like adders and multipliers.

**Unit 5:** Semiconductor memories: non-volatile and volatile memory devices, flash memories, SRAM Cell Design, Differential Sense Amplifiers, DRAM Design. Programmable logic devices: PLA, PAL, PROM etc., programming strategies, circuit implementation, CPLD and FPGA architecture, case study of Intel FPGAs, their features and programming.

**ASSESMENT:** Mid-term test, Assignment, Tutorial, Quiz and End semester exam

**PRACTICALS:**

**Unit 1(L):** SPICE (Open-source) and experiments based on it **(Week-1, Week-2, Week-3)**
**Unit 2(L):** MAGIC (Open-source) and experiments based on it **(Week-4, Week-5, Week-6)**
**Unit 3(L):** Introduction to HDLs, their features, HDL based design, features of Verilog/VHDL and programming methodologies, various modelling styles in Verilog/VHDL, Digital designing with HDL, test benches. **(Week-7, Week-8, Week-9, Week-10)**

**ASSESMENT:**

Internal viva, Continuous evaluation of experiments, Journal write-up, and Additional experiments conducted, Quiz, End semester exam.

**TEXT BOOKS RECOMMENDED:-**


1. J.M. Rabaey, A. Chandrakasan and B. Nikolic, Digital Integrated Circuits- A Design Perspective, 2/e, Prentice Hall of India, 2003.
2. N. Weste and D. Harris, CMOS VLSI Design: A Circuits and Systems Perspective, 3/e,Pearson Education India, 2007.
3. S. Brown & Z. Vranesic- Fundamentals of Digital Logic with VHDL
4. Samir Palnitkar, Verilog (Lab)


**REFERENCE BOOKS RECOMMENDED:**


1. Weste & Eshraghain – principles of CMOS VLSI Design
2. D.L.Perry- VHDL Programming by Example
3. J. Bhasker- VHDL Primer
4. Sung Mo Kang- CMOS Digital Integrated Circuits, TMH

## EC 35011: DATA COMMUNICATION

**COURSE OUTCOMES:**

At the end of this course students will demonstrate the ability to:

1. Understand Concept of Information theory and Channel Capacity .
2. Study various channel coding techniques and theory application.
3. Develop basics of various data communication systems and its components.
4. Analyze various communication systems using different digital data transmission and access techniques.
5. Apply different digital switching techniques and protocols for data transmission.

| Hours / Week | | | Maximum Marks | | | | Total Marks | Credits | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Theory | | Practical | | | | | |
| L | T | P | End Sem | CW | SW | End Sem | | Th | Pr | Total |
| 3 | - | - | 70 | 30 | - | - | 100 | 3 | - | 3 |

**Unit1.InformationTheory:**

Concept of amount of information, Entropy of discrete ensembles, Shannon's source coding theorem, Encoding of discrete sources, Mutual information, Channel coding theorem, Calculation of channel capacity of discrete memoryless channels, Shannon's channel's capacity of AWGN channel, Shannon's limit, Modulation-coding trade-offs.

**Unit 2. Error Control Coding:**

Asynchronous and synchronous transmission, Types of error, Error detection, Error Correction, Hamming distance, Hamming weight, Parity-check codes, Repetition code, Cyclic Redundancy Check (CRC), Error control using forward error correction (FEC), Linear block codes, Cyclic codes, Hamming codes, convolutional codes.

**Unit 3. Data transmission and Signal Encoding:**

Networks for data communication (LAN, MAN, WAN), Network models: OSI reference model and TCP/IP model, Transmission terminology, Transmission impairments, Data rate limits, Performance parameters, digital signal encoding, Modes of digital data flow (simplex, duplex, full duplex), Transmission modes and media, Scrambling, Discrete Multi-tone Technique (DMT), ADSL .

**Unit 4. Multiplexing, Synchronization, Spread Spectrum and Multiple Access:**

Review of FDM, TDM, WDM, Synchronization, Digital transmission system hierarchy and their frame structure DS0, DS1, T1, E1 etc. Spread Spectrum: Frequency hop spread spectrum (FHSS), Direct sequence spread spectrum (DSSS), Multiple Access Techniques.

**Unit 5: Telecommunication switching and Networks:**

Necessity of switching, Introduction to digital switching, Circuit switching, Packet switching, Telephone Network, Dial-up modems, Traffic engineering: Network traffic and load parameters, Erlang formulae, An overview of ISDN architecture and protocol and Voice over Internet Protocol (VoIP), Introduction to ITU and IEEE standards.

**ASSESMENT:** Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

**TEXT BOOKS RECOMMENDED:-**


1. Behronz A. Forouzon , " Data Communication and Networking" , Tata Mc graw hill , 4th Edituion, 2007.
2. Bernard Sklar, " Digital Communication Fundamentaks and Applications ", Pearson Education , 2nd Edition , 2001.
3. Simon Haykins , " Communication systems ", John Wiley Publications , 4th Edition , 2000..


