Department of Electronics and Communication Engineering, VNIT Nagpur

B. Tech. (Electronics and Communication Engineering)

Course Book

July 2016

General information about the department

The department offers the following academic programs:

Course-work oriented programs

- 4-year B. Tech. program
- 2-year M. Tech. program

Research programs

- Ph.D. program

Course Oriented Programs :

B.Tech. program: The B.Tech. program is a four-year course oriented undergraduate program. The course work is spread across all the semesters. The courses include a set of core courses offered by the department (DC), a set of departmental electives (DE), open courses (OC) from other engineering departments and humanities/management courses (HM). A student may complete maximum two courses in each OC and HM category. Besides, a student must also complete a project in the final year towards the fulfillment of the degree requirements.

M.Tech. program: The M.Tech. program is a two-year course oriented graduate program. The student has to take a set of core courses and a set of electives. The course work is spread across the first two semesters with an option of taking electives in the third semester. This is followed by a project in the third and fourth semester in which the student can take up a project of his or her interest, supervised by a faculty member of the department. The project may be defined by industry/R&D organization. It may be carried out in the institute or at the industry / R&D organization

List of faculty members

S.N.	Name	Qualification	E-mail ID
1.	Dr. A. G. Keskar	Ph. D.	agkeskar@ece.vnit.ac.in
2.	Dr. K. D. Kulat	Ph. D.	kdkulat@ece.vnit.ac.in
3.	Dr. A. S. Gandhi	Ph. D.	asgandhi@ece.vnit.ac.in
4.	Dr. K. M. Bhurchandi	Ph.D.	bhurchandikm@ece.vnit.ac.in
5.	Dr. Ashwin Kothari	Ph. D.	ashwinkothari@ece.vnit.ac.in
6.	Dr. V. R. Satpute	Ph. D.	vrsatpute@ece.vnit.ac.in
7.	Mrs. P. H. Ghare	M. Tech.	phghare@ece.vnit.ac.in
8.	J. Sengputa	M. Tech.	jsengupta@ece.vnit.ac.in
9.	K. Surender	M. Tech.	ksurender@ece.vnit.ac.in
10.	Dr. Vinay Kumar Tripathi	Ph. D.	vk@ece.vnit.ac.in
11.	Dr. Saugata Sinha	Ph. D.	saugatasinha@ece.vnit.ac.in
12.	Dr. Prabhat Sharma	Ph. D.	Prabhatsharma@ece.vnit.ac.in
13.	Dr. Deep Gupta	Ph. D.	deepgupta@ece.vnit.ac.in
14.	Dr. Sudhir Kumar	Ph. D.	sudhirkumar@ece.vnit.ac.in

Institute Vision

To contribute effectively to the national endeavour of producing quality human resource of world class standard by developing a sustainable technical education system to meet the changing technological needs of the Country, incorporating relevant social concerns and to build an environment to create and propagate innovative technologies for the economic development of the Nation.

Institute Mission

The Mission of VNIT is to achieve high standards of excellence in generating and propagating knowledge ein engineering and allied disciplines. V.N.I.T. is committed to providing an education that combines rigorous academics with joy of discovery. The Institute encourages its community to engage in a dialogue with society to be able to effectively contribute for the betterment of humankind.

Department Vision

To be the epitome academic rigour still flexible to accommodate every student and faculty for Basic, current and future technologies in Electronics and communication Engineering.

Department Mission

To be a centre of excellence and provide best platform for students and staff for their growth.

B. Tech. (ECE) Program Educational Objectives

I. To develop the ability among students to understand the concept of Mathematics, Physics and core electronics subjects which will facilitate understanding of new technology.

II. To provide student with a strong foundation in the engineering fundamentals necessary to formulate, solve and analyze engineering problems and to prepare them for graduate studies, R&D, consultancy and higher learning.

III. To build up skills to analyze the requirements of electronics, understand the technical specifications, design and provide novel engineering solutions and efficient product design.

IV. To prepare graduates who possess the necessary foundation required to take up gainful employment in core sector and allied sector or prepare them for a successful career and work professionally to meet the technical requirement of Indian and multinational companies.

