

SRI VENKATESWARA UNIVERSITY::TIRUPATI
S.V.U.COLLEGE OF SCIENCES
DEPARTMENT OF PHYSICS
(Revised syllabus for regular students those who study in S.V.U. College (Campus), Tirupati)
(with effect from the batch of students who admitted during the academic year 2015-16)
M.Sc. INSTRUMENTATION
(CHOICE BASED CREDIT SYSTEM)
SCHEME OF INSTRUCTION AND EXAMINATION

Semester	Course Code	Title of the Paper	Core / Elective	No. of Credits	Internal Assessment	Semester end Exams	Total Marks
I	INS-101	Introduction to Instrumentation, Data analysis and Control Systems	Core	04	30	70	100
	INS-102	Electronic Devices, Linear ICs and Industrial Electronics	Core	04	30	70	100
	INS-103	Digital Techniques and Principle of Communications	Core	04	30	70	100
	INS-104	“C” Programming	Core	04	30	70	100
	INS-105	Analogue Electronic Lab	Core	04	30	70	100
	INS-106	Digital Electronics Lab	Core	04	30	70	100
Total= 600							
II	INS-201	Computer Architecture and Organization	Core	04	30	70	100
	INS-202	Sensors, Signal Conditioners and Recorders	Core	04	30	70	100
	INS-203	VLSI Systems Design	Core	04	30	70	100
	INS-204	Electronic Instrumentation	Core	04	30	70	100
	INS-205	VLSI Lab	Core	04	30	70	100
	INS-206	Transducers Lab	Core	04	30	70	100
Total = 600							
	INS-207	Human Values and Professional Ethics – I	Core	04	30	70	100
III	INS-301	Scientific / Analytical Instrumentation	Core	04	30	70	100
	INS-302	Microcontrollers and Digital Signal Processing	Core	04	30	70	100
	INS-303	Bio medical Instrumentation	Core	04	30	70	100
	INS-304	Industrial and Process control Instrumentation	Core	04	30	70	100
	INS-305	Micro Controllers Lab	Core	04	30	70	100
	INS-306	Analytical Instrumentation Lab	Core	04	30	70	100
IV	INS-401	Project work Dissertation	Core	08	30	70	200
	INS-402	Viva-Voce	Core	04	30	70	100
	INS-403	Human Values and Professional Ethics – II	Core	04	30	70	100
Total = 3000							

SEMESTER- I

INS -101 INTRODUCTIONS TO INSTRUMENTATION, DATA ANALYSIS AND CONTROL SYSTEMS

Unit I a. Introduction to instruments and their representation:

Typical applications of Instrument systems. Functional elements of Instrumentation and Measuring systems i.e. Input elements (Transducers and Electrodes), intermediate elements (signal conditioning) and output elements (Data display and storage).

b. Errors and uncertainties in Measurements and Static performance characteristics of instruments:

Introduction to errors and uncertainties in the measurement of performance parameters of instruments. Static performance parameters: Accuracy, Precision, Resolution, Threshold, Sensitivity, Linearity, Hysteresis, Dead band, Backlash, Drift, Span. Impedance loading and matching.

Unit II a. Basic statistical concepts:

Types of measured quantities, Central tendency of data, Estimates of True value of Data. Measures of Dispersion of Data (Spread, Variability). Standard deviation of the mean and its evaluation. Coding.

b. Data distributions

Properties of Gaussian distribution. Area under the normal distribution curves. Determination of Mean value and Standard Deviation of the continuous distribution of Gaussian types. Standardized normal distribution. Confidence level. Central limit theorem. Significance test. Chi-Square test for goodness of fit.

Unit III a. Introduction to control systems and, Mathematical modeling of Physical systems

Historical development of control systems. Open- loop and closed loop control systems, Effects of Feedback on overall gain, Stability, Sensitivity, Bandwidth and Noise. Differential equation approach to Mechanical, Thermal, Hydraulic and Pneumatic Systems (simple treatment). Block diagram algebra. Signal flow-Graphs.

b. Stability criteria

Necessary condition for stability. Hurwitz stability criterion. Routh stability criterion. Relative stability Analysis. Basic control action. Proportional (P), Proportional Derivative (PD), Proportional Integral (PI) and Proportional Integral Derivative (PID) controllers and their effect on the system performance.

Unit IV

a. Root locus concept and Design problem: Construction of Root-loci. Rules for constructing Root-loci. Determination of roots from root locus. Design and Compensation technique: Preliminary design considerations. Realization of basic lead and lag compensation, cascaded and feed back compensation.

b. Frequency response Analysis and Stability criteria

Introduction, correlation between time and frequency responses. Polar plots, Bode plots Log-Magnitude versus Frequency and Phase versus Frequency Plots. Nyquist stability criterion. Assessment of relative stability. Stability Analysis Gain Margin M_p and Phase Margin P , Nicholas chart.

