SYLLABUS

FOR

INTEGRATED MASTER OF SCIENCE IN ELECTRONICS, COMPUTER AND INSTRUMENTATION [M.Sc. (ECI)]

A Five year Degree Course

SAURASHTRA UNIVERSITY
RAJKOT
(Effective from June 2010)

Department of Electronics
Saurashtra University Campus
Rajkot-360005
Phone No. 0281-2579006 / 7
www.saurashtrauniversity.edu

SAURASHTRA UNIVERSITY
DEPARTMENT OF ELECTRONICS
M.Sc. (ECI) SYLLABUS
SEMESTER VII TO X

SEMESTER VII	**(24 Credits)**	
Paper-25	Advance Microprocessor	**(4 Credits)**
Paper-26	Advance Instrumentation	**(4 Credits)**
Paper-27	Robotics	**(4 Credits)**
Paper-28	Fiber Optics	**(4 Credits)**
	Practicals	**(8 Credits)**
SEMESTER VIII	**(24 Credits)**	
Paper-29	Introduction to Matlab	**(4 Credits)**
Paper-30	Advance Computer Concept & Networking	**(4 Credits)**
Paper-31	JAVA: Fundamentals and Practice	**(4 Credits)**
Paper-32	VHDL: Fundamentals and Practice	**(4 Credits)**
	Practicals	**(8 Credits)**
SEMESTER IX	**(24 Credits)**	
Paper-33	LAB VIEW: An Introduction	**(4 Credits)**
Paper-34	Website Development using MYSql,PHP and html	**(4 Credits)**
Paper-35	Basic Programmable Controllers	**(4 Credits)**
Paper-36	Automobile and Automative Electronics	**(4 Credits)**
	Practicals	**(8 Credits)**
SEMESTER X	**(24 Credits)**	
Paper-37	Futuristic Electronics and Technology	**(4 Credits)**
Paper-38	Digital Signal Processing	**(4 Credits)**
Paper-39	Industrial Electronic devices	**(4 Credits)**
Paper-40	Elective Paper	**(4 Credits)**
	I:- Radar and Nevigation	
	II:- Microwave Electronics	
	III:- Bio-Medical Instrumentation	
	IV:- Electromagnetics	
	Practicals	**(8 Credits)**

M.Sc. (ECI)
Detailed Syllabus

SEMESTER VII

Paper 25: Advance Microprocessor

Credit: 04

Total marks: 100(70 External+30 Internal)

Total Hours requires: 60 Hrs.

Unit 1: 8086 and supporting chips

Features of 8086-8086 internal architecture-the execution unit-the bus interface unit-segment registers - IP register-Memory segmentation-Physical address generation – pin diagram of 8086 – Even and odd memory banks for 8086

8086 operating modes – signal descriptions of 8086 – 8086 timing diagrams – general bus operation – bus buffering and latching – special processor activities – 8284: clock generator and driver – 8282/8283: An octal latch – 8286: octal bus transceiver – 8288: Bus controller – Minimum and maximum mode block diagram and their comparison – Read, Write cycle in minimum node – HOLD response sequence – Maximum mode Read, Write cycle – Timing for RQ/GT signals

Unit 2: Memory, I/O interfacing and interrupt of 8086

Memory interfacing – generalized block schematic of memory interfacing – decoder logic using programmable array logic – address decoding techniques – interfacing EPROM and RAM – SRAM interfacing- interfacing EPROM/RAM device to 8086 using PROM – dynamic RAM – interfacing example

I/O mapped I/O, interfacing 16-bit Input/Output port – memory mapped I/O – comparing memory mapped I/O and I/O mapped I/O.

8086 interrupt structure – software interrupts – interrupt service routines – interrupt vector table (IVT) – dedicated interrupt pointers – Interrupt instruction – the operation of a real mode interrupt – hardware interrupts – interrupt procedure – priority of 8086 interrupts.

Unit 3: Addressing modes, instruction and introduction to assembly language programming

Addressing modes – instruction encoding format – segment override prefix – Data movement instruction – Arithmetic instructions – Bit manipulation instructions – program control instructions – string instructions

Introduction to assembly language programming – development of an assembly language program – program development tools – assembly language structure – structure programming

Subroutines/procedures – macros – timing and delay loops.