V. To give exposure to emerging edge technologies, adequate training and opportunities to work as team on multi disciplinary projects with effective communication skills and leadership qualities.

B.Tech.(ECE) Programme Outcomes(POs)

1. The Department of Electronics and Communication Engineering has a strong focus on providing students with a strong background in mathematics, science and engineering.The department provides students with adequate practical training by way of laboratory sessions, design and problem based learning.

2. Students shall participate and succeed in competitive examinations such as GATE,GRE and TOEFL,PSUs and may admit to various programs like Master of Science (Abroad/India),Master of Technology (India) and Doctor of Philosophy (India/Abroad).

3. Students will be able to realize their ideas with the help of„Incubation Centre" established within college premises and will be able to participate in National/ International level project(Design/Coding) competitions organized by Industry/Institutes.

4. With the help of technical and entrepreneur skills students will be able to employ appropriate techniques using hardware and software engineering tools for modern engineering applications a nd will demonstrate an ability to apply their knowledge of advanced mathematics and electronics engineering principles towards creating new technologies that helps students to establish their own industries/ventures.

5. With the help of established laboratories (AMTEL MCU Centre, TEXAS INSTRUMENTS Analog Laboratory) Students are working with cutting edge technology and can pursue their career in the specific areas.

6. By working amid project groups of various projects sponsored by DST, BARC(Govt. of India funded projects), students can participate and gain research experience which will be useful for pursuing a career in various government and private R&D centres in India and Abroad.

7. Through the work experience gained from summer/winter training programs conducted by the expert faculties from the department and at various eputed organizations in India and Abroad, students can have up to date knowledge of the specific field and can pursue career in that field.

Scheme of Instruction-

CREDIT REQUIREMENTS

Program Core (PC)		**Program Elective (PE)**	
Category	Credit	Category	Credit
Basic Science (BS)	18	Departmental Electives (DE)	33-48
Engineering Science (ES)	20	Humanities & Management (HM)	0-6
Humanities (HU)	05	Open Courses (OC)	0-6
Departmental Core (DC)	79-82		
Total	**122-125**	Total	**48-45**
Grand Total PC + PE			**170**

Details of credits:

I Semester				**II Semester**			
CORE				**CORE**			
Code	**Course**	**L-T-P**	**Credit**	**Code**	**Course**	**L-T-P**	**Credit**
	Please refer Scheme of Basic Sciences				Please refer Scheme of Basic Sciences		

III Semester				**IV Semester**			
CORE				**CORE**			
Code	**Course**	**L-T-P**	**Credit**	**Code**	**Course**	**L-T-P**	**Credit**
PHL203	Electronic Materials	3-0-0	3	MAL205	Numerical Methods and Probability Theory	3-1-0	4
MAL201	Integral Transforms & Partial Differential Equations	3-1-0	4	ECL211	Signals and Systems Analysis	3-1-0	4
EEL209	Linear Network Theory	3-0-0	3	ECP211	Signals and Systems Analysis Lab.	0-0-2	1
ECL201	Electronic Devices	3-1-0	4	ECL305	Electromagnetic Fields	3-1-0	4
ECP201	Electronic Devices Lab.	0-0-2	1	ECL306	Microprocessors & Interfacing	3-0-0	3
ECL202	Digital Logic Design	3-0-0	3	ECP306	Microprocessors & Interfacing Lab.	0-0-2	1
ECP202	Digital Logic Design Lab.	0-0-2	1	ECP307	Electronic Product Engg. Workshop	0-0-2	1
				ECL308	Analog Circuit Design	3-0-0	3
				ECP308	Analog Circuit Design Lab.	0-0-2	1
ELECTIVE (NIL)				**ELECTIVE (NIL)**			
	Total No. of Credits		**19**		**Total No. of Credits**		**22**