References:

1. Instrumentation Measurement and Analysis by Nakra and Choudary
2. Instrumentation- Devices and Systems by Rangan, Sarma and Mani
3. Measurement of Systems Applications and Design by Earnest O. Doebelin
4. A course in Electrical and Electronic Measurements and Instrumentation By A.K. Sawhney
5. Electronic Instrumentation and Measurement Techniques, Cooper and Albert D. Helfriek
6. Applied Electronics By G.K. Mithal
7. Principles of Industrial Instrumentation by D. Patranabis
8. Control Systems Engineering by Nagarath and Gopal
9. Automatic control systems by Benjamin C. Kuo
10. Modern control systems engineering by Ogata

INS -102: ELECTRONIC DEVICES, LINEAR I.C S AND INDUSTRIAL ELECTRONICS

Unit I a. Electronic Devices:

Introduction to semiconductors. General semiconductor devices -Diodes, Transistor, Field Effect Transistor (FET), MOSFET, Zener diodes Special semi conductor devices - Tunnel diode, Varactor diodes, UJT, SCR, Diac, Triac, Thyristor. Integrated circuits (IC s) -SSI, MSI, LSI and VLSI

b. Power supplies and Regulation (DC and AC)

Rectifiers - Half wave, Full wave, Bridge, Voltage Multipliers, Filters -inductance. LC. Pi, and T sections. Basic DC voltage regulation- Two terminal and three terminal voltage regulators,. Switch mode regulated Power supplies (SMPS)- AC voltage regulation- Step voltage regulation and Servo voltage regulation, Constant voltage transformer, UPS.

Unit II a. Analysis of Operational amplifiers:

Introduction to operational amplifiers,. Characteristics of ideal and real operational amplifiers, Op amp configurations - Inverting, Non-inverting, current and voltage-followers, Differential amplifiers and comparators,. Virtual ground and Miller effect.

b. Mathematical operations and applications of Operational amplifiers:

Addition, Subtraction, Scale changing (Multiplication and Division) Integration and Differentiation. Waveform generators: Wein Bridge Oscillator and Multi vibrators, Precision Rectifiers, Instrumentation Amplifiers, Active filters.

Unit III Thyristors and Related Power Devices

Thyristor turn on and off methods, Thyristor ratings, SCR half wave rectifier, SCR full wave rectifier, Light activated silicon controlled rectifier (LASCR), Schockly diodes, TRIAC power control circuit, UJT Full wave phase control circuit, Programmable UJT, Silicon controlled switch (SCS), Gate turn off thyristors (GTO), Gate drive Circuits.

Unit IV Industrial Applications

Relays, Reed relay, Solid state relay, UJT/SCR time delay relay, AC time delay relay , Precision long time delay relay, Integrated circuit timers (.555 timers), Electronic resistance welding types of resistance welding, AC welder circuits, Industrial heating, skin effect, High frequency power source for induction heating, Dielectric heating, applications, comparison between dielectric and induction heating, Resistance heating.

Reference books:

1. Fundamentals of Electronic Devices by David A. Bell
2. Operational Amplifiers and Linear Integrated Circuits by Robert F. Coughlin and Frederick F. Driscoll
3. Operational Amplifiers and Linear Integrated Circuits by Ramakanth Gaekwad
4. Operational Amplifier characteristics and applications by Robert G. Irvine
5. Semiconductor circuits : Linear and Digital by Marlin, Restenbalt
6. An introduction to Operational Amplifiers by SV Subramanyam
7. Industrial electronics by S.Biswas, Dhanpat Rai, India
8. Electronic devices and Circuits by G.K. Mithal
8. Industrial and Power Electronics - G.K. Mithal and Maneesha Gupta, Khanna, 2003.
9. Integrated Electronics - J. Millman and C.C Halkias, McGraw Hill, 1972.
10. Electronic Devices and circuits - Theodore. H.Bogart, Pearson Education, 2003.
11. Thyristors and applications - M. Rammurthy, East-West Press, 1977.

INS -103 : DIGITAL TECHNIQUES AND PRINCIPLES OF COMMUNICATIONS

Unit I a.Number systems and codes:

Binary numbers - Binary to decimal conversion, decimal to binary conversion. Binary addition, Subtraction, multiplication and division. Octal numbers : Octal to binary and binary to octal conversions. Octal to decimal and decimal to octal conversions, Hexadecimal numbers - Hexadecimal to binary and binary to hexadecimal Conversions

b. Logic gates and Boolean algebra

Logic gates AND, OR, NOT, NAND, NOR, XOR and XNOR, Laws of Boolean algebra-Simplification of Boolean functions . De Morgan's theorems, Karnaugh Map simplification.

c. Combinational circuits and flip flops:

Half adder, Full adder, Parallel binary adder, 8421 adder. Half and Full subtracters, Sequential logic: R-S (Delay element). J-K, J-K Master/Slave (race around conditions) flip flops

Unit II a. Registers, Counters and logic implementation :

Registers - Buffer register, Shift registers, Applications of shift registers- Ring counters, Johnson counter. Counters-Asynchronous/ Ripple counters, Synchronous counters, Mod counters using reset input, Counter application- Digital clock.

b. Combinational logic: Read only Memory (ROM)-Combination logic using ROM, Types of ROMs, Programmable Logic Array (PLA), Programmable Array Logic (PLA)

c. Analogue to Digital and Digital to Analogue converters:

Introduction, D/A conversion: The R-2R Ladder type DAC, The weighted resistor type DAC, specifications, A/D conversion: Flash type ADC, Dual slope ADC, Successive approximation type ADC

Unit III Analogue modulation (Principles only):