Unit 4: Programming examples

Average of block of N bytes – reverse the contents of block of N bytes and transfer them from source to destination – Find maximum number in array – Find the number of negative numbers in the array – checking the parity of number is odd or even – add two 3x3 matrices – Subtract two 3x3 matrices – Find the square of a number – Find the factorial of a number – Find the factorial of a number using recursive procedure – find the LCM of two number – find the GCD of two numbers – find ${}^{n}C_{r}$ of a number – find Fibonacci series of N given terms – Multiply two 16-bit signed numbers-Divide 16-bit signed numbers by a 16-bit signed numbers – Divide two BCD numbers – add two 8-bit ASCII numbers – ASCII to binary conversion – Binary to ASCII conversion – ASCII to BCD conversion – BCD to ASCII conversion – compare given strings – operation on strings – concatenate two strings using procedure – find the string length of the given string – Reverse the given string – occurrence of substring in the given string – case conversion

Recommended Book

1. Advanced microprocessor
   By: U.S.Shah
   Tech-max publication,Pune

Reference Book

1. Microcomputer systems:- The 8086/8088 family architecture, programming and design
   Liu and G.A.Gibson
   Prantice-Hall of India

PAPER 26: ADVANCE INSTRUMENTATION

Credit: 04

Total marks: 100(70 External+30 Internal)

Total Hours requires: 60 Hrs.

Unit 1: WAVE ANALYZERS, HARMONIC DISTORTION AND MEASURING INSTRUMENTS

INTRODUCTION – Basic wave analyzer – Frequency selective wave analyzer – Heterodyne wave analyzer – harmonic distortion analyzer – spectrum analyzer – digital Fourier analyzer, practical FFT spectrum analysis using a waveform processing software (ss-36)

Output power meter – Field strength meter – stroboscope – phase meter – vector impedance meter (direct reading) – Q meter – LCR Bridge – RX meters – Automatic Bridges – transistor testing – megger – analog $_{p}$H meter

Unit 2: Bridges and recorders

Wheastone's bridge – Kelvin's bridge – practical Kelvin's Double bridge – bridge controlled circuits – digital readout bridges – Microprocessor controlled bridges – AC bridges – capacitance comparison bridge – inductance comparison bridge – Maxwell's bridge – Hay's bridge – Schering's bridge – Wien's bridge Wagner's earth connection – resonance bridge – types of detectors – precautions to be taken when using a bridge

Strip chart recorder – Galvanometer meter type recorder – Null type recorder – circular chart recorder – X-Y recorder – Magnetic recorders – frequency modulation(FM) recording – recording – digital data recording – objective and requirements of recording data – Recorder selection for particular applications – recorder specification – potentiometric recorder – digital memory waveform recorder – application of strip chart recorder

Unit 3: Transducers and signal conditioning

Electrical transducer – selecting a transducer – Resistive transducer – resistive position transducer – strain gauges – resistance thermometer – thermistor – inductive transducer – differential output transducer – LVDT –pressure inductive transducer – capacitive transducer – Load cell – piezo electric transducer – photo electric transducer – photo –voltaic cell – semi conductor photo diode – the photo transistor – temperature transducers – frequency generating transducers – Reluctance pulse pick-ups – Flow measurement – mechanic flow meter – magnetic flow meter – turbine flow meter – measurement of thickness using Beth Gauge

Operational amplifier – basic instrumentation amplifier – Application of instrumentation amplifiers – chopped and modulated DC amplifier – modulators

Unit 4: Measurement set up and measurement of power

Measurement of microwave frequencies – resonant co-axial lines – cavity wavemeters – RF/UHF field strength meter – measurement of sensitivity – measurement of selectivity – intermodulation method of measuring non-linear distortion – measuring frequency response in audio amplifier – modulation – measuring frequency modulation – measuring frequency deviation with a radio receiver – measuring amplitude modulation using CRO

Requirements of dummy load – Bolometer – bolometer method for power measurement – Bolometer element – Bolometer mount – measurement of power by means of a bolometer bridge – unbalanced Bolometer Bridge – self balancing Bolometer bridge - measurement of large amount of RF power – measurement of power on a transmission line – standing wave ratio measurement – measurement of standing wave ratio using directional couplers.

Recommended Book

1. Electronic instrumentation
   By: H.S.Kalsi,
   Second edition
   Tata Mc Graw Hill

Reference Book

1. Electronic instrumentation and measurement
   By: Anand,PHI
2. Instrumentation, measurement and analysis
   By: Nikrs B C and Chaudhary K.K., TMN

Paper 27: Robotics

Credit: 04

Total marks: 100(70 External+30 Internal)

Total Hours requires: 60 Hrs.

Unit 1: Introduction to robots, robotic manipulation and basics of kinematics:

Automation-Automation and robots – History of robots – Definition of robotics – artificial intelligence and robotics – Definition of a robot – Robotic manipulators – Robot motion – Representation of robot – Robot anatomy – Robot programming – Classification of robots – Specification of the robot – Notations – Symbols – coordinate transformation .

