

**Indira Gandhi University, Meerpur, Rewari**  
**SCHEME OF STUDIES AND EXAMINATION**  
**B.TECH. (Electronics and Communication Engineering)**  
**SEMESTER 5<sup>th</sup> and 6<sup>th</sup>**



**Scheme effective from 2019-20**

**INDIRA GANDHI UNIVERSITY, MEERPUR, REWARI**  
**SCHEME OF STUDIES AND EXAMINATION**  
**BTech. III YEAR (ELECTRONICS & COMMUNICATION ENGINEERING)**  
**SEMESTER V**

Course No.	Course Title	Teaching Schedule				Marks of Class Work	Examination		Total Marks	Duration of Exam
		L	T	P	Total		Theory	Practical		
EE-301	COMMUNICATION Engg.	3	1	-	4	50	100	-	150	3
EE-303	ELECTRONIC MEASUREMENT & INSTRUMENTATION (EL,EI,IC,EE,EEE,AEI)	3	1	-	4	50	100	-	150	3
EE-305	ANALOG ELECTRONIC CIRCUITS (EL,EI,IC,EE,EEE,AEI)	3	1	-	4	50	100	-	150	3
EE-307	ANTENNAS,WAVE PROPAGATION& TV Engg.	3	1	-	4	50	100	-	150	3
CSE-210	COMPUTER ARCHITECTURE AND ORGANISATION (EL,EI, IC, Common with IV sem. CSE, IT )	3	1	-	4	50	100	-	150	3
EE-309	MICROPROCESSORS AND INTERFACING (EL,EI,IC,CSE,IT,EEE,AEI)	3	1	-	4	50	100	-	150	3
EE-323	ELECTRONIC MEASUREMENT & INSTRUMENTATION LAB (EL,EI,IC,EE)	-	-	2	2	25	-	25	50	3
EE-325	ANALOG ELECTRONIC CIRCUITS LAB (EL,EI,IC)	-	-	2	2	25	-	25	50	3
EE-329	MICROPROCESSORS AND INTERFACING LAB (EL,EI,IC,CSE,IT,EEE,AEI)	-	-	2	2	25	-	25	50	3
EE-335	PRACTICAL TRAINING		-	2	2		-			
GPECE301	GERNERAL PROFICIENCY					50			50	3
	<b>TOTAL</b>	<b>18</b>	<b>6</b>	<b>8</b>	<b>32</b>	<b>425</b>	<b>600</b>	<b>75</b>	<b>1100</b>	

**Note:**

- 1) Students will be allowed to use non-programmable scientific calculator. However, sharing of calculator will not be permitted in the examination.
- 2) Assessment of Practical Training-I, undergone at the end of IV semester, will be based on seminar, viva-voce, report and certificate of practical training obtained by the student from the industry. According to performance letter grades A, B, C, F are to be awarded. A student who is awarded 'F' grade is required to repeat Practical Training.

**EE-301**

**COMMUNICATION ENGINEERING**

**L T P**

**3 1 -**

Theory : 100 Marks

Class work : 50 Marks

Total : 150 Marks

Duration of Exam : 3 Hours

**NOTE: For setting up the question paper, Question No. 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.**

**Section-A**

**SPECTRAL ANALYSIS :**

Fourier Series, Fourier transforms, Convolution Theorem, Correlation, Cross-Correlation and autocorrelation.

**Section-B**

**INFORMATION THEORY :**

Introduction to information and entropy, channel capacity for discrete and continuous channels, Shannon's Theorem, Shannon-Hartley Theorem, Noisy channels, coding theory : Shannon's coding, minimum redundancy coding, maximization of entropy of a continuous message transmission rate, effect of medium on the information, selection of channels, effect of noise and its minimization.

**Section-C**

**RANDOM SIGNAL THEORY :**

Representation of random signals, concept of probability, probability of joint occurrence, conditional probability, discrete probability theory, continuous random variables, probability distribution function, probability density function, joint probability density functions.

**Section-D**

**RANDOM SIGNAL THEORY :**

Statistical average and moments, Ergodic processes, correlation Function, power spectral density, central limit theory, response of linear system to random signals. Error function  
Covariance relation among the spectral densities of the two input-output random processes. Cross spectral densities, optimum filters. Introduction to Linear Block Code and cyclic Codes

**TEXT BOOK :**

1. Principles of Communication Systems : Taub Schilling; TMH

**REFERENCE BOOKS.**

1. Communication Systems : Singh and Sapre ; TMH

2. Communication Systems : A Bruce Carlson; TMH

**EE-303**

**L T P**

**3 1 -**

**ELECTRONIC MEASUREMENT AND INSTRUMENTATION**

Theory : 100 Marks

Class work : 50 Marks

Total : 150 Marks

Duration of Exam : 3 Hours

**NOTE:** For setting up the question paper, Question No. 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

**Section-A**

**OSCILLOSCOPE:**

Block diagram, study of various stages in brief, high frequency CRO considerations  
measurement of phase & frequency, electrostatic deflection, dual trace & dual beam oscilloscope  
Sampling and storage oscilloscope  
.

