SAURASHTRA UNIVERSITY , RAJKOT
TEACHING AND EXAMINATION SCHEME FOR
B.E. SEM VII (Electronics & Communication Engg.)

Code No.	Subject	Teaching		Examination Scheme				
		Lect.	Pra.	Theory	Paper Hrs.	Prac/ Oral	Term Work	Total
701	Micro controller & Applications	4	2	100	3	50	25	175
702	VLSI Technology	4	2	100	3	50	25	175
703	Digital Communication Networks.	4	2	100	3	50	25	175
704	Digital Signal Processing	4	2	100	3	50	25	175
705	Elective – I	4	2	100	3	50	25	175
706	Project Part – I	-	2	-	-	50	25	75
	Total	20	12	500	-	300	150	950

Note:- For Project – I

The students are required to select a project, finalize it and prepare a synopsis of the same and it should be submitted at the end of the term, however this being a preliminary work for sem 8th project.

- **Elective – I :**

1) **Industrial Electronics**
2) **Digital Computer Organization**
3) **Radar & Navigation Aids.**
4) **Advanced Instrumentation Systems.**

SAURASHTRA UNIVERSITY, RAJKOT
B.E.SEMESTER-VII (E.C.)
701: Micro controller & Its Applications

THEORY SCHEME		EXAMINATION SCHEME				
THEORY Hours	PRACTICAL Hours	THOERY Marks	PAPER Hours	PRACTICAL/ORAL Marks	TERMWORK Marks	TOTAL Marks
04	02	100	03	50	25	175

1. **Microprocessors & microcontrollers :**

   Comparison between Microprocessor & Microcontrollers, Four bit, Eight bit & Sixteen bit & Thirty two bit microcontrollers comparison.

2. **8051 architecture :**

   Introduction, 8051 Pin out & features, the internal architecture, Programming module, Memory organization, 8051 oscillator & clock, Stack & Stack Pointer, Various Special function registers, I/O port & circuits, counters & timers, Serial I/Os, Interrupts, Interfacing of 8051 with external RAM & ROM.

3. **Microcontroller design :**

   Specification of Microcontroller, External memory & Space decoding, reset & clock circuits, Expanding I/Os, memory address decoding, Timing Subroutines time delays, Pure software time delay, software polled timers, Pure hardware delay, serial data transmission & reception, Look- up tables for 8051, PC as base address, DPTR as base address.

4. **Application of Micro controller**

   Application of Micro controllers in different fields like keyboard, display, D/A & A/D conversion etc…

5. **Introduction of different micro controllers like ATMEL, 8096, Philips, Dallas, etc…**

6. **Basic Assembly language Programming Concepts :**

Instruction Set of 8051, Addressing Modes, Data transfer group, Logical group, Arithmetic group, Branch group

Introduction to Assembler & Simulator

Programming using Instructions & Simulator

Reference Books :

1) The 8051 Micro controller architecture, programming & Application - **Kenneth J. Ayla** (PRI)
2) Programming & Customizing the 8051 Microcomputer - **Myke Predko** (TMH)
3) The concepts & features of Micro controller – **Raj Kamal** (Wheeler Publishing)
4) Advanced Microprocessor & interfacing – **B. Ram** (TMH)

SAURASHTRA UNIVERSITY, RAJKOT
B.E.SEMESTER-VII (E.C.)
702 : VLSI Technology

THEORY SCHEME		EXAMINATION SCHEME				
THEORY Hours	PRACTICAL Hours	THOERY Marks	PAPER Hours	PRACTICAL/ORAL Marks	TERMWORK Marks	TOTAL Marks
4	2	100	3	50	25	175

1. INTRODUCTION:

Historical Perspective, Overview of VLSI Design Methodologies, VLSI Design Flow, Design Hierarchy, Concepts of Regularity, Modularity, and Locality, VLSI Design Styles, Design Quality, Packaging Technology, CAD Technology.

2. FABRICATION OF MOSFETs:

Introduction, Fabrication process Flow, The C-MOS n-well Process, Layout Design Rules, Full-Custom Mask Layout Design.