V Semester				VI Semester			
CORE				**CORE**			
Code	**Course**	**L-T-P**	**Credit**	**Code**	**Course**	**L-T-P**	**Credit**
EEL310	Control Systems	3-0-0	3	ENL302	Device Modeling	3-0-0	3
EEP310	Control Systems Lab	0-0-2	1	ENP302	Device Modeling Lab.	0-0-2	1
ECL204	Measurement & Instrumentation	3-0-0	3	ECL303	Digital Communication	3-0-0	3
ECP204	Measurement & Instrumentation Lab	0-0-2	1	ECP303	Digital Communication Lab	0-0-2	1
ECL301	Analog Communication	3-1-0	4	ECL304	Digital Signal Processing.	3-0-0	3
ECP301	Analog Communication Lab	0-0-2	1	ECP304	Digital Signal Processing Lab.	0-0-2	1
ECL401	Hardware Description Languages	3-0-0	3				
ECP401	Hardware Description Languages Lab	0-0-2	1				
ECL405	Wave guides and Antennas	3-0-0	3				
ELECTIVE* (Maximum one THEORY)				**ELECTIVE* (Maximum THREE theory, ONE lab)**			
PHL208	Physics of Semiconductor Devices	3-0-0	3	CSL312	Concepts in Operating Systems	3-0-0	3
CSL311	Computer Architecture & Organization	3-0-0	3	ECL403	Embedded Systems	3-0-0	3
ECL309	Finite Automata	3-0-0	3	ECP403	Embedded Systems Lab.	0-0-2	1
ECP309	Finite Automata Lab	0-0-2	1	ECL404	RF & Microwave Engg.	3-0-0	3
ECL310	CMOS Design	3-0-0	3	ECP404	RF & Microwave Engg. Lab	0-0-2	1
ECL311	Automotive Electronics	3-0-0	3	ECL408	Biomedical Engineering	3-0-0	3
ECL414	Electronic Product Design and Reliability	3-0-0	3	ECL415	Electronic System Design	3-0-0	3
ECL421	Advanced Sensors and Instrumentation	3-0-0	3	ECL420	Smart Antennas	3-0-0	3
OC	OC	3-0-0	3	ECL426	Advanced Microprocessors & Interfacing	3-0-0	3
HM	HM	3-0-0	3	ECP426	Advanced Microprocessors & Interfacing Lab	0-0-2	1
				OC	OC	3-0-0	3
				HM	HM	3-0-0	3
	Total No. of Credits (20 + 3)	=	**23**		**Total No. of Credits (12+10)**	=	**22**

***Notes for DE + OC + HM**

Credits offered for registration from 5^{th} to 8^{th} semester are 53
Credits to be earned are 48. The registration for electives (DE) shown is maximum possible in that semester. Hence, total no. of credits is also maximum possible. Student need not register for courses with sum of credits = (53 – 48) = 5

VII Semester				VIII Semester			
CORE				CORE			
Code	**Course**	**L-T-P**	**Credit**	**Code**	**Course**	**L-T-P**	**Credit**
ECD401	Project Phase – I	0-0-4	2	ECD402	Project Phase II	0-0-8	4
ELECTIVE* (Maximum SIX theory and THREE labs)				**ELECTIVE* (Maximum SIX theory and ONE lab)**			
EEL309	Power Electronics	3-0-0	3	MAL408	Statistical Analysis & Queuing Theory	3-0-0	3
EEP309	Power Electronics Lab.	0-0-2	1	ECL406	Mobile Communication Systems	3-0-0	3
ECL402	Comm. Net. & Network Applications	3-0-0	3	ECL409	Radio Frequency Circuit Design	3-0-0	3
ECP402	Comm. Net. & Network Applications Lab.	0-0-2	1	ECP409	Radio Frequency Circuit Design Lab.	0-0-2	1
ECL407	Radar Engineering	3-0-0	3	ECL410	Satellite Communication	3-0-0	3
ECL412	Advanced Digital Signal Processing	3-0-0	3	ECL411	Digital Image Processing	3-0-0	3
ECP412	Advanced Digital Signal Processing Lab.	0-0-2	1	ECL413	Adaptive Signal Processing	3-0-0	3
ECL423	Image Analysis and Computer Vision	3-0-0	3	ECP413	Adaptive Signal Processing Lab	0-0-2	1
ECP423	Image Analysis and Computer Vision Lab	0-0-2	1	ECL417	Multimedia Networks	3-0-0	3
ECL424	Optical Communication	3-0-0	3	ECL418	Network Planning and Management	3-0-0	3
ECP424	Optical Communication Lab.	0-0-2	1	ECL419	Wireless Sensor Networks	3-0-0	3
ECL434	Wireless Digital Communication	3-0-0	3	ECP419	Wireless Sensor Networks Lab	0-0-2	1
OC	OC	3-0-0	3	ECL427	Broadband Communication	3-0-0	3
HM	HM	3-0-0	3	OC	OC	3-0-0	3
				HM	HM	3-0-0	3
	Total No. of Credits (2 + 21)	=	**23**		**Total No. of Credits (4+19)**	=	**23**

