M. Tech Electronics Product Design and Technology

for Batch 2011

SEM ESTER : First								
Course Code	**Course Title**	**Load Allocation**				**Marks Distribution**		
		L	T	P	Total	Theory/ Practical	Sessional	Total
MTET101	Microelectronics Technology	3	1	0	4	100	50	150
MTET102	Computer Integrated Manufacturing Systems	3	1	0	4	100	50	150
MTET103	Advanced Communication Systems	3	1	0	4	100	50	150
MTET104	Advanced Digital System Design	3	1	0	4	100	50	150
MTET105	Designing with Power Devices	3	1	0	4	100	50	150
MTET106	CAD/CAM LAB	0	0	4	4	100	50	150
MTET107	Advanced Digital Design and Implementation – LAB	0	0	4	4	100	50	150
	Grand total	15	5	8	28	700	350	1050

MTET 101 MICRO ELECTRONICS TECHNOLOGY

Introduction and its use in I.C. fabrication. Scales of integration from SSI to ULSI.

- **CRYSTAL GROWTH**

Single Crystal growth of Silicon and Gallium Arsenide. Substroth slicing and polishing. Zen refining of Semiconductor crystals.

- **OXIDATION**

Oxide layer growth on Silicon wafer surface. Oxidation in the presence of dry oxygen & wet oxygen. Oxide layer growth along various crystal directions.

- **DIFFUSION**

Solution to Fick's Laws Junction formation. Diodes, transistors and MOSFETs.

- **EPITAXY**

VPE, LPE and MBE: Individual epitaxial units, their operation and quality of film growth.

- **ION IMPLANTATION**

The process and techniques for formation of ion-implanted doped layers and their characteristics.

- **THIN FILM DEPOSITION**

Growth of thin metallic films. Normal and ultra-high vacuum systems. Thickness monitors .

- **CHEMICAL VAPOUR DEPOSITION** Growth of CVD films. Growth Mechanism and characterization. MOCVD.

- **STANDARD BIPOLAR, NMOS AND CMOS CIRCUITS** Processing and fabrication using circuit layout. Process evaluation.

- **THE SI-MOS CAPACITOR** Its fabrication and characteristics.

- **SUB MICRON DEVICE PHYSICS AND TECHNOLOGY** Review of basic device physics, MOS capacitor and transistor theory, Moore's law on technology scaling, MOS device scaling theory, Short channel effects, sub threshold leakage, Punch through, DIBL, High field mobility, Velocity saturation and overshoot, ULSI technology, Nano fabrication.

- **BOOKS:**

1. Fundamentals of semiconductor Fabrication- S. M Sze , G May

2. Physics of semiconductor devices- S.M Sze

REFERENCES:

1. Microelectronics: Theory Design and Fabrication by Edward Keonjian
2. Microelectronics –Jacob Millman

MTET 102 ADVANCED COMMUNICATION SYSTEMS

- **INTRODUCTION**

  Introduction to communications systems, analog and digital communication systems, Applications of communication systems.

- **DIGITAL COMMUNICATION**

  Introduction, Digital Modulation techniques, BPSK, QPSK, PCM, DPCM, Delta Modulation, Digital Transmission and Transmission Impairments.

- **OPTICAL NETWORKS**

  WDM, TDM, Telecommunication Infrastructure, Switching, 3G systems, SONET, SDH, Architecture of Optical Transport Network, Link Management Protocols, Solutions.

- **SATELLITE COMMUNICATION**

  Basic Transmission Theory, System Noise Temperature and G/T Ratio, Design Of Down Links, Domestic Satellite Systems Using Small Earth Stations, Uplink Design, Design Of Satellite Link For Specified (C/N). Multiple Access Techniques, Frequency Division Multiple Access(FDMA), TDMA, CDMA, Estimating Channel Requirements, Practical Demand Access Systems, Random Access, Multiple Access With On Board Processing. VSAT

- **MOBILE COMMUNICATIONS**

  Mobile telephone service, Transmission protocols, Introduction to GSM, GPRS, CDMA, Switching techniques, Fading, Quality of service (QOS).