**REFERENCE BOOKS RECOMMENDED:**


1. J. Das S,. K. Mullick P. K. Chatterjee "Principles of Digital Communication: Signal Representation, Detection, Estimation and Information Coding ",John Wiley & Sons (Asia) Pte Ltd (February 1, 1987)
2. Shu lin and Costello, "Error Control Coding : Fundamentals and Applications", Pearson 2nd edition, 2004.
3. R.P. Singh and S.D. Sapre, "Communication Systems " , Tata Mc Graw Hill, 2nd Edition, 2007

**PEC-1**

## CO 35251: DATA STRUCTURES & OPERATING SYSTEMS

**COURSE OUTCOMES: -**

At the end of this course students will demonstrate the ability to:

1. Identify linear versus nonlinear data structures, Understand common data structures and be able to implement them, choose appropriate data structures for problem solving and show how data structures map onto physical memory.
2. Compare different implementations of the same data structure, Manipulate data structures with basic operations.
3. The general structure and purpose of an operating system, the concepts of process, address space, and file, process deadlock, deadlock avoidance and recovery, Compare and contrast various CPU scheduling algorithms.
4. Understand different memory management techniques and be able to describe the advantages and disadvantages of each, Storage systems– disks

| Hours / Week | | | Maximum Marks | | | | Total Marks | Credits | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Theory | | Practical | | | | | |
| L | T | P | End Sem | CW | SW | End Sem | | Th | Pr | Total |
| 3 | - | 2 | 70 | 30 | 40 | 60 | 200 | 3 | 1 | 4 |

**THEORY:**

**Unit 1.** Data Structure: stack, queue, list, tree, definition of complexity.

**Unit 2.** Sorting: Theory of sorting, searching, various techniques and their comparison, matrix manipulation, sets and string.

**Unit 3.** Operating System: Evolution, different types, features of operating system. CPU Scheduling: Types of scheduler, process and processor scheduling, multiprogramming. Input /Output: Asynchronous operation, speed gap, programmed I/O, Interrupt driven I/O.

**Unit 4.** Memory: Hierarchy, management technique, partitioning, swapping, paging, segmentation, page segmented memory, comparison of techniques, virtual memory, and demand paging and replacement policies.

**Unit 5.** File System: User and System view of file system, disk organization, disk allocation method: contiguous, linked and Indexed, file protection, system calls, disk scheduling. Deadlock avoidance and deadlock recovery. Case Studies: Linux, Unix, MS-DOS, Window NT.

**ASSESMENT:** Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

**PRACTICALS:**

**List of Experiments:**

**Lab Assignment # 01**

1. Write a program to implement singly linked list in following way: Note: Your output menu should be

following-

**********Menu**********

1. Insertion
2. Deletion
3. Traversing
4. Searching

Enter your choice: 1

Where do you want to insert:

1. At beginning
2. At a specified position
3. At end

One node inserted!!!

**********Menu**********

1. Insertion
2. Deletion
3. Traversing
4. Searching

2. Write a program to reverse a singly linked list.
3. Write a program to implement doubly linked list.
4. Write a program to merge two singly linked list in sorted order.

**Lab Assignment # 02**

1. Write programs to implement stack by following ways:
   a) Using Array
   b) Using Linked List.
2. Write a program to implement Queue.
3. Write a program to implement binary search tree and perform following operations on that:
   a) Traversal (inorder,preorder,postorder)
   b) Sort the data of tree in ascending order.
4. Write a program to sort the array elements in following way:

   The sorting technique always maintains a sorted sublist in the lower positions of the list. Begin by assuming that a list with one item (position 0) is already sorted. On each pass, one for each item 1 through $n-1$, the current item is checked against those in the already sorted sublist. As we look back into the already sorted sublist, we shift those items that are greater to the right. When we reach a smaller item or the end of the sublist, the current item can be inserted. (**Hint:** It works the way we sort playing cards in our hands.)

**ASSESMENT:**

Internal viva, Continuous evaluation of experiments, Journal write-up, and Additional experiments conducted, Quiz, End semester exam.

**TEXT BOOKS RECOMMENDED:-**


1. Galvin and Silberschatz, Operating Systems and concepts, Addison Wesley.
2. Tanenbaum, Operating Systems, PHI
3. Kruze, Data Structures and Program Design, Prentice Hall


**REFERENCE BOOKS RECOMMENDED:-**


1. William Stallings, Operating systems, PHI
2. Bach A. S., Design of UNIX operating system, PHI.R
3. Tenanbaum, Data structures using C, Pearson Edu.

**PEC-1**

## EC 35252: ELECTRONICS MEASUREMENT

**COURSE OUTCOMES:-**

At the end of this course students will demonstrate the ability to:

1. Study various types of measuring instruments & their characteristics with their applications in various electronic circuits.
2. Measure signals, diagnose fault in electronics circuits & systems and its rectification.
3. Design and analyze transducer based measurement circuits.
4. Understand the electronic measurement circuits and subsystems.
5. Analyze and measurement of high frequency circuit parameters.

| Hours/ Week | | | Maximum Marks | | | | Total Marks | Credits | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Theory | | Practical | | | | | |
| L | T | P | End Sem | CW | SW | End Sem | | Th | Pr | Total |
| 3 | - | 2 | 70 | 30 | 40 | 60 | 200 | 3 | 1 | 4 |

**THEORY:**

**Unit 1.** Measurement and their methods, Classification of measuring instruments, Static and dynamic characteristics of instruments, Standards of resistance, voltage, current, frequency and time, shielding and grounding. AC and DC voltmeters.