Introduction, Modulation, Need for Modulation, Types of Modulations, Amplitude modulation, Frequency modulation, phase modulation, Comparison between AM, FM and PM , Various forms of AM and its comparison, Generation of AM and FM, Demodulation of AM and FM

b. Pulse modulation:

Introduction, Principles of Pulse modulation, Types of Pulse modulations, Sampling theorem, Analog pulse modulation, Digital modulation, Comparison between various types of pulse modulations, Generation and Demodulation of various types of Pulse modulations, Advantages and Applications of PCM

Unit IV

a. Introduction to Satellite Communication Systems

(Principles only):

Line of sight of propagation, Line of sight transmitter and receiver, Microwave repeater, Classification of satellites, Differences between active and passive satellites^ Geostationary satellite, Transponders, Microwave repeater station (block diagram), Satellite repeater (block diagram) , Functioning of a Satellite and earth station, applications of satellite communications, Advantages and disadvantages.

b. Introduction to Wireless Communication Systems (Principles only):

Evolution of mobile radio communication, Mobile radiotelephony, Mobile radio systems, Frequency division Multiplexing , time division multiplexing, Paging systems, Cordless telephone system, Cellular telephone system, Calling through cellular telephone. Comparison of common wireless communication systems, trends in cellular radio and personal communication.

References:

1. Semiconductor Pulse circuits by Mitchel
2. Digital Principles and Applications by Malvino and Leach
3. Digital Electronics for Scientists by Malmstadt & Enke
4. Integrated Digital Electronics Design by Taub and Schilling
5. Pulse and Digital and Switching waveforms by Millman and Taub
6. Digital computer Electronics: An introduction to Microcomputers by AP Malvino
7. Electronic communication systems by Kennedy
8. Principles of communications by Taub and Schilling
9. Analog and Digital Communications by Gregg.
10. Communication Systems Analog and Digital - R.P. Singh and SDSapre, 2004.
11. Communication Systems Engineering - John. G. Proakis and Masoud Salehi 12 Mobile communications, J. Schiller, Pearson 2008.

INS -104: "C" PROGRAMMING

UNIT-1

a. Overview of computers: Overview of computer system, people, procedures, data, information, hardware-operations of computing, hardware categories, software application software and system software, developments in computer technology, types of programming languages, algorithms, flow charts.

B. Overview of C: History of C, importance of C, basic structure of C programs, programming style.

UNIT- II

a. Constants, Variables and Data Types: Character set, C tokens, keywords and identifiers, constants, variables, data types, declaration of variables, declaration storage classes, assigning values to variables, defining symbolic constants, declaring a variable as Constant and volatile, Overflow and underflow of data.

b. Operators and Expressions: Introduction to operators, arithmetic operators, relational operators, logical operators, assignment operators, increment and decrement operators, conditional operators, bit wise operators, special operators, arithmetic expressions, reading and writing a character, formatted input and output.

c. Decision Making and Looping: IF and Else IF statements, SWITCH statements, WHILE, DO-WHILE and FOR statements. C programs covering all the above aspects.

UNIT- III

a. Arrays and Strings: Introduction to arrays, initialization of One dimensional array and two dimensional arrays, declaring and initializing string variables, reading and writing strings, string handling functions.

b. User Defined Functions: need for user-defined functions, definition of functions, return values and their types, function calls and declarations, arguments but no return values, no arguments no return values, nesting of functions, passing arrays to functions, passing strings to functions.

UNIT- IV

a. Structures and Pointers: Defining a structure, declaring structure variables, structure initialization, copying and comparing structure variables, arrays of structures, understanding pointers, declaring pointer variables, initialization of pointer variables, pointer expressions.

b. File Management and Linked Lists: Defining and opening a file, closing a file, input/output operations on files, concepts of Single Linked Lists.

REFERENCE BOOKS:

1. Programming in ANSI C - E. Balaguruswamy.
2. Let us C - Yeshwanth Kanitkar.
3. Data Structures using C - A.M. Tanenbaum and others.

SEMESTER-II

INS-201: COMPUTER ARCHITECTURE AND ORGANIZATION

UNIT I

a. Basic Structure Of Computers: Computer Types, Functional unit, Basic Operational concepts, Bus structures, Performance, multiprocessors and multi computers.

b. Register Transfer Language And Micro operations: Register Transfer language. Register Transfer Bus and memory transfers, Arithmetic Micro-operations, logic micro operations, shift micro operations, Arithmetic logic shift unit. Instruction codes. Computer Registers Computer instructions - Instruction cycle. Memory -Reference Instructions. Input - Output and Interrupt. STACK organization. Instruction formats. Addressing modes

UNIT II

a. Micro Programmed Control: Control memory, Address sequencing, microprogram example, design of control unit Hard wired control. Micro programmed control

b. Computer Arithmetic: Addition and subtraction, multiplication Algorithms, Division Algorithms, Floating - point Arithmetic operations. Decimal Arithmetic unit Decimal Arithmetic operations.

UNIT III

a. The Memory System: Basic concepts semiconductor RAM memories. Read only memories Cache memories performance considerations, Virtual memories secondary storage. Introduction to RAID.

b. Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous data transfer Modes of Transfer, Priority Interrupt Direct memory Access, Input -Output Processor (IOP) Serial communication; Introduction to peripheral component, Interconnect (PCI) bus. Introduction to standard serial communication protocols like RS232, USB, and IEEE1394.