BOOKS:

1. Advanced Communication Systems - by Wayne Tomasi; Pearson.
2. Digital Communication - by Proakis; PHI
3. Optical Networks - by Uyless Black; Pearson
4. Satellite Communication - by Timothy Pratt; Addison Wesley.
5. Related IEEE/IEE publications

MTET 103 COMPUTER INTEGRATED MANUFACTURING SYSTEMS

- **INTRODUCTION**

Objectives of a manufacturing system-identifying business opportunities and problems
classification production - systems-linking manufacturing strategy and systems-analysis of manufacturing operations.

- **COMPUTER AIDED PLANNING AND CONTROL**

Production planning and control-cost planning and control-inventory management-Material requirements planning - (ERP)-shop floor control-Factory data collection system-Automatic identification system-barcode technology automated data collection system.

- **COMPUTER MONITORING**

Types of production monitoring systems-structure model of manufacturing process-process control & strategies direct digital control-supervisory computer control-computer in QC –contact inspection methods non-contact inspection method - computer-aided testing –integration of CAQC with CAD/CAM.

- **INTEGRATED MANUFACTURING SYSTEM**

Definition - application - features - types of manufacturing systems-machine tools-materials handling system computer control system - DNC systems manufacturing cell. Flexible manufacturing systems (FMS) - the FMS concept-transfer systems - head changing FMS – variable mission manufacturing system - CAD/CAM system - human labour in the manufacturing system- computer integrated manufacturing system benefits. Rapid prototyping - Artificial Intelligence and Expert system in CIM.

BOOKS:

1. Groover, M.P., "Automation, Produ tion System and CIM", Prentice-Hall of India, 1998.

REFERENCES:

1. David Bedworth, "Computer Integrated Design and Manufacturing", TMH, New Delhi, 1998.
2. Yorem Koren, "Computer Integrated Manufacturing Systems", McGraw Hill, 1983.
3. Ranky, Paul G., "Computer Integrated Manufacturing", Prentice Hall International, 1986.
4. R.W. Yeomamas, A. Choudry and P.J.W. Ten Hagen, "Design rules for a CIM system", North Holland Amsterdam, 1985.
5. W.Bosshart, Design & Fabrication of PCB

MTET 104 ADVANCED DIGITAL SYSTEM DESIGN

- **INTRODUCTION TO DIGITAL DESIGN**

Number Systems, Signed, Unsigned number, 1's Complement, 2's Complement, Binary Operations - Addition, Subtraction using 1's & 2's Complement etc., Code converters-Excess-3, Gray Code.

- **LOGIC CIRCUIT DESIGN**

Universal Gates, Karnaugh Maps, Minimization of Logic Functions- Sum of Products, Product of Sum, Minimization of Logic Circuit.

- **HARDWARE DESCRIPTION LANGUAGES**

Introduction to VHDL, Design Units, Modeling styles- Behavioral, Structural and Concurrent, VHDL based digital design flow, Data objects, Data types, Delay models- Delta, Inertial, & Transport, Concurrent statements, Sequential statements, Process statements, Conditional & Selective signal assignments, Generate statements, Signal and Variable assignments, Synthesis of statements, Loops- for loop, while loop, Subprograms – Functions, Procedures, Generic, Package, IEEE standard logic library, Test bench, Component declaration, Instantiation, Configuration- declaration & specification.

- **FINITE STATE MACHINES (FSMS)**

Review of Moore and Mealy state machines, Finite state machines, Representation, Design steps, FSM code structure, Synthesis of FSMs.

- **ASYNCHRONOUS SEQUENTIAL CIRCUITS**

Analysis & Synthesis of asynchronous digital circuits, State Reduction, State Assignment, Hazards.

- **TESTING OF DIGITAL CIRCUITS**

Introduction, Types of faults, Fault modeling, Path sensitization, Testing algorithms-D-frontier and PODEM, Linear Feedback Shift Register, Built in Self Test.

- **FPGA Prototyping**

Introduction, Elements of FPGA, FPGA Implementation of following circuits –Full Adder, Subtractor, Decoder, Encoder, Data Selector, Ripple Carry Adder, Arithmetic Logic Unit, ROM, 4X4 Key board controller.