**Section-B**

**ELECTRONIC INSTRUMENTS:**

Instruments for measurement of voltage, current & other circuit parameters, Q-meters,  
R.F. power measurements,  
introduction to digital meter, chopper amplifier type voltmeter, true RMS voltmeter, electronic  
multimeter

**Section-C**

**GENERATION & ANALYSIS OF WAVEFORMS:**

Block diagram of pulse generators, signal generators, function generators wave analysers,  
distortion analysers,  
spectrum analyser, Harmonic analyser, FFT analyser

**FREQUENCY & TIME MEASUREMENT:**

Study of decade counting Assembly (DCA), frequency measurements, period measurements,  
universal counter,

**Section-D**

**TRANSDUCERS & SIGNAL CONDITIONING:**

Classification, Transducers of types: RLC photocell, thermocouples etc. basic schemes of  
measurement of displacement, velocity, acceleration, strain, pressure, liquid level &  
temperature.

DC signal conditioning system, AC signal conditioning system, data acquisition and conversion  
system

**TEXT BOOK:**

1. A course in Electrical & Electronics Measurements & Instrumentation : A.K.Sawhney; Dhanpat Rai &  
Sons.

**REFERENCE BOOKS.**

1. Electronics Instrumentation & Measurement Techniques : Cooper; PHI.

L T P  
3 1 -

Theory : 100 Marks  
Class work : 50 Marks  
Total : 150 Marks  
Duration of Exam : 3 Hours

**NOTE:** For setting up the question paper, Question No. 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

#### **Section-A**

##### **SINGLE AND MULTISTAGE AMPLIFIERS:**

Classification of amplifiers, distortion in amplifiers, frequency response of an amplifier, step response of an amplifier, pass-band of cascaded stages, RC-coupled amplifier, low frequency response of RC coupled stage, effect of an emitter bypass capacitor on low Frequency response, multistage CE amplifier . **FEEDBACK AMPLIFIERS :**

Feedback concept, transfer gain with feedback, general characteristics of negative feedback amplifiers, input resistance, output resistance, voltage series feedback, current series feedback, current shunt feedback, voltage shunt feedback.

#### **Section-B**

##### **OSCILLATORS:**

Sinusoidal oscillators, Barkhausen criteria, R-C phase shift oscillator, general form of oscillator circuit, wien-bridge oscillator, crystal oscillator.

#### **Section-C**

##### **POWER AMPLIFIERS:**

Class A, B, and C operations; Class A large signal amplifiers, higher order harmonic distortion, efficiency, transformer coupled power amplifier, class B amplifier : efficiency & distortion; class A and class B push-pull amplifiers; class C power amplifier.

##### **OPERATIONAL AMPLIFIERS :**

Ideal and practical operational amplifiers, inverting and non-inverting amplifier, differential amplifier, emitter coupled differential amplifier, transfer characteristics of a differential amplifier, offset error : voltage and current, common mode rejection ratio (CMRR) .

#### **Section-D**

##### **LINEAR APPLICATIONS OF OPERATIONAL AMPLIFIERS :**

Scale changer, phase shifter, adder, voltage to current converter, current to voltage converter, DC voltage follower, Bridge amplifier, AC coupled amplifier, AC voltage follower, Integrator, differentiator.

#### NON-LINEAR APPLICATIONS OF OPERATIONAL AMPLIFIERS :

Comparators, sample & hold circuits, Logarithmic amplifier, anti-log amplifier, logarithmic multiplier, waveform generators , Miller & Bootstrap sweep generators, regenerative comparator (Schmitt Trigger), multivibrators, ADC.

#### TEXT BOOK:

1. Agarwal - Foundations & Analog & digital electronics,Elsevier
2. Integrated Electronics: Milman Halkias, TMH.
3. Microelectronic Circuits : Sedra & Smith.

#### REFERENCE BOOKS:

1. Operational Amplifiers:Gaikwad
2. Electronic Circuit Analysis and Design ( Second edition) : D.A.Neamen; TMH

**EE-307**

**ANTENNAS, WAVE PROPOGATION &TV ENGINEERING**

**L T P**

**3 1 -**

Theory : 100 Marks

Class work : 50 Marks

Total : 150 Marks

Duration of Exam : 3 Hours

**NOTE: For setting up the question paper, Question No. 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.**

**Section-A**

Retarded potential, field of short dipole, Antenna pattern & antenna parameters Antenna pattern, Gain, Directivity, Radiation resistance, Aperture, Beam-width etc, Reciprocity theorem for antenna.

**Section-B**

Wave equation for radiated fields from current and voltage sources in terms of electric scalar potential and magnetic vector potential .Fields and pattern of an infinitesimal dipole. Definition of various potentials used in antenna theory .:

Relation between current distribution and field pattern of an antenna, linear antenna, half wave dipole, Antenna impedance, Directivity, Radiation resistance, Directional properties, Effect of ground on antenna pattern, Input impedance Broad band matching.

**Section-C**

Two element array, broad side, End fired pattern, Beam width pattern multiplication, multi element array and their properties, Synthesis of an array.parabolic feed antenna, conical, helix, log periodic, horn, Microwave antenna ground waves propagation, Space waves propagation, Effect of Earth, Duct formation, Ionosphere, and sky wave

**Section-D**

**TELEVISION SYSTEM:**

Picture transmission, sound transmission, picture reception, sound reception synchronization, receiver controls, color television. Monochrome picture tube, Beam deflection, screen phosphor, face plate, picture tube characteristics, picture tube,circuit controls. Television Camera Tubes: Basic principal, Image orthicon, Vidicon.