Dot and cross products – coordinate frames-rotations – Rotation about an arbitrary axis – Homogeneous coordinates – screen transformations.

Unit 2: Kinematics: Direct and inverse

Introduction – types of robot arm kinematics – Kinematic parameters – Tool/hand/ wrist coordinate system – arm matrix and arm equation – joint type parameters – solutions of the Direct Kinematics problem – computation of arm matrix/CHCTM – Denavit – Hartemberg (D-H) Representation – Direct Kinematics of a two axis planar articulated robot arm (mini Drafter with the scale fixed) – Direct arm kinematic analysis of three axis planar articulated arm(Mini Drafter) – Direct kinematic analysis of a four axis Adept-1 SCARA robot.

Introduction of inverse kinematics – Definition of inverse kinematics – why inverse kinematics is not unique – configuration of tool – Relation between DK and IK

I.K.P. Solutions – tool configuration vector, W- tool configuration of four axis SCARA robot – tool configuration of five axis articulated robot – Inverse Kinematics of: two axis planar articulated robot, three axis planar articulated robot – four axis adept-1 SCARA robot.

Unit 3: Work space analysis and trajectory planning.

Robot work space – work space envelope – work space analysis/work envelope of a four axis adept-1 SCARA robot – work space fixtures

Path and trajectories – Types of robot motions/paths/trajectory – pick and place trajectory – continuous path motion/trajectory – controlled motion path/Trajectary – straight line motion/straight line trajectory – interpolated motion.

Unit 4: Robotics vision and robot task planning:

Introduction to robotic vision – image representation and analysis – template matching – polyhedral objects – shape analysis – segmentation – iterative processing of images – perspective transformation – camera calibration – structured illumination – image compression techniques.

Introduction to robot task planning – task planners – robot programming – uncertainty – robot motion planning techniques – Gross motion planning techniques – CS using rotation – General Voromoi Diagram(GVD) – motion Hevristics – Grasp planning – fine motion planning – compliant motion – Simulation of planner motion – polygon penetration algorithm – a task planning simulation problem.

Recommended Book

1. Fundamental of robotics
   By: T.C.Manjunath
   Nandu Printers and Publishers PVT LTD.
   Mumbai-400 071

Reference Book

1. Industrial robotics: Technology, programming and applications
   By: Mikell P. Groover, Mitchell Weiss,
   Roger N Nagel and Nicholas G.Odrey
   Mc Grow –Hill international Editions

2. Foundations of robotics: Analysis and control
   By: Tsuneo Yoshi Kawg

3. Applied Robotics: An introduction Book I and II
   By: Edwin wise
   Cengase learning (Indian edition)

4. Fundamentals of robotics: Analysis & control
   By: Robert J. Schilliny.
   Prentice- Hall of India (EEE)

Paper 28: Fiber optics

Credit: 04

Total marks: 100(70 External+30 Internal)

Total Hours requires: 60 Hrs.

Unit 1: Optical fiber waveguides

Ray theory transmission-Electromagnetic theory for optical propagation – cylindrical fiber – single mode fibers

Unit 2: Transmission characteristics of optical fibers

Introduction-Attenuation – Material absorption losses in silica glass fibers – linear scattering losses – non-linear scattering losses – fiber bend loss – mid infrared and far infrared transmission – dispersion – intra modal dispersion – inter modal dispersion – overall fiber dispersion – dispersion modified single – node fibers – polarization – Non-linear phenomenon

Unit 3: Fiber, cables, joint and couplers

Preparation of optical fiber – liquid – phase techniques – vapor phase deposition techniques – Fluoride glass fibers – optical fibers – optical fiber cables – stability of the fiber transmission characteristics – cable design

Fiber alignment and joint loss – Fiber splices - fiber connector – Expanded beam connectors – fiber couplers

Unit 4: Optical fiber measurements

Fiber attenuation measurements – fiber dispersion measurements – fiber refractive index profile measurements – fiber cutoff wavelength measurements – fiber numerical aperture measurements – fiber diameter measurement – mode field diameter for single mode fiber – reflectance and optical return loss – field measurements

Recommended Book

1. Optical fiber communications : Principles and practice
   By: John M.Senior
   Pearson Education
   Low price-second edition.

Reference Book

1. Fiber optics through experiments

   Edition by : M.R.Shenoy, Sunil K Khijwania

   Ajay Ghatak, Bishnu P Pal

   Second edition
   Publisher: Viva Books Pvt Ltd,
   New Delhi
2. Fiber optical communication
   By: D C Agarwal
   S.Chand & Co.

3. An introduction to optical fiber
   By: Allen H. cherin

4. Optical fiber communication
   By: Cerd Keiser.