BOOKS:

- Fundamentals of Digital Logic with VHDL design – Stephen Brown, Zvonko Vranesic – Tata McGraw Hill.
- Digital Design Principles – Fletcher.
- Logic and Computer Design Fundamentals – Morris Mano

- VHDL Primer – J. Bhasker – Pearson Education.

REFERENCE :

- Digital System Design Using VHDL – Charles H. Roth.
- Digital System Design – John Wakerley.
- VHDL – 3rd Edition – Douglas Perry – Tata McGraw Hill
- VHDL – Zainalabedin Navabbi.

MTET 105 DESIGNING WITH POWER DEVICES

- **POWER SEMICONDUCTOR DEVICES**

General characteristics of Power devices such as GTOs, Power BJT ,Power MOSFET,IGBT, MCT.

- **TRANSFORMER DESIGN**

Fundamentals, Selection of core material, Insulating material and wires, Design Methodology of pulse transformers, High Frequency transformers, Design of Transformers for PWM converters

- **COILS**

Fundamentals, Selection of core material, Insulating materials and wires, Design of inductors for power frequency, Radio frequency & High frequency

- **SWITCH MODE POWER SUPPLIES**

Basic regulators-Buck,Boost, Buck Boost, Derived topologies-flyback, forward, Pushpull, half & full bridge converter, Special converters like Cuk' converter, PWM control techniques, Study of PWM control ICs Design of base derive circuits, Design of input section, output section & control section, Thermal design concepts, EMI/EMC considerations, Protection circuit design for power supplies.

- **UPS AND OTHER POWER SUPPLIES**

Concept of Uninterrupted power supplies, Inverter preferred (online UPS), Line preferred UPS system (offline UPS system),Line interactive UPS system, Reliability of UPS system, Solar cells as power source devices & their characteristics.

BOOK:

1. George Chryssis, 'High frequency switching power supplies: theory & design" McGraw Hill Book Co. 1984 (Text)

REFERENCES:

1. K.Kitsum, " Switch mode power conversion –basic theory and design" Marcel Deckker Inc, 1984
2. N.Radhakrishnan and S.R.Bhat, "Design and technology of low power transformers and inductors" CEDT, July 1998

MTET 106 CAD/CAM LAB

- 2D drawing and drafting using sketcher workbench – 2 drawings
- 3D modeling and drafting using 3D features – 5 models
- Assembling and drafting of 2 assemblies
- Surface modeling – 4 exercises
- Types of PCBs & Overview
- of PCB Technologies
- About the Base Material
- Component Identification
- Introduction to OrCAD Capture &
- Entry of Schematic Diagram
- Netlist File Creation
- Introduction to OrCAD Layout Plus
- Placement of Components
- Manual Routing
- Post Processing
- Excursion to an Industry

Note- 1 The term- work will be accessed on the basis of completion of above assignments and submission of report

2 Practical examination: Duration 3 hours, Candidate will carry out one exercise in 2D modeling and one exercise in 3D Modeling, followed by oral examination

MTET 107 ADVANCED DIGITAL DESIGN & IMPLEMENTATON (LAB)

- Design and Implementation of following features in Counter:-Counter with Asynchronous reset & clear signal, Synchronous Counter, Mod 10 Counter, FSM.
- Design and Implementation of ALU with following features:-Addition, Subtraction, Multiplication, Division, Square, Factorial, AND, OR, EXOR, EXNOR, Increment, Decrement, 1's Complement, 2's Complement etc.
- Design and Implementation of 8 X 8 Key board controller.
- Design and Implementation of Shift Register with following features:-Parallel in Serial out, Serial in Parallel out, Parallel in Parallel out, Serial in Serial out, Universal Shift Register.
- Design and Implementation of Hardware Multiplier.
- Design and Implementation of Universal Asynchronous Transmitter & Receiver.