3. MOS TRANSISTOR:

The MOS Structure, The MOS system under External Bias, Structure and Operation of MOSFET, MOSFET V-I Characteristics, MOSFET Scaling and Small Geometry Effects, MOSFET Capacitances.

4. MOS INVERTERS:

Introduction, Resistive Load Inverter, Inverter with n-type MOSFET Load, CMOS Inverter, Delay-Time Definitions, Calculation of Delay Times, Inverter Design with delay constraints, Estimation of Interconnect Parasitic, Calculation of Interconnect Delay, Switching Power Dissipation of CMOS Inverters.

5. COMBINATIONAL MOS LOGIC CIRCUITS:

Introduction, MOS Logic Circuits with Depletion NMOS loads, CMOS Logic Circuits, Complex Logic Circuits, CMOS Transmission Gates.

6. DYNAMIC LOGIC CIRCUITS:

Introduction, Basic Principles of Pass Transistor Circuits, Voltage Bootstrapping, Synchronous Dynamic Circuits Techniques, Dynamic CMOS Circuit Techniques, High Performance dynamic CMOS Circuits.

7. LOW-POWER CMOS LOGIC CIRCUITS:

Introduction, Overview of Power Consumption, Low Power Design through voltage scaling, Estimation and Optimization of Switching Activity, Reduction of Switched Capacitance, Adiabatic Logic Circuits.

8. DESIGN FOR MANUFACTURABILITY:

Introduction, Process Variations, Basic Concepts and Definitions, Design of Experiments and Performance Modeling, Parametric Yield Estimation, Parametric Yield Estimation, Worst Case Analysis, Performance Variability Minimization.

9. DESIGN FOR TESTABILITY:

Introduction, Faults Types and Models, Controllability and Observability, Ad Hoc Testable Design Techniques, Scan-Based Techniques, Built-In-Test techniques, Current Monitoring I_{DDQ} Test.

10. FINITE STATE MACHINES:

Moore and Mealey machines synchronous controllers, Timing consideration, Control using PLA/EPROM/CPLD and FPGA.

11. Architecture of CPLD and FPGA

12. VHDL PROGRAMMING

Reference Books :

1. CMOS Digital Integrated Circuits Analysis and Design (Third Edition) - **Sung. Mo. Kang. & Yusuf Lablebici** (TMH)
2. VHLD Primer - **J. Bhasker** (Pearson)
3. VHDL - **Douglas Perry** (MGH)

SAURASHTRA UNIVERSITY, RAJKOT
B.E.SEMESTER-VII (E.C.)
703: Digital Communication Networks

THEORY SCHEME		EXAMINATION SCHEME				
THEORY Hours	PRACTICAL Hours	THOERY Marks	PAPER Hours	PRACTICAL/ORAL Marks	TERMWORK Marks	TOTAL Marks
4	2	100	3	50	25	175

1. Introduction :

Approaches to network design, network functions and network topology, Message, packet and Circuit switching, Telephone, telegraph networks and INTERNET, Discussion on switching approaches. Protocols and standards, Standards organization.

2. Layer Architecture :

OSI reference model, TCP/IP architecture, Berkeley API, TCP/ IP utilities.

3. Transmission systems and telephone Network :

SONET – Multiplexing and frame architecture, Wavelength Division multiplexing, Circuit switches, Space division switches, time-division switches, time-space-time switches, Telephone network, Transmission facilities, End-to-End digital services, Signalling, Signalling system # 7 architecture.

4. Peer – to – peer Protocols :

Service models, ARQ protocols, other adaptation function, Data link control, flow control protocols (Simplex, half duplex, Full duplex Sliding window protocols), Error control Codes (CRC, Hamming Codes), Framing techniques, HDLC Protocol in detail) Packet multiplexers, Statistical multiplexing, Speech interpolation and multiplexing of Packetized speech.

5. Local – Area – Networks :

LAN structure, MAC sub layer and LLC layer. Random access protocols, ALOHA, slotted ALOHA, CSMA, CSMA-CD, Scheduling approaches to medium access control, LAN standards and LAN bridges.