**TEXT BOOKS :**

1. Antennas by J.D.Kraus, TMH.
2. Antenna & Wave Propagation by K.D Prasad.
3. Monochrome and Color Television : R.R.Gulati ; New Age.

CSE- 210E  
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3    1    -

## COMPUTER ARCHITECTURE & ORGANIZATION

Class Work:	50
Exam:	100
Total:	150

Duration of Exam: 3 Hrs.

**NOTE: For setting up the question paper, question no 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.**

### Section A

Boolean algebra and Logic gates, Combinational logic blocks(Adders, Multiplexers, Encoders, de-coder), Sequential logic blocks(Latches, Fliplops, Registers, Counters) Store program control concept, Flynn's classification of computers (SISD, MISD, MIMD); Multilevel viewpoint of a machine: digital logic, micro architecture, ISA, operating systems, high level language; structured organization; CPU, caches, main memory, secondary memory units & I/O; Performance metrics; MIPS, MFLOPS.

### Section B

#### **Instruction Set Architecture:**

Instruction set based classification of processors (RISC, CISC, and their comparison); addressing modes: register, immediate, direct, indirect, indexed; Operations in the instruction set; Arithmetic and Logical, Data Transfer, Control Flow; Instruction set formats (fixed, variable, hybrid); Language of the machine: 8086 ; simulation using MSAM.

### Section C

#### **Basic non pipelined CPU Architecture and Memory Hierarchy & I/O Techniques CPU**

Architecture types (accumulator, register, stack, memory/ register) detailed data path of a typical register based CPU, Fetch-Decode-Execute cycle (typically 3 to 5 stage); microinstruction sequencing, implementation of control unit, Enhancing performance with pipelining.

The need for a memory hierarchy (Locality of reference principle, Memory hierarchy in practice: Cache, main memory and secondary memory, Memory parameters: access/ cycle time, cost per bit); Main memory (Semiconductor RAM & ROM organization, memory expansion, Static & dynamic memory types); Cache memory (Associative & direct mapped cache organizations.

### Section D

#### **Introduction to Parallelism and Computer Organization [80x86]:**

Goals of parallelism (Exploitation of concurrency, throughput enhancement); Amdahl's law; Instruction level parallelism (pipelining, super scaling –basic features); Processor level parallelism (Multiprocessor systems overview).

Instruction codes, computer register, computer instructions, timing and control, instruction cycle, type of instructions, memory reference, register reference. I/O reference, Basics of Logic Design, accumulator logic, Control memory, address sequencing, micro-instruction formats, micro-program sequencer, Stack Organization, Instruction Formats, Types of interrupts; Memory Hierarchy.

#### **Text Books:**

Patterson - Computer Organization & design, Elsevier

Computer Organization and Design, 2nd Ed., by David A. Patterson and John L. Hennessy, Morgan 1997, Kauffmann.

Computer Architecture and Organization, 3rd Edi, by John P. Hayes, 1998, TMH.

#### **Reference Books:**

Operating Systems Internals and Design Principles by William Stallings, 4th edition,



EE-309

## Microprocessors and Interfacing

L T P

3 1 -

Theory : 100 Marks

Class work : 50 Marks

Total : 150 Marks

Duration of Exam : 3 Hours

**NOTE: For setting up the question paper, Question No. 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.**

### SECTION A

**THE 8085 PROCESSOR :**

Introduction to microprocessor, 8085 microprocessor : Architecture, instruction set, interrupt structure, and Assembly language programming.

### SECTION B

**THE 8086 MICROPROCESSOR ARCHITECTURE :**

Architecture, block diagram of 8086, details of sub-blocks such as EU, BIU; memory segmentation and physical address computations, program relocation, addressing modes, instruction formats, pin diagram and description of various signals

### SECTION C

**INSTRUCTION SET OF 8086 :**

Instruction execution timing, assembler instruction format, data transfer instructions, arithmetic instructions, branch instructions, looping instructions, NOP and HLT instructions, flag manipulation instructions, logical instructions, shift and rotate instructions, directives and operators, programming examples.

### SECTION D

**INTERFACING DEVICE :**

8255 Programmable peripheral interface, interfacing keyboard and seven segment display, 8254 (8253) programmable interval timer, 8259A programmable interrupt controller, Direct Memory Access and 8237 DMA controller.