M.Tech Electronics Product Design and Technology

SEM 2								
Course Code	Course Title	Load Allocation				Marks Distribution		
		L	T	P	Total	Internal	External	Total
MTET201	Embedded System Design	3	1	0	4	50	100	150
MTET202	Neural Networks & Fuzzy Logic	3	1	0	4	50	100	150
MTET203	Advanced Digital Signal Processing	3	1	0	4	50	100	150
MTET204	Physical design of Electronic Equipments	3	1	0	4	50	100	150
MTET205	Advanced Micro Controllers	3	1	0	4	50	100	150
MTET206	Advanced Micro Controller-LAB	0	0	4	4	50	100	150
MTET207	Digital Signal Processing - LAB	0	0	4	4	50	100	150
	Grand Total	15	5	8	28	350	700	1050

2nd Semester

MTET201 EMBEDDED SYSTEMS DESIGN

- **INTRODUCTION AND EXAMPLES OF EMBEDDED SYSTEMS**

Concept Of Embedded System Design: Design challenge, Processor technology, IC technology, Design technology, Trade-offs

- **CUSTOM SINGLE PURPOSE PROCESSOR HARDWARE, GENERAL-PURPOSE PROCESSOR**

introduction, basic architecture, operation, super-scalar and VLSIIW architecture, application specific instruction set processors (ASIPS), microcontrollers, digital signal processors, selecting a microprocessor.

- **MEMORY**

Introduction, Memory writes ability, Storage performance, Tradeoff s, Common memory types Memory hierarchy and cache

- **AVR 8515 MICROCONTROLLER**

Architecture and Programming in assembly and C. Interfacing Analog and digital blocks: Analog-to-Digital Converters (ADCs), Digital to-Analog, Converters (DACs)., Communication basics and basic protocol concepts, Microprocessor interfacing: I/O addressing, Port and Bus based, I/O, Memory mapped I/O, Standard I/O interrupts, Direct memory access, Advanced communication principles parallel, serial and wireless, Serial protocols I2C, Parallel protocols PCI bus, Wireless protocol IrDA, blue tooth.

- **DIFFERENT PERIPHERAL DEVICES**

Buffers and latches, Crystal, Reset circuit, Chip select logic circuit, timers and counters and watch dog timers, Universal asynchronous receiver, transmitter (UART), Pulse width modulators, LCD controllers, Keypad controllers. Design tradeoffs due to thermal considerations and Effects of EMI/ES etc.

- **SOFTWARE ASPECT OF EMBEDDED SYSTEMS**

Challenges and issues in embedded software development, Co-design

- **EMBEDDED SOFTWARE DEVELOPMENT ENVIRONMENTS**

Real time operating systems, Kernel architecture: Hardware, Task/process control subsystem, Device drivers, File subsystem, system calls, Embedded operating systems, Task scheduling in embedded systems: task scheduler, first in first out, shortest job first, round robin, priority based scheduling, Context switch: Task synchronization: mutex, semaphore, Timers, Types of embedded operating systems, Programming languages: assembly languages, high level languages

- **DEVELOPMENT FOR EMBEDDED SYSTEMS**

Embedded system development process, Determine the requirements, Design the system architecture, Choose the operating system, Choose the processor, Choose the development platform, Choose the programming language, Coding issues, Code optimization, Efficient input/output, Testing and debugging, Verify the software on the host system, Verify the software on the embedded system

BOOKS

- Frankvahid/Tony Givargis, “Embedded System Design- A unified Hardware/software Introduction”.
- David E Simon, " An embedded software primer ", Pearson education Asia, 2001.
- Dreamteach Software team,” Programming for Embedded Systems”□ AVR 8515 manual
- J.W. Valvano, "Embedded Microcomputor System: Real Time Interfacing"
- Jack Ganssle, "The Art of Designing Embedded Systems", Newnes, 1999.

MTET 202 NEURAL NETWORKS & FUZZY LOGICS

- Neural networks characteristics, History of development in neural networks principles, Artificial neural net terminology, Model of a neuron, Topology, Learning, types of learning, Supervised, Unsupervised, Re-inforcement learning. Knowledge representation and acquisition.

- Basic Hop field model, Basic learning laws, Unsupervised learning, Competitive learning, K-means clustering algorithm, Kohonen`s feature maps.

- Radial basis function neural networks, Basic learning laws in RBF nets, Recurrent back propagation, Introduction to counter propagation networks, CMAC network, and ART networks.