6. Internet Protocol (IP):

Packet – switching networks, Routing, Shortest path Algorithms, hierarchical routing, link state V/S distance vector routing, Open loop and closed – loop systems of congestive control. Repeaters, Bridges, Routers, Gateways, IP header, IP addressing & classes

7. TCP and UDP:

Internet protocol, transmission control Protocol broadcast routing and multicast routing, transport layer and quality control, Functions of transport layer, TCP protocols stack, Addressing, crash recovery, service model transmission policy, congestion control algo., Timer management

UDP: Basic concepts, Protocol and application.

8. Network Security :

Security protocol and Cryptographic algorithms.

9. Application layer protocols (DNS, SNMP, E-MAIL, WWW, E-NEWS.)

REFERENCE BOOKS :

1. Communication network - **Andrew Tanenbaum.** (PHI)
2. Data communication & network - **Benrouz Forouzan.** (TMH)
3. Communication network – **Alberto - Ieon – Gorcia.** (TMH)

SAURASHTRA UNIVERSITY, RAJKOT
B.E. SEMESTER - VII (E.C.)
704 :Digital Signal Processing

THEORY SCHEME		EXAMINATION SCHEME				
THEORY Hours	PRACTICAL Hours	THOERY Marks	PAPER Hours	PRACTICAL/ORAL Marks	TERMWORK Marks	TOTAL Marks
4	2	100	3	50	25	175

1. **Introduction :**

   Classification of signals, Basic operations on signals, Elementary signals, Properties of systems, Properties of the impulse response representation for LTI systems, Differential & Difference equation representation for LTI system, Block diagram representations, State variable descriptions for LTI systems.

2. **The Z- Transform**

   Introduction, The Z - transforms, Properties of the ROC, Properties the Z transform. Inversion Z- transform, Transform analysis of LTI systems, Computational structures for implementing discrete time systems,

3. **Fourier representations for signals.**

   Introduction, Discrete time periodic signals, Continuous time periodic signals, Discrete time non-periodic signals, Continuous time non-periodic signals, Properties of Fourier representations.

4. **DFT and FFT**

   Its property & applications, Frequency domain sampling, Linear filtering methods, Frequency analysis of signals, FFT algorithms, Application of FFT algorithms, Linear filtering approaches to computation of DFT.

5. **IIR digital filter :**

Introduction, Impulse transformation, Bilinear transformation, Frequency transformation, Design digital butterworth and chebyshev filter, Design inverse chebyshev and elliptic filter, Phase modification.

6. **FIR digital filter :**

   Introduction, Windowing techniques (ALL), Frequency sampling technique.

7. **Effect of finite word length in digital filters.**

   Rounding & Truncation error, Quantization effects in A/D conversion, Output noise power from a digital coefficient quantization effects in direct form realization of IIR / IIR filters, Multi Rate signal processing.

8. **Application of DSP :**

   Speech processing, Image processing, Radar signal processing.

REFERENCES BOOKS :-

1. Digital signal processing - **John G. Proakis (PHI).**
2. Introduction to digital signal processing **-** **Johnny r. Johnson (PHI).**
3. Digital signal processing **-** **Oppenheim & Schafer (PHI).**
4. DSP - **S. Salivahanan (TMH).**
5. Signals and systems - **Haykin & veen John wiley & sons**.
6. Signals & linear systems - **Gabel & Roberts, John wiley & sons.**
7. Signals & systems - **Oppenheim, (PHI).**
8. Signals & system - **Husain**, **(Umesh publication).**
9. Signals and Systems - **Sanjay Shama** (**S.K.K & Sons).**

SAURASHTRA UNIVERSITY, RAJKOT
B.E.SEMESTER-VII (E.C.)

705 : Industrial Electronics (Elective –I)

THEORY SCHEME		EXAMINATION SCHEME				
THEORY Hours	PRACTICAL Hours	THOERY Marks	PAPER Hours	PRACTICAL/ORAL Marks	TERMWORK Marks	TOTAL Marks
4	2	100	3	50	25	175

1. Thyristor Controlled D.C. Drives:

Single – Phase Drives, Single –Phase Series D.C. Motor Drives, Three-Phase Drives, Dual Converters, Reversible Drives, Speed Regulation by Armature Current Control, Speed Regulation by Armature Voltage Control, Speed Regulation of D.C. Series and Shunt Motor, VDR method of speed regulation of shunt motor with change in supply voltage, D.C. chopper Speed control, Brushless Drives.