**Unit 2.** Basics of sensors and transducers, Types of transducers, LVDT, RVDT, Strain Gauge, Types of strain gauges, Types of microphones, Types of speakers, Opto-electronics and piezoelectric transducers, their calibration and application, Universal product code.

**Unit 3.** Principle & construction of CRO & its various controls, Dual-beam and dual-trace CROs, Estimation of phase & frequency using CRO, Digital storage oscilloscopes, Attenuators, Measurement of RF frequency, Power, and Impedance.

**Unit 4.** Principle, construction & applications of frequency meter, Types of frequency meters, Types of Q-meters, AC bridges and their applications, High frequency measurements, Measurements of insertion gain & phase.

**Unit 5.** Signal & waveform generators, Frequency synthesizers, Digital voltmeter, Digital frequency counters & millimetre's, Spectrum analyzer, RF impedance, Voltage and power meter, Optical power meter, Vector analyzer, Distortion analyzer, VSWR and return loss measurements. Measurement of RF Impedance, RF Voltage and RF Power.

**ASSESMENT:** Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

**PRACTICALS:**

**List of experiments**

1. Introduction to CRO.
2. Measurement of unknown frequency using CRO.
3. Measurement of unknown phase shift using CRO.
4. Introduction to Digital Storage Oscilloscope (DSO)
5. Measurement of parameters from the device characteristic curves displayed by curve tracer.
6. Measurement using general purpose Digital Multimeter.
7. Study of Balanced Modulator as a phase meter.
8. Measurement of insertion gain of a two port network.
9. Measurement of linear displacement.
10. Measurement of displacement utilizing piezoresistive effect.
11. Measurement of linear displacement utilizing the principle of change in capacitance.

**ASSESMENT:**

Internal viva, Continuous evaluation of experiments, Journal write-up, and Additional experiments conducted, Quiz, End semester exam.

**TEXT BOOKS RECOMMENDED:-**

1. Shawney, Electrical & Electronic Measurement, 17th ed., 2005, Dhanpat Rai& Sons.
2. D. V. S. Murthy, Transducers and Sensors, 2nd ed., 2000, PHI.
3. Copper, Electronic Measurement, 5th ed., 2009, PHI.

**REFERENCE BOOKS RECOMMENDED:-**

1. Patranabis D., Sensors and Transducers, 2nd ed., 2001, S. Chand & Co.
2. Bhattacharya S. K., Electronics, Measurements and instrumentation, 2nd ed., 2001, Khanna Pub.
3. Terman & Petit, Electronic measurements, 3rd ed., 2005, Mc Graw Hill.

**MC**

**HU2XXXX/3XXXX:ESSENCE OF INDIAN KNOWLEDGE TRADITION**

| Hours / Week | | | Maximum Marks | | | | Total Marks | Credits | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Theory | | Practical | | | | | |
| L | T | P | End Sem | CW | SW | End Sem | | Th | Pr | Total |
| 2 | - | - | - | 50 | - | - | 50 | - | - | - |

**PRE-REQUISITES: NIL**

**Course objectives**

1. To make students acquainted with the legacy of ancient Indian knowledge.
2. To make students understand about the role of Indian school of Philosophy and its contribution to the modern world.
3. To make students realize the crucial role and impact of yoga practice in lives.
4. Imparting among students the learning of Indology and significance of Indian linguistics.
5. To focus on the meditative aspects of students in order to improve their lifestyle and revive Indian traditional values.

**Course outcomes**

**Students will be able to**

1. Execute their ideas and learning with in Indian context.
2. Apply the Indian linguistics and express them with reason.
3. Define the means and ends of their professional careers.
4. Cope up with challenges in the cognitive development to deal with unforeseen crisis.
5. Adopt a balanced approach towards life, profession and problems.

**Course Contents**

**Unit 1** - Vedic and non-Vedic philosophical traditions: nature and cause of the universe, nature of role of God, concepts of substances/matters and *Samsara, Sukh-Dukh* & rebirth, state of liberation and its path.

**Unit 2** - Basic structure and classification of Indian Knowledge Systems: Ashtadash-Vidya, Dwadashanga & Anuyoga, three volumes of Tripitika, some prevalent text literature from religious domain.

**Unit 3** - Indian Linguistic Tradition and human behaviour: Phonology, Morphology, Syntax and Semantics, Emotions & Reflection in human behavior.

**Unit 4** - Indian Artistic Tradition: Chitrakala, Murtikala, Vastukala, Sthapatya, Sangeet, Nritya and Sahitya.

**Unit 5** - Ancient Indian Science: yoga and holistic health care, Indian contribution to modern Science and mathematics, some famous Indian ancient Scientists.

**ASSESSMENT:**

Only **Sessional Work** (100 marks) on the basis of viva (30) Attendance (20), Quizes/Tests/Activities (30) and Presentations (20) will be awarded against the assessment done throughout the session.