- Applications of neural nets such as pattern recognition, Optimization, Associative memories, speech and decision-making. VLSI implementation of neural networks.

- Fuzzy Logic: Basic concepts of fuzzy logic, Fuzzy vs. Crisp set, Linguistic variables, Membership functions, Operations of fuzzy sets, Fuzzy IF- THEN rules, Variable inference techniques, De-Fuzzification, Basic fuzzy inference algorithm, Fuzzy system design, FKBC & PID control, Antilock Breaking system (ABS), Industrial applications.

Books Recommended:

1. Neural Networks - by Simon Haykin
2. Fuzzy logic with engineering application - by ROSS J.T (Tata Mc)
3. Neural Networks & Fuzzy Logic - by Bart Kosko
4. Neural computing theory & practice - by P.D. wasserman (ANZA PUB).
5. Introduction to applied Fuzzy Electronics-Ahmad M.Ibrahim (PHI)
6. Introduction to artificial neural systems - by J.M. Zurada.(Jaico Pub)
7. An introduction to Fuzzy control - by D. Driankor, H. Hellendorn, M.Reinfrank (Narosa Pub.)
8. Fuzzy Neural Control - by Junhong NIE & DEREK LINKERS (PHI)
9. Related IEEE/IEE publications
10. Fuzzy System Design Principles, Building Fuzzy IF-THEN Rule Bases – by Riza C.Berkiu & Trubatch, IEEE Press

MTET 203 ADVANCED DIGITAL SIGNAL PROCESSING

- Review of Fourier Transforms, Z-Transforms, Discrete Fourier Transform, Fast Fourier Transform, Convolution And Correlation.

- Design of digital filters: introduction to filter design, types of digital filters,choosing between, fir and iir filters, filter design steps, effect of finite register length in filter design, realization of iir digital filters and fir digital filter, design of iir filters from continuous time filters, design of fir filters by windowing.

- Digital signal processors: general and special purpose digital signal processors, computer architecture for signal processing, selecting digital signal processors, architecture and programming of ADSP 2181 processor.

- Spectrum estimation: non-parametric methods correlation method, co-variance estimator, performance analysis of estimators, consistent estimators, ar, ma, ARMA signal modeling parameter estimation using Yule-walker method.

- Linear estimation and predication: maximum likelihood criterion efficiency of estimator, least mean squared error criterion, recursive estimators, and linear predications.

- Multirate digital signal processing: Mathematical description of change of sampling rate, interpolation and decimation, continuous time model, direct digital domain approach, interpolation and decimation by an integer factor, single and multistage realization, applications of sub band coding.

- Adaptive Filters: Applications Of Adaptive Filters, Adaptive Direct Form FIR Filters: The LMS Algorithm, Adaptive Lattice Ladder Filters, Recursive Least Squares Lattice Ladder Algorithms.

Books

1. Monson H.Hayes, " Statistical Digital Signal Processing and Modeling ", John Wiley and Sons, Inc., New York, 1996
2. Emmanuel C.Ifeachor Barrie W.Jervis, “Digital Signal Processing”, Pearson
3. Education Asia
4. Proakes Manolakis ,” Digital Signal Processing principles, algorithms, and
5. applications”, Prentice Hall India
6. ADSP 2181 manuals
7. Keshab K. Parhi, ” VLSI DSP Systems; Design & implementation” , Wiley
8. InterScience Publishers
9. John G. Proakis, Charles M. Rader, Fuyun Ling, Chrysostomos L. Nikias, Marc
10. Moonen, Ian k. Proudler, ” Algorithms for statistical signal processing”, Pearson
11. Education Asia

MTET 204 PHYSICAL DESIGN OF ELECTRONIC EQUIPMENT

- **CONTROL PANEL LAYOUT**

Types of controls, Design and Organization of control Panel, Engineering Considerations, Layout of components, Control Mountings.