2. Thyristor Controlled A.C. Drives :

Induction Motor : Various Schemes of speed control & Constant frequency operation, Variable frequency operation, Operation on Non-sinusoidal voltage source, Speed control by Choppers, Synchronous Motor Control, Comparison between a.c. and d.c. drives, Choice between A.C. and D.C. Drives.

3 Synchronous Motor Drives :

Introduction, Basic principles of Synchronous Motor Operation, Synchronous Servomotor Drives with Sinusoidal Waveforms, Synchronous Servomotor Drives with Trapezoidal Waveforms, Load- Commutated Inverter Drives, Cycloconverters.

3. **Resistance Welding :**

Resistance welding, Digital weld control timer, Types of resistance welding, Electronics control in resistance welding, Ignitron contractor, Heat control, Non-synchronous timer, Synchronous weld timer, Sequence timer, Energy-Storage Welding Systems.

4. R.F. Heating :

Wave-forms in class–C Amplifier, Analysis of class–C Amplifier, Power Relations, Resonant- load circuit, Neutralization circuit for triode tuned power Amplifiers, Oscillator Frequencies, Induction Heating, Application of Induction Heating, High-frequency power source for induction heating, Dielectric Heating, Electrical Problems in Dielectric Heating, Electrodes used in Dielectric Heating, Thermal losses in Dielectric Heating, Power calculations, Application of dielectric heating, Resistance heating, Skin effect, depth of penetration, Calculation for heat control, Design of resistance heating elements, Power required for rapid heating, Application of induction heating.

5. **Ultrasonics and X-rays:**

   Generation of Ultrasonic waves, Applications of Ultrasonics, Production of X-rays, Properties of X-rays, Minimum wavelength by an X-ray tube, Bagg's X-ray spectrometer, Practical application of X-Rays.

6. **Industrial Robotic Systems:**

   Parts of Robotic Systems, Classification of Robotic Systems, Robotic System Configurations, Degrees of Freedom of a Robotic System, Programming Robotic Systems, Motions of Robotic Systems, Sensor for Robotic systems, Mechanical Parts of Industrial Robots, Control System for Industrial Robots.

7. **Industrial Applications :**

   HVDC Transmission, Static Var Compensators. Battery Charger, Temperature control circuits, CVTs (Constant Voltage Transformer), High frequency electronic ballast.

Reference Books :

1. Industrial and Power Electronics. - **Harish C. Rai – (**Umesh Pub.)
2. Thyristor Engineering - **M. S. Berde** (Khanna Pub.)
3. Electronics Machines, Drives and Power systems.- **Theodore Wildi** (Pearson Edu.)
4. Thyristors & Their Appl. – **M Ramamoorty** (Affiliated East-West Press Pvt.Ltd
5. Power Electronics and Solidstate Drives. – **Dr. M.N.Bandopadhyay** (Khanna Pub.)
6. Power Electronics, Circuits, Devices & Application – **Rashid** (PHI)
7. Industrial Electronics – **S.N. Biswas** (Dhanpat Rai & Co.)
8. Power Electronics converter, Application and design – **Mohan/Undeland/Robbins** (John Wiley & Sons(Asia) Pvt Ltd.)
9. Power Electronics Systems, Theory and Design – **Jai P. Agrawal** (Pearson Edu.)

SAURASHTRA UNIVERSITY, RAJKOT
B.E.SEMESTER-VII (E.C.)

705 : Radar & Navigation Aids (Elective –I)

THEORY SCHEME		EXAMINATION SCHEME				
THEORY Hours	PRACTICAL Hours	THOERY Marks	PAPER Hours	PRACTICAL/ORAL Marks	TERMWORK Marks	TOTAL Marks
4	2	100	3	50	25	175

1. Navigation :

Introduction, Navigation Parameters, Types of Navigational Aits.

2. Principles of Radar :

Introduction, Radar Equation, Radar frequencies, Radar Set, Radar Applications, Receiver Noise, Signal to Noise Ratio, Transmitter Power, Pulse Repetition Frequency, Pulse Duration, Propagation Effects, Scanning Radars, Tracking Radars, Lobe Switching, Conical Scan, Monopulse Tracking, Accuracy of radar measurements in Presence Noise.