**TEXT BOOKS :**

1. Microprocessor Architecture, Programming & Applications with 8085 : Ramesh S Gaonkar; Wiley Eastern Ltd.
2. The Intel Microprocessors 8086- Pentium processor : Brey; PHI

**REFERENCE BOOKS:**

1. Microprocessors and interfacing : Hall; TMH
2. The 8088 & 8086 Microprocessors-Programming, interfacing, Hardware & Applications : Triebel & Singh; PHI
3. Microcomputer systems: the 8086/8088 Family: architecture, Programming & Design : Yu-Chang Liu & Glenn A Gibson; PHI.
4. Advanced Microprocessors and Interfacing : Badri Ram; TMH

L T P  
0 0 2

CLASS WORK : 25  
EXAM : 25  
TOTAL: 50  
DURATION OF EXAM: 3 HRS

**LIST OF EXPERIMENTS:**

- 1) Study blocks wise construction of a analog oscilloscope & Function generator.
- 2) Study blocks wise construction of a Multimeter & frequency counter.
- 3) Study Measurement of different components & parameters like Q of a coil etc using LCRQ meter.
- 4) Study of distortion factor meter and determination of the % distortion of the given oscillator
- 5) Determine output characteristics of a LVDT and Measure displacement using LVDT
- 6) Study characteristics of temperature transducer like Thermocouple, Thermistor & RTD with implementation of a small project using signal conditioning circuits like instrumentation amplifier.
- 7) Measurement of Strain using Strain Guage.
- 8) To study differential pressure transducer & signal conditioning of output signal.
- 9). Measurement of level using capacitive transducer..
- 10) Study of Distance measurement using ultrasonic transducer.

Note: Any Eight Experiments should performed from above list and two experiments can be suitably chosen on the contemporary topics

## ANALOG ELECTRONIC CIRCUITS LAB

**EE-325**

L T P  
0 0 2

CLASS WORK	:	25
EXAM	:	25
TOTAL	:	50
DURATION OF EXAM	:	3 HRS

LIST OF EXPERIMENTS: (Select Any ten Experiments)

1. Design & measure the frequency response of an RC coupled amplifier using discrete components.
2. Design a two stage RC coupled amplifier and determine the effect of cascading on gain and bandwidth
3. Study the effect of voltage series, current series, voltage shunt, and current shunt feed-back on amplifier using discrete components.
4. Design & realize inverting amplifier, non-inverting and buffer amplifier using 741 Op Amp.
5. Verify the operation of a differentiator circuit using 741 op amp and show that it acts as a high pass filter.
6. Verify the operation of an integrator circuit using 741 op amp and show that it acts as a low pass filter.
7. Design and verify the operations of op amp adder and subtractor circuits.
8. Plot frequency response of AC coupled amplifier using op amp 741 and study the effect of negative feedback on the bandwidth and gain of the amplifier.
9. Study of IC 555 as astable & monostable multivibrator
10. Design & realize using op amp 741, Wein -bridge oscillator.
11. To design & realize using op amp 741, square wave generator.
12. To design & realize using op amp 741, logarithmic amplifier & VCCS.
13. Study of 8 bit monolithic Analog to digital converter
14. Study of R-2R ladder network & 8 bit monolithic Digital to Analog Converter.

### Microprocessor & Interfacing Lab

**EE-329**

**L T P**

**0 0 2**

CLASS WORK	:	25
EXAM	:	25
TOTAL	:	50
DURATION OF EXAM	:	3 HRS

#### List of Experiment

##### ANY TEN EXPERIMENTS SHOULD BE PERFORMED:

1. Write a program using 8085 for Hexadecimal addition & subtraction of two numbers.
2. Write a program using 8085 Microprocessor for addition and subtraction of two BCD numbers
3. Write a program to perform multiplication and division of two 8 bit numbers using 8085
4. Write a program using 8086 for division of a defined double word (stored in a data segment) by another double Word division and verify.
5. Write a program using 8086 for finding the square root of a given number and verify.
6. Write a program using 8086 to copy 12 bytes of data from source to destination & verify.
7. Write a program to find maximum and minimum from series using 8086.
8. Write a program to initiate 8251 and to check the transmission and reception of character.
9. Write a program to interface ADC & DAC with 8085 & demonstrate generation of square wave.
10. Write a program to control the operation of stepper motor using 8085/8086 and 8255 PPI.
11. Write a program to interface 8X8 LED Matrix Display using 8085/8086 microprocessors and 8255 PPI.
12. Write a program to control the traffic light system using 8085/8086 and 8255 PPI.
13. Write a program to control simulated elevator 8085/8086 microprocessors and 8255 PPI.

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**SCHEME OF STUDIES AND EXAMINATION**  
**B.Tech. III YEAR (ELECTRONICS & COMMUNICATION ENGINEERING)**  
**SEMESTER - VI**

Course No.	Course Title	Teaching Schedule				Marks of Class Work	Examination		Total Marks	Duration of Exam
		L	T	P	Total		Theory	Practical		
EE-302	MICROWAVE AND RADAR ENGINEERING	3	1	-	4	50	100	-	150	3
EE-304	CONTROL SYTEMS ENGG. (EL,EE, EEE)	3	1	-	4	50	100	-	150	3
EE-306	VLSI Design	3	1	-	4	50	100	-	150	3
IT-305	COMPUTER NETWORKS	3	1	-	4	50	100	-	150	3
EE-310	DIGITAL SYSTEM DESIGN (EL,EI, IC,EE,CSE, AEI)	3	1	-	4	50	100	-	150	3
EE-308	MICROCONTROLLER & EMBEDDED SYSTEM	3	1	-	4	50	100	-	150	3
EE-328-F	MICROCONTROLLER & EMBEDDED SYSTEM LAB	-	-	2	2	25	-	25	50	3
EE-326-F	DIGITAL SYSTEM DESIGN LAB (EL,EI, IC,EE,CSE, AEI)	-	-	2	2	25	-	25	50	3
EE-322-F	MICROWAVE AND RADAR LAB	-	-	2	2	25	-	25	50	3
EE-324-F	CONTROL SYTEMS ENGG. LAB (EL,EE, EEE,AEI)	-	-	2	2	25	-	25	50	3
	<b>TOTAL</b>	<b>18</b>	<b>6</b>	<b>8</b>	<b>32</b>	<b>400</b>	<b>600</b>	<b>100</b>	<b>1100</b>	

NOTE:

1. Students will be allowed to use non-programmable scientific calculator. However, sharing of Calculator will not be permitted in the examination.
2. Each student has to undergo practical training of 6 weeks during summer vacation and its evaluation shall be carried out in the VII semester.