- **COMPUTER AIDED PHYSICAL DESIGN**

Sources of New Ideas, Creativity Techniques, Elements of Aesthetics, Form, Shape, Color, Graphics, Balance, Harmony

- **ERGONOMICS**

Application of ergonomics in Design, Man machine interface, Ergonomics and Aesthetics consideration for development of control panel

- **PACKAGING**

Standardization and modulation, Design considerations for interconnection, Types of interconnections, Wires, cables, connector, Treatment of Vibration.

- **THERMAL**

Thermal management of electronic equipment, Thermal design considerations, Component level, board level, system level, Fans and system operating characteristics, Heat Sink design.

- **MATERIALS**

Selection of Materials, Sheet metals and plastic, processes and surface finishing

BOOK:

1. Scott A.W., Cooling of Electronic Equipment (Text)

REFERENCES:

1. Ergonomics at work, David J. Oborne, Pub. Wiley (Text)
2. SAMEER Notes on Product Design, Thermal Design
3. Product Design of Electronic Equipment, SAMEER
4. SAMEER Notes on Ergonomics and Human Interface
5. Pradeep Yammiyavar, CEDT Lecture Module series on control Panel, Ergonomics and Form design for electronic equipments
6. Workshop on Product Design, Lozarou
7. Workshop on Product design, Ayyaswamy

MTET 205 ADVANCED MICROCONTROLLERS

- The PIC18 Microcontrollers: History and Features
- PIC18 Architecture & Assembly Language Programming
- Branch, Call, and Time Delay Loop
- PIC18 I/O Port Programming
- Arithmetic, Logic Instructions and Programs
- Bank Switching, Table Processing, Macros, and Modules
- PIC18 Programming in C
- PIC18 Hardware Connection and ROM Loaders

- PIC18 Timer Programming in Assembly and C
- PIC18 Serial Port Programming in Assembly and C
- Interrupt Programming in Assembly and C
- LCD and Keyboard Interfacing
- ADC, DAC, and Sensor Interfacing
- SPI Protocol and DS1306 RTC Interfacing
- Motor Control: Relay, PWM, DC, and Stepper Motors
- Introduction to ARM and AVR 8515 microcontroller: Architecture and Programming in assembly and C.

MTET 206 ADVANCED MICROCONTROLLERS LAB

- Simple programs for sorting a list of numbers in ascending and descending order.
- Sorting a list without destroying the original list.
- Code conversion - Binary to Gray/Gray to Binary.
- Program for addition of BCD numbers.
- Interface an LED array and 7-segment display
- Interfacing of PIC18 with LCD
- Interfacing of PIC18 with Keyboard Interfacing
- Interfacing of PIC18 withADC, DAC
- Interfacing of PIC18 with temperature Sensor
- Interfacing of PIC18 with DS1306 RTC
- Interfacing of PIC18 with DC Motor Control
- Interfacing of PIC18 with Stepper Motors

MTET 207 DIGITAL SIGNAL PROCESSING LAB

- Filter implantation using MATLAB
- Powering up and programming the DSP kit; Familiarization with Hardware & Software.
- Accessing memory mapped registers and non memory mapped registers of TI DSP
- Programming the DSP timer in C
- FFT implantation using DSP kit

- Digital filter design using DSP kit
- Implementation of adaptive filters using DSP kit

M. Tech Electronic Product Design & Technology

SEM 3								
Course Code	Course Title	Load Allocation				Marks Distribution		
		L	T	P	Total	Internal	External	Total
MTED 301	Electronic Instrumentation Technology	3	1	0	4	50	100	150
MTED 302	System On Chip	3	1	0	4	50	100	150
MTET 301	Sensor Technology and MEMS	3	1	0	4	50	50	150
MTED 304	ThesisSeminar*	0	0	10	10	50	100	150
Grand total		6	2	10	18	150	300	600

SEM 4					
Subject Code	Subject	Schedule of Teaching			
		L	T	P	Total
MTET 401	Thesis*	0	0	28	28

* The students will complete their Thesis work and submit copies of the Thesis report to the University as per its existing procedures. The Internal and External Examiners appointed by the University will evaluate the same through a Viva-voce examination and award **Distinction / Pass / Fail** to the Thesis.