UNIT IV

a. Pipeline And Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline Vector Processing, Array Processors.

b. Multi Processors: Characteristics of Multiprocessors, Interconnection Structures, Inter processor Arbitration. Inter Processor Communication and Synchronization Cache Coherence. Shared Memory Multiprocessors.

REFERENCES

1. Computer Systems Architecture - M. Moris Mano, 11th Edition, PHI/Pearson.
2. Computer Organization - Car Hamacher, Zvonks Vranesic, SafeaZaky, McGraw Hill.
3. Computer Organization and Architecture - William Stallings Sixth Edition, Pearson.
4. Structured Computer Organization - Andrew S. Tanenbaum, 4th Edition Pearson.
5. Fundamentals of Computer Organization and Design, -Sivarama Dandamudi

INS -202: SENSORS, SIGNAL CONDITIONERS AND RECORDERS

Unit-I

a. General Introduction to sensors / transducers.

Definition of a transducer/sensor Role of a transducer in a generalized measurement system. Classification of transducers. Characteristics of a transducers. Significant parameters of a transducer.

b. Temperature sensors:

Temperature scales. Mechanical temperature sensors. Resistance type temperature sensors. Platinum resistance thermometer. Thermistors. Thermocouples. Solid state sensors. Quartz thermometer. Radiation type sensors - Optical pyrometers. Calibration of thermometers

Unit II

a. Displacement and Strain Transducers: Displacement transducers - Variable resistance, inductance and capacitance. Linear voltage differential Transformer (LVDT) Strain - Definition, Principle of working of strain gauges. Gauge factor.

Types of strain gauges. Materials for strain gauges. Temperature compensation. Application

b. Pressure transducers:

Manometers, Elastic transducers - Diaphragms, Bellows, Bourdon or helical tubes. Electrical pressure transducers - Variable resistance, inductance and capacitance. Piezoelectric pressure transducer. Vibrating element pressure sensors. Pressure calibration.

Unit III

a. Opto -Electronic Transducers:/

Photoemission tube. Photomultiplier tube, Photoconductive cell. Photovoltaic cell (solar cell). Photodiode, Photo-transistor, Photo FET, Light emitting diode. Liquid crystal display. Optoelectronic couplers. Laser diode

b. Electrochemical cells and Biomedical Electrodes:

Electrochemical cells — types. Electrode potential - cell potential. Reference electrodes. Ion selective electrodes. Indicator or working electrodes. Dropping mercury electrodes. Biomedical electrodes -Unipolar, bipolar, non-polar macro and microelectrodes. Surface" electrodes. Microelectrodes - Glass capillary and metal capillary electrodes.

Unit IV

a. Signal conditioners (Filters, Detectors & Amplifiers)

Filters - Integrators, Differentiators and active filters. Detectors -Peak Detectors, sample and hold circuits. Phase sensitive detector and precision rectifiers, Amplifiers- chopper stabilized DC amplifiers. Instrumentation amplifiers. Logarithmic and anti logarithmic amplifiers Isolation amplifiers, Lock in amplifiers.

b. Recorders, Displays and Storage Devices

Recorders- Basic recording systems. Strip chart recorders. Galvanometer and Potentiometer type recorders (direct and null type). Indicators and display Devices - Nixie, LED, LCD and seven segment and dot matrix displays. Magnetic tape and disc recorders. Data loggers, Dot matrix and laser printers. Compact disc/Optical disc recorders

References:

1. Instrumentation Measurement Analysis by Nakra and Chaudary
2. Instrumentation - Devices and Systems by Rangan, Mani and Sharma
3. A course in Electrical and Electronic Measurements and Instrumentation by AK Sawhney
4. -. Instrumental Methods of Analysis by Willard, Meritt, Dean and Seattle
5. Hand Book of Biomedical Instrumentation by RS Khandpur
6. Fundamentals of Electronic Devices by David A. Bell
7. An introduction to Operational amplifiers by SV Subramanyam

INS-203: VLSI SYSTEMS DESIGN

Unit I:

a. Introduction to Digital system and VLSI

Design significance of Integrated circuits, Integrated Circuit manufacturing technology and economics, CMOS Technology, IC Design techniques

b. Transistors and gates

Transistors And Layout, Fabrication Processes, Transistors, Wires and Vias, Design Rules, Layout Design Tools. Logic Gates, Combinational Logic Functions, Static Complementary Gates, Wires and Delay, Switch Logic, Alternative Gate Circuits

Unit II

Combinational Networks And Sequential Machines:

Combinational Logic Networks, Layout Design Method, Simulation, Combinational Network Delay, Crosstalk, Power Optimization, Switch Logic Networks, Combinational Logic Testing Sequential Machines, Latches And Flip-Flops Sequential Systems And Clocking Disciplines. Sequential System Design, Power Optimization, Design Validation, Sequential Testing

Unit III

Sub system Design, Floor Planning And Architecture Design:

Sub system Design Principles, Combinational Shifters, Adders, Alus, Multipliers, High Density Memory, Field Programmable Gate Arrays, Programmable Logic Arrays Floor Planning Methods, Off-Chip Connections. Architecture Design, Register-Transfer Design, High Level Synthesis Architecture For Low Power Architectural Testing