**EE-302**

**MICROWAVE AND RADAR ENGINEERING**

L T P  
3 1 -

Theory : 100 Marks  
Class work : 50 Marks  
Total : 150 Marks  
Duration of Exam : 3 Hours

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**Section-A**

**WAVEGUIDES:** Introduction, comparison with transmission lines, propagation in TE & TM mode, rectangular wave guide, TEM mode in rectangular wave guide, characteristic impedance, introduction to circular waveguides and planar transmission lines.

**Section-B**

**MICROWAVE COMPONENTS & TUBES :** Directional couplers, tees, hybrid ring, S-parameters, attenuators, cavity resonators, mixers & detectors, matched Load, phase shifter, wave meter, Ferrite devices: Isolators, circulators.  
Limitation of conventional tubes; Construction, operation and properties of Klystron amplifier, reflex Klystron, magnetron, TWT, BWO, crossed field amplifiers.

**Section-C**

**MICROWAVE SOLID STATE DEVICES & MEASUREMENTS:** Varactor diode, Tunnel diode, Schottky diode, GUNN diode, IMPATT, TRAPATT and PIN diodes. MASER, parametric amplifiers. Power measurement using calorimeter & bolometers measurement of SWR, frequency, wavelength and impedance. Microwave bridges.

**Section-D**

**RADAR :** Block Diagram and operation, Radar Frequencies, Simple form of Radar Equation, Prediction of Range  
Performance, Pulse Repetition frequency and Range Ambiguities, Applications of Radar

**TEXT BOOKS:**

1. Microwave devices and circuits : Samuel Liao; PHI
2. Microwave devices & Radar Engg : M. Kulkarni; Umesh

**REFERENCE BOOK :**

1. Microwaves and Radar : A.K. Maini; Khanna

**CONTROL SYSTEM ENGINEERING**

L T P  
3 1 -

Theory : 100 Marks  
Class work : 50 Marks  
Total : 150 Marks  
Duration of Exam : 3 Hours

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**Section-A**

**INTRODUCTORY CONCEPTS** :System/Plant model, types of models, illustrative examples of plants and their inputs and outputs, controller servomechanism, regulating system, linear time-invariant (LTI) system, time-varying system, causal system, open loop control system, closed loop control system, illustrative examples of open-loop and feedback control systems, continuous time and sampled data control systems. Effects of feedback on sensitivity (to parameter variations), stability, external disturbance (noise), overall gain etc. Introductory remarks about non-linear control systems.

**Section-B**

**MATHEMATICAL MODELLING** :Concept of transfer function, relationship between transfer function and impulse response, order of a system, blockdiagram algebra, signal flow graphs : Mason's gain formula & its application, characteristic equation, derivation of transfer functions of electrical and electromechanical systems. Transfer functions of cascaded and non-loading cascaded elements. Introduction to state variable analysis and design.

**Section-C**

**TIME DOMAIN ANALYSIS** :Typical test signals, time response of first order systems to various standard inputs, time response of 2nd order system to step input, relationship between location of roots of characteristics equation,  $\zeta$  and  $\omega_n$ , time domain specifications of a general and an under-damped 2nd order system, steady state error and error constants, dominant closed loop poles, concept of stability, pole zero configuration and stability, necessary and sufficient conditions for stability Hurwitz stability criterion Routh stability criterion and relative stability. Root locus concept, development of root loci for various systems, stability considerations..

**Section-D**

**FREQUENCY DOMAIN ANALYSIS , COMPENSATION & CONTROL COMPONENT** :Relationship between frequency response and time-response for 2nd order system, polar, Nyquist, Bode plots, stability, Gain-margin and Phase Margin, relative stability, frequency response specifications. Necessity of compensation, compensation networks, application of lag and lead compensation, basic modes of feedback control, proportional, integral and derivative controllers, illustrative examples. Synchros, AC and DC techogenerators, servomotors, stepper motors, & their applications, magnetic amplifier.

**TEXT BOOK :**

1. Control Systems :Anuj Jain & Naveen mehra vayu education
2. Control Systems - Principles & Design : Madan Gopal; Tata Mc Graw Hill.
3. Control System Engineering : I.J.Nagrath & M.Gopal; New Age

**REFERENCE BOOKS :**

1. Automatic Control Systems : B.C.Kuo, PHI.
2. Modern Control Engg : K.Ogata; PHI.

L T P  
3 1 -

Theory : 100 Marks  
Class work : 50 Marks  
Total : 150 Marks  
Duration of Exam : 3 Hours

**NOTE:** For setting up the question paper, Question No. 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

#### Section-A

**INTRODUCTION** : Introduction to Computer-aided design tools for digital systems. Hardware description languages; introduction to VHDL data objects, classes and data types, Operators, Overloading, logical operators. Types of delays Entity and Architecture declaration. Introduction to behavioral dataflow and structural models.