***Notes for DE + OC + HM**

Credits offered for registration from 5th to 8th semester are 53
Credits to be earned are 48. The registration for electives (DE) shown is maximum possible in that semester. Hence, total no. of credits is also maximum possible. Student need not register for courses with sum of credits = (53 – 48) = 5

List of Core Courses

Course Code	Course Title	L-T-P	Credit	Category	Prerequisite	
					Code	Course Title
PHL203	Electronic Materials	3-0-0	3	DC	Nil	Nil
MAL201	Integral Transforms & Partial Differential Equations	3-1-0	4	DC	Nil	Nil
EEL209	Linear Network Theory	3-0-0	3	DC	Nil	Nil
ECL201	Electronic Devices	3-1-0	4	DC	Nil	Nil
ECL202	Digital Logic Design	3-0-0	3	DC	Nil	Nil
ECP201	Electronic Devices Lab.	0-0-2	1	DC	Nil	Nil
ECP202	Digital Logic Design Lab.	0-0-2	1	DC	Nil	Nil
MAL205	Numerical Methods and Probability Theory	3-1-0	4	DC	Nil	Nil
ECL306	Microprocessors & Interfacing	3-0-0	3	DC	ECL202	Digital Logic Design
ECL308	Analog Circuit Design	3-0-0	3	DC	ECL201	Electronic Devices
ECL210	Signals and Systems Analysis	3-1-0	4	DC	MAL201	Integral Transforms & Partial Differential Equations
ECL305	Electromagnetic Fields	3-1-0	4	DC	MAL102	Mathematics-II
ECP306	Microprocessors & Interfacinbg Lab.	0-0-2	1	DC	ECL202	Digital Logic Design
ECP308	Analog Circuit Design Lab.	0-0-2	1	DC	ECL201	Electronic Devices
ECP307	Electronic Product Engg. Workshop	0-0-2	1	DC	ECL308	Analog Circuit Design
ECP210	Signals and Systems Analysis Lab	0-0-2	1	DC	Nil	Nil
ECL301	Analog Communication	3-1-0	4	DC	MAL201, MAL205	Integral Transforms & Partial Differential Equations, Basic Numerical Analysis and Probability Theory
ECL401	Hardware Description Languages	3-0-0	3	DC	ECL309	Finite Automata
EEL310	Control Systems	3-0-0	3	DC	MAL201	Integral Transforms & Partial Differential Equations
ECL405	Wave Guides and Antennas	3-0-0	3	DC	ECL305	Electromagnetic Fields
ECL204	Measurement & Instrumentation	3-0-0	3	DC	Nil	Nil

ECP301	Analog Communication Lab	0-0-2	1	DC	MAL201, MAL205	Integral Transforms & Partial Differential Equations, Basic Numerical Analysis and Probability Theory
EEP310	Control Systems Lab.	0-0-2	1	DC	MAL201	Integral Transforms & Partial Differential Equations
ECP401	Hardware Description Languages Lab.	0-0-2	1	DC	ECL309	Finite Automata
ECP204	Measurement & Instrumentation Lab.	0-0-2	1	DC	Nil	Nil
ECL303	Digital Communication	3-0-0	3	DC	ECL301	Analog Communication
ECL304	Digital Signal Processing.	3-0-0	3	DC	MAL201	Integral Transforms & Partial Differential Equations
ECL302	Device Modeling	3-0-0	3	DC	PHL203, ECL201	Electronic Materials, Electronic Devices
ECP303	Digital Communication Lab.	0-0-2	1	DC	ECL301	Analog Communication
ECP304	Digital Signal Processing Lab.	0-0-2	1	DC	MAL201	Integral Transforms & Partial Differential Equations
ECP302	Device Modeling Lab.	0-0-2	1	DC	PHL203, ECL201	Electronic Materials, Electronic Devices
ECD401	Project Phase – I	0-0-4	2	DC	Nil	Nil
ECD402	Project Phase II	0-0-8	4	DC	ECD401	Project Phase - I