Unit IV

Chip Design And CAD Systems And Algorithms

Design Methodologies For Chip Design, Case Studies, Timer Chip and PDF 8 Data Path, CAD Systems, Simulation, Layout Synthesis, Layout Analysis, Timing Analysis and Optimization, Logic Synthesis, Test Generation, Sequential Machine Optimizations, Scheduling And Binding, Hardware/Software Co-Design

References

- 1 Essentials of VLSI circuits and systems - Kamran Eshraghian, Eshraghian Douglas and A. Pucknell, PHI, 2005 Edition.
2. Modern VLSI Design - Wayne Wolf, Pearson Education, 3rd Edition, 1997.
2. Principles of CMOS VLSI Design - Weste and Eshraghian, Pearson Education, 1999.
4. Introduction to VLSI Circuits and Systems - John .P. Uyemura, JohnWiley,2003.
- 5 Digital Integrated Circuits - John M. Rabaey, PHI, EEE, 1997.
6. VLSI Technology, Sujata Pandey and Manoj Pandey, Dhanpat Rai, 2009

INS-204: ELECTRONIC INSTRUMENTATION

UNIT-I

Analogue Measuring Instruments

a. Principle, Operation and constructional details of moving coil moving iron - induction type dynamometer type of DC meters Thermal type and rectifier type of meters. Errors and their compensation - extension of ranges of DC and AC meters -Ohmmeters - series type - shunt type meters - Meggers. Design and constructional details of multi meters.

(Basic principle, design and working with suitable block/circuit diagrams)

b. Cathode Ray Oscilloscope - Single beam. Dual trace, dual beam., Electronic-voltmeters (Transistor, FET & IC versions). , D.C. and A.C. Millie/Micro voltmeters Precision rectifier types. Nano ammeter (using op.amp). Analogue frequency meter. Analogue phase meter, impedance, L, C, R Bridges, Q meters and Distortion factor meters.

UNIT-II

Digital Measuring Instruments

(Basic principle, design and working with suitable block/ circuit diagrams)

- a) Digital frequency meter.
- b) Digital volt meter.
- c) Digital multimeters.
- d) Digital phase meter.
- e) Digitizing Oscilloscopes, Storage oscilloscope and Sampling Oscilloscopes.

UNIT-III

Waveform Generators

(Basic principle, design and working with suitable block/circuit diagrams)

- (a) A.F. Sine/Square wave Generator.
- (b) R.F. Signal Generator.
- (c) Standard signal Generator.
- (d) Function Generator.

UNIT - IV

Special Instruments

- (a) Spectrum Analyzers
- (b) Frequency Synthesizers
- (c) Digital tachometer
- (d) Digital watt meter
- (e) Digital Capacitance meter

REFERENCE BOOKS:

1. Electronic Instrumentation and Measuring Techniques. — Cooper
2. Electronic Instrumentation — Kalsi
3. Electronic Measurements and Instrumentation. — Oliver & Cage
4. Instrumentation Devices and Systems. — Rangan, Sarma and Mani
5. A Course in Electrical and Electronic Measurements and Instrumentation. by AK Sawhney

INS-- 207: Human Values and Professional Ethics – I

Chapter I: Definition and Nature of Ethics – Its relation to Religion, Politics, Business, Law, Medicine and Environment. Need and Importance of Professional Ethics – Goals – Ethical Values in Various Professions.

Chapter II: Nature of Values – Good and Bad, Ends and Means, Actual and Potential Values, Objective and Subjective Values, Analysis of Basic Moral Concepts – Right, Ought, Duty, Obligation, Justice, Responsibility and Freedom, Good Behavior and Respect for Elders, Character and Conduct.

Chapter III: Individual and Society: Ahimsa (Non-Violence), Satya (Truth), Brahmacharya (Celibacy), Asteya (Non Possession) and Aparigraha (Non-stealing). Purusharthas (Cardinal virtues) - Dharma (Righteousness), Artha (Wealth), Kama (Fulfillment Bodily Desires), Moksha (Liberation).

Chapter IV: Bhagavad Gita – (a) Niskama Karma, (b) Buddhism – The Four Noble Truths – Arya astanga marga, (c) Jainism - Mahavratas and Anuvratas. Values Embedded in Various Religions, Religious Tolerance, Gandhian Ethics.

Chapter V: Crime and Theories of Punishment – (a) Reformative, Retributive and Deterrent, (b) Views on Manu and Yajnavalkya.

Books for study:

1. Johns S Mackenzie: A Manual of ethics
2. “The Ethics of Management” by Larue Tone Hosmer, Richard D. Irwin Inc.
3. Management Ethics – Integrity at work by Joseph A. Petrick and John F. Quinn, Response Books, New Delhi.
4. “Ethics in Management” by S.A. Shelekar, Himalaya Publishing House.
5. Harold H. Titus: Ethics for Today
6. Maitra, S.K: Hindu Ethics
7. William Lilly: Introduction to Ethics
8. Sinha: A Manual of Ethics
9. Manu: Manava Dharma Sastra or the Institute of Manu: Comprising the Indian System of Duties: Religious and Civil (ed) G.C. Haughton.
10. Sasruta Samhita: Tr. KavirajKunjanlal, KunjanlalBrishagratha, Chowkamba Sanskrit Series, Vol I,II and III, Varanasi, Vol I PP, 16-20, 21-32 and 74-77 only.
11. Charaka Samhita: Tr. Dr. Ram Karan Sarma and Vaidya Bhagavan Dash, Chowkambha Sanskrit Series Office. Varanasi I, II, III Vol I PP 183-191.
12. Ethics, Theory and Contemporary Issues. Barbara Mackinnon, Wadsworth/Thomson Learning, 2001.
13. Analyzing Moral Issues, Judith A. Boss, Mayfield Publishing Company, 1999.
14. An Introduction to Applied Ethics (Ed.) John H. Piet and Ayodya Prasad, Cosmo Publications.
15. Text Book for Intermediate First Year Ethics and Human Values, Board of Intermediate Education – Telugu Academy, Hyderabad.
16. I.C. Sharma Ethical Philosophy of India. Nagin& Co Julundhar.