#### Section-B

**VHDL STATEMENTS** : Assignment statements, sequential statements and process, conditional statements, case statement Array and loops, resolution functions, Packages and Libraries, concurrent statements. Subprograms: Application of Functions and Procedures, Structural Modelling, component declaration, structural layout and generics.

#### Section-C

**COMBINATIONAL & SEQUENTIAL CIRCUIT DESIGN**: VHDL Models and Simulation of combinational circuits such as Multiplexers, Demultiplexers, encoders, decoders, code converters, comparators, implementation of Boolean functions etc. VHDL Models and Simulation of Sequential Circuits Shift Registers, Counters etc.

#### Section-D

**DESIGN OF MICROCOMPUTER & PROGRAMMABLE DEVICE** : Basic components of a computer, specifications, architecture of a simple microcomputer system, implementation of a simple microcomputer system using VHDL Programmable logic devices : ROM, PLAs, PALs, GAL, PEEL, CPLDs and FPGA. Design implementation using CPLDs and FPGAs

#### REFERENCE BOOKS:

1. Ashenden - Digital design, Elsevier
2. IEEE Standard VHDL Language Reference Manual (1993).
3. Digital Design and Modelling with VHDL and Synthesis : KC Chang; IEEE Computer Society Press.
4. "A VHDL Primer" : Bhasker; Prentice Hall 1995.
5. "Digital System Design using VHDL" : Charles. H. Roth ; PWS (1998).
6. "VHDL-Analysis & Modelling of Digital Systems" : Navabi Z; McGraw Hill.
7. VHDL-IV Edition : Perry; TMH (2002)
8. "Introduction to Digital Systems" : Ercegovac. Lang & Moreno; John Wiley (1999).
9. Fundamentals of Digital Logic with VHDL Design : Brown and Vranesic; TMH (2000)
10. Modern Digital Electronics- III Edition: R.P Jain; TMH (2003).
11. Grout - Digital system Design using FPGA & CPLD 'S, Elsevier



**IT-305**

## **COMPUTER NETWORKS**

L T P  
3 1 -

Theory :100 Marks  
Class work : 50 Marks  
Total : 150 Marks  
Duration of Exam : 3 Hours

**NOTE:** For setting up the question paper, Question No. 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions

### **Section-A**

**OSI Reference Model and Network Architecture:** Introduction to Computer Networks, Example networks ARPANET, Internet, Private Networks, Network Topologies: Bus-, Star-, Ring-, Hybrid -, Tree -, Complete -, Irregular -Topology; Types of Networks : Local Area Networks, Metropolitan Area Networks, Wide Area Networks; Layering architecture of networks, OSI model, Functions of each layer, Services and Protocols of each layer

### **Section-B**

**TCP/IP:** Introduction, History of TCP/IP, Layers of TCP/IP, Protocols, Internet Protocol, Transmission Control Protocol , User Datagram Protocol, IP Addressing, IP address classes, Subnet Addressing, Internet Control Protocols, ARP, RARP, ICMP, Application Layer, Domain Name System, Email – SMTP, POP,IMAP; FTP, NNTP, HTTP, Overview of IP version 6.

### **Section-C**

**Local Area Networks:** Introduction to LANs, Features of LANs, Components of LANs, Usage of LANs, LAN Standards, IEEE 802 standards, Channel Access Methods, Aloha, CSMA, CSMA/CD, Token Passing, Ethernet, Layer 2 & 3 switching, Fast Ethernet and Gigabit Ethernet, Token Ring, LAN interconnecting devices: Hubs, Switches, Bridges, Routers, Gateways.

**Wide Area Networks:** Introduction of WANs, Routing, Congestion Control, WAN Technologies, Distributed Queue Dual Bus (DQDB),

### **Section-D**

Synchronous Digital Hierarchy (SDH)/ Synchronous Optical Network (SONET), Asynchronous Transfer Mode (ATM), Frame Relay, Wireless Links.

**Introduction to Network Management:** Remote Monitoring Techniques: Polling, Traps, Performance Management, Class of Service, Quality of Service, Security management, Firewalls, VLANs, Proxy Servers, Introduction to Network Operating Systems: Client-Server infrastructure, Windows NT/2000.

#### **Text Book:**

Computer Networks (3rd edition), Tanenbaum Andrew S., International edition, 1996.

#### **Reference Books:**

Data Communications, Computer Networks and Open Systems (4th edition), Halsall Fred, 2000, Addison Wesley, Low Price Edition.

Business Data Communications, Fitzgerald Jerry,.

Computer Networks – A System Approach, Larry L. Peterson & Bruce S. Davie, 2nd Edition

Computer Networking – ED Tittel , 2002, T.M.H.

**EE-306**

**VLSI DESIGN**

L T P  
3 1 -

Theory : 100 Marks  
Class work : 50 Marks  
Total : 150 Marks  
Duration of Exam : 3 Hours

**NOTE:** For setting up the question paper, Question No. 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

**Section-A**

**BASIC MOS TRANSISTOR :** Enhancement mode & Depletion mode – Fabrication (NMOS, PMOS, CMOS, BiCMOS) Technology – NMOS transistor current equation – Second order effects – MOS Transistor Model.