List of Elective Courses

Course Code	Course Title	L-T-P	Credits	Category	Prerequisite	
CSL 311	Computer Architecture & Organisation	3-0-0	3	DE	ECL202	Digital Logic Design
ECL 309	Finite Automata	3-0-0	3	DE	ECL202	Digital Logic Design
ECL 403	Embedded Systems	3-0-0	3	DE	ECL 306	Microprocessors & Interfacinbg
CSL 312	Concepts in Operating Systems	3-0-0	3	DE	Nil	Nil
ECL 404	RF & Microwave Engg.	3-0-0	3	DE	ECL305	Electromagnetic Fields
ECP 404	RF & Microwave Engg. Lab	0-0-2	1	DE	ECL305	Electromagnetic Fields
ECL 415	Electronic System Design	3-0-0	3	DE	ECL201, ECL 308	Electronic Devices, Analog Circuit Design
ECP 403	Embedded Systems Lab.	0-0-2	1	DE	ECL 306	Microprocessors & Interfacing
ECL 402	Comm. Net. & Network Applications	3-0-0	3	DE	ECL303	Digital Communication
ECL 412	Advanced Digital Signal Processing	3-0-0	3	DE	ECL304	Digital Signal Processing
ECL 423	Image Analysis and Computer Vision	3-0-0	3	DE	ECL303	Digital Signal Processing
ECL 424	Optical Communication	3-0-0	3	DE	ECL 303	Digital Communication
ECL 434	Wireless Digital Communication	3-0-0	3	DE	ECL303	Digital Communication
ECL 407	Radar Engineering	3-0-0	3	DE	ECL305	Electromagnetic Fields
EEL 309	Power Electronics	3-0-0	3	DE	ECL308	Analog Circuit Design
ECP 402	Comm. Net. & Network Applications Lab.	0-0-2	1	DE	ECL303	Digital Communication
ECP 412	Advanced Digital Signal Processing Lab.	0-0-2	1	DE	ECL304	Digital Signal Processing
ECP 423	Image Analysis and Computer Vision Lab	0-0-2	1	DE	ECL303	Digital Signal Processing
EEP 309	Power Electronics Lab.	0-0-2	1	DE	ECL308	Analog Circuit Design
ECP 424	Optical Communication Lab.	0-0-2	1	DE	ECL303	Digital Communication
ECL 406	Mobile Communication Systems	3-0-0	3	DE	ECL303	Digital Communication
ECL 409	Radio Frequency Circuit	3-0-0	3	DE	ECL302	Device Modeling