SEMESTER- III

INS - 301: SCIENTIFIC/ ANALYTICAL INSTRUMENTATION

Unit-I Colorimeters and Spectrophotometers

Colorimeter - Principle and working with a block diagram. Salient features of individual blocks. Specifications of a colorimeter. Applications of colorimeters to analytical and biomedical purposes. Spectrophotometer - Principle and working with a block diagram. Salient features of individual blocks. Specifications and operation , of Spectrophotometer. Types of spectrophotometers - Ultraviolet, Visible and Infrared. Applications of spectrophotometers to chemical analysis

b. Electron Microscopes

Transmission electron microscope - Principle and working with a block diagram. Salient features of individual blocks. Scanning electron microscope - Principle and working with a block diagram. Description of g individual blocks. Applications of electron microscopes.

Unit- II a. p^H meters and Conductivity Bridges

p^H meters: Principle and working with a block diagram. Salient features of individual blocks. Types of p^H meters Applications of p^H meters in chemical and industrial fields.

Conductivity bridges: Principle and working of a conductivity bridge with block diagram. Salient features of individual blocks. Applications of conductivity bridges.

b. Polarographs and Nuclear radiation detectors

Polarographs: Principle and working with a block diagram. Salient features of individual blocks. Characteristics of dropping mercury electrode. Polarogram. Pulse polarograph. Application of Polarographs in chemical and Industrial fields. Nuclear radiation detectors: Ionization chamber, GM Counter, Proportional Counter, Solid state detectors.

Unit- III

a. Resonance Spectrometers

Nuclear Magnetic Resonance spectrophptometer - Principle and working with suitable schematic/block diagrams. Experimental arrangement. Salient features of individual blocks. NMR spectrum . Applications of NMR spectrometer. Electron spin resonance spectrometer - Principle and working with a block diagram. Experimental arrangement. Salient features of individual blocks. Applications

b. Mass Spectrometers

Mossbauer spectrometer - Experimental* arrangement. Salient features of individual blocks. Sources, absorbers and detectors. Mossbauer spectrum. Applications of Mossbauer spectrometer. Mass spectrometer - Principle and working. Description of individual blocks of experimental arrangement. Applications n of Mass spectrometer.

Unit- IV

a. Thermal Analyzers

Thermo gravimetric and Differential Thermal analyzers – Principle and working with schematic diagram. Description of individual blocks. Applications

b. Chromatographs

Chromatographs - Gas and liquid (HPLC) chromatographs : Principle and working with a block diagram. Applications.

References:

1. Instrumental Methods of Analysis by Willard, Merrit , Dean and Seattle
- 2 Instrumental Methods of Analysis by Chatwal and Anand
1. Principles of Instrumental Analysis by Skoog
2. Industrial Instrumentation by Soisson
3. Molecular spectroscopy by Singh and Dikshit
4. Instrumental Analysis by Mann, Wickers and Gulick
5. Instrumental Methods of Chemical Analysis by B K Sharma

INS -302 MICRO CONTROLLERS AND DIGITAL SIGNAL PROCESSING

UNIT-I

a. Introduction to Microcontrollers

Introduction, Microcontrollers and Microprocessors Embedded versus external Memory devices, 8 bit and 16 bit micro controllers,

CISC and RISC processors, Harvard and Von Newmann Architectures, commercial microcontroller devices **b.8051 Microcontroller**

Introduction, MCS-51 architecture, Registers in MCS 51 , Pin description, connections, I/O ports and Memory Organization

UNIT –II

a. Addressing modes, Instructions and programming in 8051

Addressing modes, Instruction set, Instructions and simple programs, Assembly language programming, Development systems and tools

b. Interrupts, Timer/counters and serial communications, Interfacing

Interrupts - Interrupts in MCS-51 -Timers and counters - serial. communications - Interfacing - LEDs -Push buttons, Relays and Latch connections- Keyboard interfacing - Interfacing 7 segment displays - ADC and DAC interfacing

UNIT III

a. Introduction to DSP: Examples Of Signals, Classification Of Signals, System, Mathematical Modeling Of Continuous Systems, Signal Processing, Advantage And Disadvantage Of Signal Processing.

b. Signals : Elementary Continuous Time Signals, Continuous Time Periodic Signals, Representation. Of Periodic Signals, Elementary Discrete Time Signals, Classification Of Discrete Time Signals, Operation On Signals, Sampling And Aliasing, Discrete Time System

c. Filters: Ideal Filters, Simple ER Digital Filters, Simple FIR Filters , Comb Filter, All Pass Filter, Analogue And Digital Conversion, Reconstruction Of Analogue Signal, Types Of A/D and D/A Converters