**Section-B**

**NMOS & CMOS INVERTER AND GATES :** NMOS & CMOS inverter – Determination of pull up / pull down ratios – Stick diagram – Lambda based rules – Super buffers – BiCMOS & steering logic.

**Section-C**

**SUB SYSTEM DESIGN & LAYOUT:** Structured design of combinational circuits – Dynamic CMOS & clocking – Tally circuits – (NAND-NAND, NOR-NOR and AOI logic) – EXOR structure – Multiplexer structures – Barrel shifter.

**Section-D**

**DESIGN OF COMBINATIONAL ELEMENTS & REGULAR ARRAY LOGIC :** NMOS PLA – Programmable Logic Devices - Finite State Machine PLA – Introduction to FPGA.

**VHDL PROGRAMMING:** RTL Design – Combinational logic – Types – Operators – Packages – Sequential circuit – Sub-programs – Test benches. (Examples: address, counters, flipflops, FSM, Multiplexers / De-multiplexers).

**TEXT BOOKS**

1. D.A.Pucknell, K.Eshraghian, 'Basic VLSI Design', 3rd Edition, Prentice Hall of India, New Delhi, 2003.
2. Introduction to Digital Integrated Circuits : Rabaey, Chandrakasan & Nikolic.
3. Principles of CMOS VLSI Design : Neil H.E. Weste and Kamran Eshraghian; Pearson.

**REFERENCE BOOKS**

1. N.H.Weste, 'Principles of CMOS VLSI Design', Pearson Education, India, 2002
2. VLSI Technology: S.M. Sze; McGraw-Hill.

EE-312

## Microcontroller and Embedded Systems

L T P  
3 1 -

Theory : 100 Marks

Class work : 50 Marks

Total : 150 Marks

Duration of Exam : 3 Hours

**NOTE:** For setting up the question paper, Question No. 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

### Section-A

**INTRODUCTION OF MICROCONTROLLER:** Different types of microcontrollers: Embedded microcontrollers, External memory microcontrollers; Processor Architectures: Harvard V/S Princeton, CISC V/S RISC; microcontrollers memory types; microcontrollers features : clocking, i/o pins, interrupts, timers, peripherals.

### Section-B

**MICROCONTROLLER ARCHITECTURE:** Introduction to PIC microcontrollers, Architecture and pipelining, program memory considerations, Addressing modes, CPU registers, Instruction set, simple operations.

### Section-C

**Microcontrollers** - Microcontroller 8051- Architecture, Pin Diagram, I/O Ports, Internal RAM and Registers, Interrupts, Addressing Modes, Memory Organization and External Addressing, Instruction Set, Assembly Language Programming, Real Time Applications of Microcontroller- Interfacing with LCD, ADC, DAC, Stepper Motor, Key Board and Sensors.

### Section-D

**Embedded Systems**-Introduction, Classification, Processors, Hardware Units, Software Embedded into System, Applications and Products of Embedded Systems, Structural Units in Processor, Memory Devices, I/O Devices, Buses, Interfacing of Processor Memory and I/O Devices, Case Study of an Embedded System for a Smart Card.

### Text Book

1. B. B. Brey: The Intel Microprocessors, Architecture, Programming and Interfacing, Pearson Education.
2. Design with PIC Microcontrollers by John B. Peatman, Pearson.
3. Raj Kamal: Embedded Systems- Architecture, Programming and Design, TMH, New Delhi.
4. V. Udayashankara and M. S. Mallikarjunaswamy: 8051 Microcontroller, TMH, New Delhi.

### References:

1. **Mazidi and Mazidi: The 8051 Microcontroller and Embedded Systems, Pearson Education.**
2. **A. V. Deshmukh: Microcontroller (Theory and Application), TMH.**
3. **D. V. Hall: Microprocessors and Interfacing, TMH**
4. **Programming and Customizing the 8051 Microcontroller : Predko ; TMH.**
5. **Programming Embedded Systems in C and C++ : Michael Barr; SHROFF PUB. & DISTR**

**EE-328**

**MICROCONTROLLER&EMBEDED SYSTEM DESIGN LAB**

L	T	P
–	–	2

Class Work:	25
Exam:	25
Total:	50

Duration of Exam: 2 Hrs.

List of Experiment:

**8051/AT 89C51 microcontroller**

01. Write an Assembly language Programme (ALP) to generate 10 kHz square wave.
2. To study implementation & interfacing of Display devices Like LCD, LED Bar graph & seven segment display with Microcontroller 8051/AT89C51
3. To study implementation & interfacing of Different motors like stepper motor, DC motor & servo Motors.
4. Write an ALP for temperature & pressure measurement.
5. Write a program to interface a graphical LCD with 89C51.
6. To study Programming and Transmission & reception of data through Serial port & study of Parallel printer port.