MTED 301 ELECTRONIC INSTRUMENTATION TECHNOLOGY

- **OVERVIEW**

This module covers modern sensors and advanced measurement systems for a diverse range of applications. The students are familiarized with various sensors and sensor technologies, data acquisition and display technologies, so as to enable them to make optimal decisions in product design. Several advanced cutting edge instrumentation technologies like sensor networks, sensor fusion, advanced display technologies, etc. are covered from design and applications point of view.

- **MEASUREMENT TERMINOLOGY**:

Input and output, range, accuracy, precision, resolution, sensitivity, linearity, repeatability, reproducibility, calibration and traceability, Testing, quality assurance and safety.

- **TRANSDUCERSANDSENSORS**.

Sensors and transducers: Temperature sensors, resistive sensors, capacitive sensors, electrostatic sensors, piezoelectric sensors, ultrasonic sensors, radiological sensors and MEMS. Optical sensing techniques: Common electromagnetic sensors, IR sensors, passive

IR sensors, photo-resistive sensors, photovoltaic sensors, photodiodes, photoelectric detectors, solid state lasers. CCD and CMOS sensors.

- **DATA ACQUISITION :**

Signal conditioning: concepts, amplifiers and filters. Analog to digital conversion. Systems and considerations in Analog and digital data acquisition systems. multiplexers / de-multiplexers. Concepts of signal Transmission and telemetry. System interfacing : serial and parallel interfacing. OSI network model. Interfacing standards- UART (RS232), USB, RS485, GPIB, Ethernet and Fieldbus.

- **DISPLAY SYSTEMS**

Recorders and data loggers. Indicating instruments. Digital display methods and devices: segmental displays, Dot matrix, LED, LCD, projection devices, CRT .

- **EMERGING TOPICS:**

Introduction to sensor networks, sensor fusion, soft and intelligent sensors. System on module. Virtual instrumentation. Intelligent instrumentation. Fault tolerance.

Real time systems : introduction, reference model, scheduling approaches. Real time operating systems.

BOOKS:

1. Measurement systems - Application and design by Ernest O. Doebelin , McGraw-Hill.

2. Electronic instruments and instrumentation technology by MMS Anand, Prentice-Hall, India.

3. Electrical and electronic measurements and instrumentation, by AK Sawhney and Puneet Sawhney, Dhanpat Rai & Sons.

MTED 302 SYSTEM ON CHIP (SOC)

- System on Chip Technology Challenges
- System On a Chip (SOC) components.
- SoC Design Methodology
- Parameterized Systems-on-a-Chip
- System-on-a-chip Peripheral Cores
- SoC and interconnect centric Architectures
- System level design representations and modeling languages.
- Target architecture models.
- Intra-chip communication.
- Graph partitioning algorithms.
- Task time measurement.
- Interconnect latency modeling.
- Back annotation of lower level timing to high-level models.
- Synthesis of SOC components.
- System Level, Block Level and Hardware/Software Co-verification
- SOC components: emulation, co-simulation, Physical Verification.

BOOKS/REFERENCES

- Wayone Wolf," Modern VLSI Design: SOC Design"
- Prakash Rashnikar, Peter Paterson, Lenna Singh" System-On-A-Chip Verification methodlogy & Techniques", Kluwer Academic Publishers.
- Alberto Sangiovanni Vincentelli," Surviving the SOC Revolution: A Guide to Platformbased Design", Kluwer Academic Publishers.

MTET 301 SENSOR TECHNOLOGIES AND MEMS

- Sensors types and classification – mechanical, acoustic, magnetic, thermal,
- chemical, radiation and biosensors.
- Microsensors.
- Sensors based on surface-acoustic wave devices.
- Micromachining techniques
- MEMS for automative, communication and signal processing applications.
- Modeling and simulation of microsensors and actuators.
- Sensors and smart structures.
- Micro-opto-electro-mechanical sensors and system.

Text /References

Ristic L (ed), "Sensor Technology and Devices", Artech House, London, 1994.
Sze S.M. (ed), "Semiconductor Sensors", John Wiley, New York, 1994 Wise K.D. (Guest Editor) "Integrated Sensors, Microp-actuators and micro-systems (MEMS)", Special Issue of proceedings of IEEE, Vol. 86, No.8, August 1998.