3. Radar Transmitters and Receivers :

Introduction, The magnetron Oscillator, Klystron Amplifiers, Traveling wave Tube Amplifiers, Crossed Field Amplifiers, Modulators, Solid State Transmitters, Noise Figure of a Receiver, Mixers, Displays, Duplexers, Matched Filter Receiver, Correlation Detection, Constant False Alarm rate Receiver, Receiver Protector and Sensitivity time control.

4. **MTI Radar :**

Introduction, Operation of MTI Radar, MTI Receiver with Delay Line Canceler, Multiple or Staggered Pulse Repetition Frequencies, Range-gated Dopper Filters, Digital Signal Processing, MTI from a Moving Platform, Limitations of MTI Performance Solved Problems.

5. Modern Radars :

Introduction to Pulse-Doppler radar, Block Diagram, Detection of Multiple Target Moving with Different Velocities, Coherent Integration, Applications, Advantages of Pulse Doppler Radar, Introduction to Frequency Coded radars, Block diagram, Discrete frequency Waveform coding, Side lobe Reduction by weighted

Amplitude of the frequency Coded waveform, Matched Filter realization of Pulse compression, Waveform Analysis of a Linear Stepped Frequency Pulse, Applications of Frequency coded radars, Introduction to phase coded radars, Phase coding and Decoding, block diagram of Phase coded CW radar, decoders, Cross Correlator and Tracker, Range Trackers, Comparison of Phase-code and linear FM pulse Compressions, Introduction to millimeter wave radars, propagation of millimeter wave radar, Military radars, Anti-aircraft Weapons Systems, Missile Guidance and seeker Systems, Beam Rider, Missile Seeker, Configurations of Missile Seeker Sensors, FM-CW Sensor, Power Sources for Millimeter Wave Radars, Jamming and Anti-jamming Techniques, Electronic Counter measures, Electronic Counter Counter measures, Reapeater jamming and ECCM.

6. Navigational and Remote Sensing Radars :

Introduction, Airport radars, Meteorological radar(MET radar), Airborne radars, Doppler Navigation, Doppler Navigation Equipment, Distance Measuring Equipment, Navy radar, remote sensing radars, Pattern Synthesis, Phased Array, Remote sensing of the earth and its Atmosphere at microwaves, CW Radar, Imaging Radar, Monopulse radar Imaging, Multi Function Array Radar (MFAR).

7. Satellite Navigation :

Introduction, Doppler Navigation, Global Positioning System, Principles of Operation of GPS Navigation, GPS Segments, Format of GPS Navigation Message, GPS Data subframe, Sources of Errors in GPS, Differential Global Positioning System (DGPS), DGPS configurations, Application of GPS and DGPS, GPS Receivers.

Reference Books :

1. Radar Systems and Radio Aida to Navigation **– Dr. A. K. Sen & Dr. A. B. Bhattacharya – (**Khanna Publications)
2. Microwave and Radar Principles & Applicaitons**– A. K. Maini –** (Khanna Publications.)
3. Microwave and Radar Engineering**– M. Kulkarni -** (Umesh Publications)
4. Microwave Engineering **– Sharma & Sharma - (**Satya Prakashan)
5. RADAR Principles, Techniques & Applications **– Byron Edde – (**Pearson Edu.)

SAURASHTRA UNIVERSITY, RAJKOT
B.E.SEMESTER-VII (E.C.)

705 : Digital Computer Organization (Elective –I)

THEORY SCHEME		EXAMINATION SCHEME				
THEORY Hours	PRACTICAL Hours	THOERY Marks	PAPER Hours	PRACTICAL/ORAL Marks	TERMWORK Marks	TOTAL Marks
4	2	100	3	50	25	175

1. **Computing and Computers;**

   The Nature of Computing, The Evolution of Computers, The VLSI Era.

2. **Design Methodology:**

   System Design, The Register Level, The Processor Level**.**

3. **Processor Basics:**

   CPU Organization, Data Representation, Instruction Sets.