UNIT IV

a. Digital Signal Processors: Overview Of Digital Signal Processors, Selecting Digital Signal Processors, Applications Of PDSPPS, Vonnemann Architecture, Harvard Architectures, VLIW Architecture, Multiply Accumulate Unit (MAC), Pipe Lining, Architecture Of TMS320C50

b. Applications Of Digital Signal Processing: Introduction, Speech Processing, Speech Analysis, Speech Coding, Sub-band Coding, Channel Vocoder, Homomorphic Vocoder, Digital Processing Of Audio Signals, Radar Signal Processing, DSP Based Measurement System.

REFERENCES

1. Microcontrollers Architecture, Programming, Interfacing and System Design- Raj Kamal, Pearson Education ; 2005.
2. The 8051 Microcontroller and Embedded Systems - Mazidi and Mazidi, PHI, 2000.
3. The 8051 Microcontroller, Kenneth Ayala
4. Microcontrollers (Theory & Applications)-A. V. Deshmuk, WTMH, 2005.
5. Design with PIC Microcontrollers - John B. Peatman, Pearson Education, 2005.
6. Discrete Time Signal Processing - A.V. Oppenheim and R.W. Schaffer, PHI, 1989.
7. Fundamentals of Digital Signal Processing - Loney Luderman.
8. Digital Signal Processing - S. Salivahanan et al, TMH, 2000.
9. Digital Signal Processing - Thomas J. Cavicchi, WSE, John Wiley, 2004.
10. Digital Signal Processors, Architecture, Programming & Applications, - B.Venkata Ramani, M. Bhaskar, TMH , 4th reprint, 2004
11. Digital Signal Processing, P. Rameshbabu, Scitech, India 2009

INS - 303 : BIOMEDICAL INSTRUMENTATION

Unit-I

a. Human Physiological Systems, Bio Potentials and Electrodes:

Introductions, Cells And their Structure, Transport of ions Through Cell Membrane, Resting and Action Potentials, Bioelectric Potentials, Physiological Systems of Human Body, Electrodes Biomedical Instrumentation System.

b. Bio Signal Acquisition and Recording:

Physiological Signal Amplifiers, Isolation Amplifiers, Pre Amplifiers, Line Driving Amplifiers, Characteristics of Recording System, Electrocardiography (ECG), Electroencephalography (EEG), Electromyography (EMG), Electro- Retinography (ERG), Electro Oculography (EOG), Accuracy in Recording

Unit - II

a. Physiological Assist Devices:

Introduction, Pacemakers, Defibrillators, Nerve and Muscle Stimulators, Heart Lung Machine, Kidney Machine

b. Special Equipment:

Blood Cell Counter, Audiometer, Digital Thermometer, X Ray. Machine, Radiography and Fluoroscopy, Image Intensifiers, Angiography

Unit - III

a. Bio Telemetry:

Elements of Biotelemetry Systems, Design of aBiotelemetry System Radio telemetry System, Uses Of Biotelemetry

b. Operation Theatre Equipment:

Introduction, Surgical Diathermy Ventilators, Anaesthesia Machine, Cardiac Output Measurement, Pulmonary Function Analyzer, Oxymeters.

Unit-IV

a. Safety Instrumentation:

Radiation Safety Instrumentation: Dosimeters, Radiation Alarm, Physiological Effects due to 50 Hz Frequency, Micro Shock and Macro Shock, Hospital Architecture.

b. Advanced Biomedical Instrumentation:

Lasers in Biomedical Instrumentation, Endoscopes, Cryogenic Surgery, Computer Tomography Scanner (CT), Applications, Thermography, Applications, Ultrasonic Image Forming Systems,

Applications, Magnetic Resonance Imaging (MRI), Positron Emission Tomography

References:

1. Biomedical Instrumentation and Measurement by Harry E. Thomas
2. Hand book of Biomedical Instrumentation by R.S. Khandpur
3. Biomedical Instrumentation & Measurements by Leslie Cromwell, Fred J. Waibell, Erich A.Pfeiffer
4. Hand Book of Bio medical Engineering by Jacob Klime
5. Bio Medical Electronics by Joseph Duboy
6. Transducers for Bio medical Measurements by Richards SC Cobbold
7. Bio medical Instrumentation by M. Arumugam
8. Biomedical Instruments, Theory and Practice by Welkowitz and Dentsch
9. Biological Engineering by Schwan
10. Biomedical Engineering systems by Clines and Mulism

INS - 304 INDUSTRIAL AND PROCESS CONTROL INSTRUMENTATION

UNIT-I:

a. Process Dynamics : Process variables - Load variables -Dynamics of simple pressure, flow level and temperature process -interacting and non-interacting systems - continuous and batch process - self-regulation - Servo and Regulator operation **b. Control Actions and Controllers:** Basic control actions-characteristics of two position, three position, Proportional, Single speed floating, Integral and Derivative control modes - PI, PD, PID control modes - Pneumatic, Hydraulic and Electronic Controllers to realize various control actions.