	Design					
ECL 411	Digital Image Processing	3-0-0	3	DE	ECL304	Digital Signal Processing
ECL 419	Wireless Sensor Networks	3-0-0	3	DE	ECL303	Digital Communication
ECL 427	Broadband Communication	3-0-0	3	DE	ECL303	Digital Communication
ECP 409	Radio Frequency Circuit Design Lab.	0-0-2	1	DE	ECL302	Device Modeling
PHL208	Physics of semiconductor devices	3-0-0	3	DE	Nil	Nil
ECL310	CMOS Design	3-0-0	3	DE	ECL302	Device Modeling
ECL311	Automotive Electronics	3-0-0	3	DE	ECL204	Measurement & Instrumentation
ECL408	Biomedical Engineering	3-0-0	3	DE	ECL204	Measurement & Instrumentation
MAL408	Statistical Analysis & Queing Theory	3-0-0	3	DE	Nil	Nil
ECL413	Adaptive Signal Processing	3-0-0	3	DE	ECL304	Digital Signal Processing
ECP413	Adaptive Signal Processing Lab	0-0-2	1	DE	ECL304	Digital Signal Processing
ECL414	Electronic Product Design and Reliability	3-0-0	3	DE	ECP307	Electronic Product Engg. Workshop
ECL417	Multimedia Networks	3-0-0	3	DE	ECL303	Digital Communication
ECL418	Network Planning and Management	3-0-0	3	DE	ECL303	Digital Communication
ECL419	Wireless Sensor Networks	3-0-0	3	DE	ECL303	Digital Communication
ECP419	Wireless Sensor Networks Lab.	0-0-2	1	DE	ECL303	Digital Communication
ECL420	Smart Antennas	3-0-0	3	DE	ECL405	Wave guides & Antennas
ECL421	Advanced Sensors and Instrumentation	3-0-0	3	DE	ECL204	Measurement & Instrumentation
ECL426	Advanced Microprocessors & Interfacing	3-0-0	3	DE	ECL306	Microprocessors & Interfacing
ECP426	Advanced Microprocessors & Interfacing Lab	0-0-2	1	DE	ECL306	Microprocessors & Interfacing
ECP 309	Finite Automata Lab.	0-0-2	1	DE	ECL202	Digital Logic Design

List of Open Courses (Offered by the Department for students of other departments)

Course Code	Course Title	L-T-P	Credits	Prerequisite
ECL241	Overview of Communication Systems	3-0-0	3	BTech ECE students NOT allowed to register
ECL242	Sensors and Instrumentation Applications	3-0-0	3	BTech ECE students NOT allowed to register
ECP243	Introduction to Electronics and Instrumentation	0-0-2	1	ONLY for MSc (Chemistry) students

List of Courses (Core/Elective) offered by the Department to EEE Department

Course Code	Course Title	L-T-P	Credits	Prerequisite	
ECL206	Electronic Devices and Circuits	3-0-0	3	Nil	Nil
ECP206	Electronic Devices and Circuits Lab	0-0-2	1	Nil	Nil
ECL207	Digital Circuits	3-0-0	3	Nil	Nil
ECP207	Digital Circuits Lab	0-0-2	1	Nil	Nil
ECL320	Linear Electronic Circuits	3-0-0	3	ECL206	Electronic Devices and Circuits
ECP320	Linear Electronic Circuits Lab	0-0-2	1	ECL206	Electronic Devices and Circuits
ECL321	Microprocessors	3-0-0	3	ECL207	Digital Circuits
ECP321	Microprocessors Lab	0-0-2	1	ECL207	Digital Circuits

List of Courses (Core/Elective) offered by the Department to CSE Department

Course Code	Course Title	L-T-P	Credits	Prerequisite	
ECL322	Signals and Systems	3-0-0	3	MAL201	Integral Transforms & Partial Differential Equations
ECL445	Digital Signal Processing and its Applications	3-0-0	3		

Detailed Syllabus

PHL203 Electronic Material [(3-0-0); Credits: 3] **Back**

Course Outcomes

Students will

1. understand the dielectric properties of various materials.
2. be knowing magnetic properties of materials
3. be familiar with properties and applications of super conductors
4. understand the use of various materials for electronics engineering.
5. be familiar with electronic circuit components made from various materials

Contents

Dielectric properties of insulators in static fields, Polarization, Dielectric constant, Dielectric behavior of materials, Ferroelectric, Piezoelectric and Pyroelectric materials,
Dielectric properties of insulators in alternating fields, Complex dielectric constant, Dipolar relaxation, Dielectric loss, Loss tangent, Dielectric break down, different types of capacitor, multilayer capacitors, Ferroelectric polymers.
Conductivity of pure metals and alloys, Temperature coefficient of resistivity, High conductivity materials, Fixed and variable resistors, Resistors used in electronic circuits,
Magnetic materials classification, Soft and Hard magnetic materials, Ferrites, Magnetic cores of transformers, Relays, memory elements, Magnetic resistors and Magnetic tapes multi-ferroic materials Superconductivity, Type-I and Type-II superconductors, High temperature superconductivity, Applications of superconductivity.