4. **Datapath Design:**

   Fixed-Point Arithmetic, Arithmetic-Logic Units, Advanced Topics**.**

5. **Control Design:**

   Basic Concepts, Micro programmed Control, Pipeline Control.

6. **Memory Organization:**

   Memory Technology, Memory Systems, Caches.

7. **System Organization:**

   Communication Methods, IO and System Control, Parallel Processing.

NOTE: Detailed design is not expected only basic concepts are to be covered.

Reference Books :

1. Computer Architecture and Organization – **John P. Hayes** (McGraw – Hill)
2. Computer Organization and Architecture – **Stallings** (PHI)
3. Advanced Computer Architecture – **KAIN** (PHI)
4. Advanced Computer Architecture – **Hwang** (MGH)
5. Advanced Computer Architecture – **Dezsosima, Peterkacsuk,** (Pearson Edu.)
6. Computer Architecture & Logic Design – **Bartee** (MGH)

SAURASHTRA UNIVERSITY, RAJKOT
B.E.SEMESTER-VII (E.C.)

705 : Advanced Instrumentation Systems (Elective –I)

THEORY SCHEME		EXAMINATION SCHEME				
THEORY Hours	PRACTICAL Hours	THOERY Marks	PAPER Hours	PRACTICAL/ORAL Marks	TERMWORK Marks	TOTAL Marks
4	2	100	3	50	25	175

1. **Basic Concepts of measurement and performance characteristics of an instrumentation system**

   Introduction, Generalized measurements, zero-order systems, first order systems, second order systems, Dead time elements, Specifications and testing of dynamic response.

2. **Introduction to Transducers and Transmitters.**

   Different types of Transducers, Different types of Transmitters, 4-20 mA, 0-20 mA, 0-5 Volts, 0-10 Volts

3. **Digital Transducers**

   Digital Encoders, Linear displacement transducers, Digital Techometer, Frequency output type transducers, Other miscellaneous sensors, The signals and conversions.

4. **Microprocessor Based Instruments.**

   Introduction, Motivation, The basic structure, Programming methods, Application example.

5. **Power Plant Instruments**

   Introduction, The power plant scheme, Pressure, Temp, Flow and Level switches and controllers.

6. **Instruments for Analysis purpose.**

   Introduction, Gas and Liquid Chromatography, Nuclear Magnetic resonance spectroscopy, Electron Spin resonance spectroscopy, Mass spectroscopy

7. **Some Typical Electronics Instruments.**

   Wave Analyzer, Spectrum Analyzer, Recorders, Electron Microscope.

8. **Introduction to Data Acquisition Systems.**

9. **Application of Instruments in Bio-medical Fields.**

   X-Ray Machines, ECG, EMG, EEG.

10. **Digital Interfaces in Measurement systems.**

    Introduction, The Sampling Theorem, Quantization noise, D/A Convertors, A/D Convertors, The IEEE-485, 488 Instrumentation Bus, Serial Data Communication links, How Transmission lines affects the transfer of digital data.

Reference Books:

(1) Principles of Industrial Instruments – **D. Patranabis**-TMH

(2) Instrumentation Devices and Systems – **Rangan,Sarma,Mani** – TMH

(3) Electronics Measurements and Instrumens – **S. Ramabhadran** – Khanna

(4) Introduction to Instrumentation & Measurements – **R. B. Northrop**-CRC Press

(5) Introduction to Bio-medical Instruments- **R. S. Khanpur**

(6) Technical Data sheets for IEEE Standards

SAURASHTRA UNIVERSITY, RAJKOT
B.E.SEMESTER-VII (E.C.)

706 : Project Part - I

THEORY SCHEME		EXAMINATION SCHEME				
THEORY Hours	PRACTICAL Hours	THOERY Marks	PAPER Hours	PRACTICAL/ORAL Marks	TERMWORK Marks	TOTAL Marks
-	2	-	-	50	25	75

- The project work is a continuous work of Two semester, i.e. VII & VIII. In Semester VII the Students are supposed to carry out literature survey with regard to their project work area and represent a seminar based on it. Students are also required to submit the seminar report. The on paper design work is to be carried out simultaneously. Actual project work & testing will have to be carried out in the VIII semester.