UNIT-II

a. Programmable Logical Controllers

Introduction - Advantages of Programmable logic controllers in comparison to relay based system - Configuration of Programmable Logic controllers

b. Distributed Control Systems

Introduction - Overall control configuration- Block diagram of a Generalized control system- Relationship of hierarchy to plant structure - Single loop controllers and Double loop controllers.

UNIT-III:

a. Velocity and Acceleration measurement Relative velocity - Translational and Rotational velocity measurement - Revolution counters and Timers - Magnetic and Photoelectric pulse counting stroboscopic methods - Accelerometers of different types - Gyroscopes.

b. Force and Torque measurement

Force measurement - Different methods -Torque measurement -Dynamometers- Gyroscopic Force and Torque Measurement -Vibrating wire Force transducer

UNIT-IV

a. Density Measurement: Volume Flow meter Plus Density measurement - Strain Gauge load cell method - Buoyancy method - Air pressure balance method - Gamma ray method — Vibrating probe method. Direct Mass Flow meters. __

b. Radiation And other Measurements : Radiation Fundamentals. GM counter, Scintillation counter, Radio dating, Sound-Level Meter. Microphones. Time, Frequency, and Phase-Angle measurement. Liquid Level. Humidity. Particle Instruments and Clean-Room Technology.

REFERENCES:

1. Chemical Process Control : An introduction to Theory and Practice -Stephanopoulos
2. Process Control - Harriott P.
3. Measurement Systems -Applications and Design - by Doebelin ,Int. 1990.
4. Principles of Industrial Instrumentation - Patranabis D. TMH. End edition 1997
5. Process Control, Third Edition - Liptak E.G., Chilton Book Company, Pennsylvania, 1995
6. Process control - by Pollard A., Heinemann Educational Books, London, 1971.
7. Automatic Process Control - by Eckman D.P., Wiley Eastern Ltd., New Delhi, 993.
8. Process Control - by Patranabis.
9. Process System Analysis and Control - Coughanowr, McGraw Hill, Singapore, 1991
10. Process Instruments and Control Handbook - by Considine D.M., McGraw Hill Int.1993.
11. Mechanical and Industrial Measurements - by Jain R.K., Khanna Publishers, 1986

SEMESTER- IV

INS-401: Project work Dissertation

INS-402: Viva – Voce

INS - 403: Human Values and Professional Ethics – II

Chapter I: Value Education – Definition – Relevance to present day – Concept of human values - Self introspection – Self esteem. Family values-Components, Structure and responsibilities of family Neutralization of anger – Adjustability – Threats of family life – Status of women in family and society – Caring for needy and elderly – Time allotment for sharing ideas and concerns.

Chapter II: Medical ethics – Views of Charaka, Sushruta and Hippocrates on moral responsibility of medical practitioners. Code of ethics for medical and healthcare professionals. Euthanasia, Ethical obligation to animals, Ethical issues in relation to health care professionals and patients. Social justice in health care, human cloning, problem of abortion. Ethical issues in genetic engineering and Ethical issues raised by new biological technology or knowledge.

Chapter III: Business ethics – Ethical standards of business – Immoral and illegal practices and their solutions. Characteristics of ethical problems in management, ethical theories, causes of unethical behavior, Ethical abuses and work ethics.

Chapter IV: Environmental ethics – Ethical theory, man and nature - Ecological crisis, Pest control, Pollution and waste, Climate change, Energy and pollution, Justice and environmental health.

Chapter V: Social ethics – Organ trade, Human trafficking, Human rights violation and social disparities, Feminist ethics, Surrogacy/pregnancy. Ethics of media – Impact of Newspapers, Television, Movies and Internet.

Books for study:

1. Johns S Mackenzie: A Manual of ethics
2. “The Ethics of Management” by Larue Tone Hosmer, Richard D. Irwin Inc.
3. Management Ethics – Integrity at work by Joseph A. Petrick and John F. Quinn, Response Books, New Delhi.
4. “Ethics in Management” by S.A. Shelekar, Himalaya Publishing House.
5. Harold H. Titus: Ethics for Today
6. Maitra, S.K: Hindu Ethics
7. William Lilly: Introduction to Ethics
8. Sinha: A Manual of Ethics

9. Manu: Manava Dharma Sastra or the Institute of Manu: Comprising the Indian System of Duties: Religious and Civil (ed) G.C. Haughton.
10. Sasruta Samhita: Tr. KavirajKunjanlal, KunjanlalBrishagratha, Chowkamba Sanskrit Series, Vol I,II and III, Varanasi, Vol I PP, 16-20, 21-32 and 74-77 only.
11. Charaka Samhita: Tr. Dr. Ram Karan Sarma and Vaidya Bhagavan Dash, Chowkamba Sanskrit Series Office. Varanasi I, II, III Vol I PP 183-191.
12. Ethics, Theory and Contemporary Issues. Barbara Mackinnon, Wadsworth/Thomson Learning, 2001.
13. Analyzing Moral Issues, Judith A. Boss, Mayfield Publishing Company, 1999.
14. An Introduction to Applied Ethics (Ed.,) John H. Piet and Ayodya Prasad, Cosmo Publications.
15. Text Book for Intermediate First Year Ethics and Human Values, Board of Intermediate Education – Telugu Academy, Hyderabad.
16. I.C. Sharma Ethical Philosophy of India. Nagin& Co Julundhar.