Books

1. Dekkar A.J.; "Electrical Engineering Materials"; Prentice Hall of India Publications, 1992
2. Seth S.P.; "A course in Electrical Engineering Materials"; (Third edition) Dhanpatrai Publications,2003
3. Joshi M.A.; "Electronic components and materials"; SPD Publications
4. Pillai S.O.; "Solid State Physics"; New Age Publication, 1999
5. Kasap S.O.; "Principles of Electronic Materials and Devices"; Tata-Mcgraw-Hill, 2002

MAL201 Integral Transforms & Partial Differential Equations [(3-1-0); Credits: 4] **Back**

Course Outcomes

Students will

1. Be conversant with the mathematical analysis required for electronic communication systems.
2. Be knowing concept of various transforms such as Laplace, Fourier, Z -transform and their applications in the field of Electronics and Communication Engineering.
3. Study Difference equations, Partial differential equations and their applications in engineering.
4. have an idea of Solution of One dimensional wave equation, heat equation, Laplace equation (Cartesian and polar forms), D'Alembert solution of wave equation.
5. be able to understand and analyze the problems associated with engineering applications.

Contents

Laplace Transforms: Definition of Laplace Transforms, Linearity property, condition for existence of Laplace Transform, first and second shifting properties, transforms of derivatives and integrals, evaluation of integrals by Laplace Transform. Inverse Laplace Transform, convolution theorem, Laplace Transform of periodic functions, unit step function and Dirac delta function. Applications of Laplace Transform to solve ordinary differential equations. Fourier Series and Fourier Transforms: Fourier series, half range sine and cosine series expansions, exponential form of Fourier series. Fourier integral theorem, Fourier transform, Fourier Sine and cosine Transforms, Linearity, scaling, frequency shifting and time shifting properties, convolution theorem. Z-transform: Z - transform, Properties of Z-transforms, Convolution of two sequences, inverse Z-transform, Solution of Difference equations. Partial differential equations: Formation of first and second order equations, Solution of first order linear equations: Lagrange's equation, particular solution passing through a given curve. Higher order equations with constant coefficients, classification of linear second order PDEs, method of separation of variables, Solution of One dimensional wave equation, heat equation, Laplace equation (Cartesian and polar forms), D'Alembert solution of wave equation.

Text / Reference Books

1. Kreyszig, E.; "Advanced Engineering Mathematics" (Eighth Edition); John Wiley & Sons.
2. Jain, R.K. and Iyengar, S.R.K.; "Advanced Engineering Mathematics"; Narosa Publishers.
3. Thomas, G.B. and Finney, R.L.; "Calculus and Analytic Geometry"

EEL209 Linear Network Theory [(3-0-0); Credits: 3] **Back**

Course Outcomes

Students will

1. Understand basics electrical circuits with nodal and mesh analysis.
2. Appreciate electrical network theorems.
3. Apply Laplace Transform for steady state and transient analysis.
4. Determine different network functions.
5. Appreciate the frequency domain techniques.

Contents

Node and Mesh Analysis: Node and mesh equation, matrix approach of complicated network containing voltage and current sources, and reactances, source transformation and duality. Network theorem: Superposition, reciprocity, Thevenin's, Norton's, Maximum power Transfer, compensation and Tallegen's theorem as applied to AC. circuits. Trigonometric and exponential Fourier series: Discrete spectra and symmetry of waveform, steady state response of a network to non-sinusoidal periodic inputs, power factor , effective values, Fourier transform and continuous spectra, three phase unbalance circuit and power calculation.

Laplace transforms and properties: Partial fraction, singularity functions, waveform synthesis, analysis of RC, RL, and RLC networks with and without initial conditions with Laplace transforms evaluation of initial conditions. Two four port network and interconnections, Behaviors of series and parallel resonant circuits, Introduction to band pass, low pass, high pass and band reject filters.

Transient behavior, concept of complex frequency, Driving points and transfer functions poles and zeros of immittance function, their properties, sinusoidal response from pole-zero integral solutions. locations, convolution theorem and Two four port network and interconnections, Behaviors of series and parallel resonant circuits, Introduction to band pass, low pass, high pass and band reject filters.