**PIC Microcontroller**

7. To interface PWM based voltage regulator using PIC Microcontroller .
8. Study and analysis of interfacing of Graphical LCD using PIC controller
9. Study and interfacing of IR (RC5 protocol) and RF Communication using PIC controller
10. Study of SD/MMC card Interface using 18F4550

**EE-324**

**CONTROL SYSTEM LAB**

L T P	CLASS	WORK	:	25
0 0 2	EXAM		:	25
	TOTAL		:	50
	DURATION OF EXAM		:	3 HRS

**LIST OF EXPERIMENTS:**

ANY SIX EXPERIEMENTS (from Sl. No1-11).

1. To study speed Torque characteristics of
  - a) A.C. servo motor
  - b) DC servo motor .
2. (a) To demonstrate simple motor driven closed loop DC position control system.  
(b) To study and demonstrate simple closed loop speed control system.
3. To study the lead, lag, lead-lag compensators and to draw their magnitude and phase plots .
4. To study a stepper motor & to execute microprocessor or computer-based control of the same by changing  
number of steps, direction of rotation & speed.
5. To implement a PID controller for temperature control of a pilot plant.
6. To study behavior of 1 order,2 order type 0,type 1 system.
7. To study control action of light control device.
8. To study water level control using a industrial PLC.
9. To study motion control of a conveyor belt using a industrial PLC

**MATLAB BASED (ANY FOUR EXPT.)**

10. Introduction to MATLAB (Control System Toolbox), Implement at least any  
Different Toolboxes in MATLAB, Introduction to Control Systems  
Toolbox.  
Determine transpose, inverse values of given matrix.  
Plot the pole-zero configuration in s-plane for the given transfer  
function.  
Plot unit step response of given transfer function and find peak  
overshoot, peak time.  
Plot unit step response and to find rise time and delay time.  
Plot locus of given transfer function, locate closed loop poles for  
different values of k.  
Plot root locus of given transfer function and to find out S, Wd, Wn at  
given root & to discuss stability.  
Plot bode plot of given transfer function and find gain and phase  
margins  
Plot the Nyquist plot for given transfer function and to discuss  
closed loop stability, gain and phase margin.

L T P	CLASS	WORK	:	
25				
0 0 2	EXAM	:	25	
	TOTAL	:	50	
	DURATION OF EXAM	:	3 HRS	

## LIST OF EXPERIMENTS:

## ANY FIVE EXPERIMENTS: VHDL

1. Design all gates using VHDL.
2. Write VHDL programs for the following circuits, check the wave forms and the hardware generated
  - a. half adder
  - b. full adder
3. Write VHDL programs for the following circuits, check the wave forms and the hardware generated
  - a. multiplexer
  - b. demultiplexer
4. Write VHDL programs for the following circuits, check the wave forms and the hardware generated
  - a. decoder
  - b. encoder
5. Write a VHDL program for a comparator and check the wave forms and the hardware generated
6. Write a VHDL program for a code converter and check the wave forms and the hardware generated
7. Write a VHDL program for a FLIPFLOP and check the wave forms and the hardware generated
8. Write a VHDL program for a counter and check the wave forms and the hardware generated
9. Write VHDL programs for the following circuits, check the wave forms and the hardware generated
  - a. register
  - b. shift register

## ANY FIVE EXPERIMENTS USING: using FPGA (Spartan 3) &amp; CPLD

- 1) Design of Half-Adder, Full Adder, Half Subtractor, Full Subtractor
- 2) Design a parity generator
- 3) Design a 4 Bit comparator
- 4) Design a RS & JK Flip flop
- 5) Design a 4: 1 Multiplexer
- 6) Design a 4 Bit Up / Down Counter with Loadable Count
- 7) Design a 3: 8 decoder
- 8) Design a 8 bit shift register
- 9) Design a arithmetic unit
- 10) Implement ADC & DAC interface with FPGA
- 11) Implement a serial communication interface with FPGA
- 12) Implement a Telephone keypad interface with FPGA
- 13) Implement a VGA interface with FPGA
- 14) Implement a PS2 keypad interface with FPGA
- 15) Implement a 4 digit seven segment display

L T P  
0 0 2

CLASSWORK	:	25
EXAM	:	25
TOTAL	:	50
DURATION OF EXAM:		3 HRS

**LIST OF EXPERIMENTS: ANY TEN EXPERIEMNTS CAN BE SELECTED**

1. Study of wave guide components.
2. To measure frequency of microwave source and demonstrate relationship among guide dimensions, free space wave length and guide wavelength.
3. To measure VSWR of unknown load and determine its impedance using a smith chart.
4. Study of characteristics of Gunn oscillator & Gunn diode as modulated source (PIN modulation) and determination of modulation depth.
5. Study of insulation & coupling coefficient of a magic T & coupling coefficient and directivity of a directional coupler
6. Measurement of attenuation of a attenuator and isolation, insertion loss, cross coupling of an circulator.
7. Study of waveguide horn and its radiation pattern and determination of the beam width.
8. To study working of MIC Components like Power Divider , Ring resonator , Filters & Microwave Amplifier
9. To study Measurement of Guide wavelength (  $\lambda_g$  ), Free Space wavelength (  $\lambda_0$  ). & Concept of reduction of wavelength due to substrate material
10. Measurement of SWR in a Microwave transmission line.
11. To study working of Doppler radar & measure RPM, object Counter & velocity, .
12. Study of audio & data communication over Microwave bench.
13. Measurement of microwave power using power meter.