Text/Reference Books

1. Van, Valkenburg.; "Network analysis"; Prentice hall of India, 2000
2. Sudhakar, A., Shyammohan, S. P.; "Circuits and Network"; Tata Mcgraw-Hill New Delhi, 1994

ECL201 Electronic Devices [(3-1-0); Credits: 4] **Back**

Course Outcomes

Students will

1. Get a comprehensive introduction of electronic properties of semiconductors,
2. Be familiar with electronic devices, and their applications to circuits.
3. Be able to link knowledge of biasing and other characteristics with circuit operation
4. Have the ability to formulate problems, problem solving skills.
5. Be able to analyze performance of various types of amplifiers

Contents

Semiconductor diodes V-I characteristics, Modeling for various circuit applications, rectifier, Clipping and clamping circuits RC filters, Bipolar junction transistor (BJT), V-I characteristics, Biasing, Small signal low frequency amplifier. LED photodiode, optocoupler, V-I characteristics, optoelectronic circuits. Power devices, power diode, IGBT, SCR TRIAC, Switching Devices, DIAC, UJT characteristics and applications. Power amplifiers : Class A, B, AB,C, Efficiency calculations, Push pull complimentary symmetry ,Feedback amplifier, Oscillators.

Books

1. Millman Halkias, "Electronic Devices and Circuits", TMH, 2000
2. David A. Bell, "Electronic Devices and Circuits", PHI, 4th Edition
3. R. Boylestad, "Electronic devices and Circuit Theory", Pearson Education, 9th Edition
4. S. Poornachandra, "Electron devices", Sasikala, Scitech, 2nd Edition
4. Meade, Thompson, "Foundation of Electronics Circuits and Devices", 4th Edition

---

ECP201 Electronic Devices Lab [(0-0-2); Credits: 1] Back

Course Outcomes
Student will
1. understand the characteristics of silicon, germanium and Zener diodes.
2. understand the working of various rectifier circuits.
3. understand applications of LC and RC filters in rectifiers.
4. Know about input and output characteristics of BJT and FET.
5. Know BJT application as amplifier and oscillator.

List of Experiments

1. To study V-I characteristics of P-N junction diode
2. To study Zener diode as voltage regulator.
3. To study Half wave and Full wave rectifier.
4. Use of L-C and R-C filters for rectification.
5. To study input and output characteristics of BJT amplifier.
6. To study BJT as an amplifier.
7. To study BJT as RC-Phase shift oscillator.
8. To study Drain and Transfer characteristics of FET.

ECL202 Digital Logic Design [(3-0-0); Credits: 3] Back

Course Outcomes
Students will
1. Be able to apply the principles of number system, binary codes and Boolean algebra to minimize logic expressions and its use in digital electronics.
2. Acquire knowledge about various logic gates and logic families and analyze basic circuits of these families.
3. Develop ability to identify, analyze and design combinational circuits.
4. Develop ability to design various synchronous and asynchronous sequential circuits.
5. Be able to describe and compare various memory systems, shift registers and analog to digital and digital to analog conversion circuit

Contents

Motivation for digital systems-logic and Boolean algebra, propositions,truth tables, minimization of combinational circuits.
Karnaugh maps and tabulation procedure, implementation of sum of product and product of sum in hardware.

Decoders, multiplexers, and code converters, addersripple and carry look ahead addition.
Storage elements, flip-flops and latches: D,T, J/K flip-flops, shift register, counter.

Asynchronous and synchronous design using state and excitation tables, FSM implementation.

Overview of VLSI designs process. PAL, CPLD, FPGA, ASIC Structure overview.

Introduction to hardware description language for digital circuit implementation.

Text Books
1. Kohavi Z, "Switching & Finite Automata Theory", 2th Edition, Tata McGraw Hill.
2. M.Morris Mano, "Digital Design", Prearson Education

Reference Books
1. Stephen Brown, Vranesic Z , "Fundamentals of Digital Logic with VHDL Design", TMH

ECP202 Digital Logic Design Lab [(0-0-2; Credits: 1] Back

Course Outcomes
Students will

1. Be able to describe how analog signals are used to represent digital values in different logic families, including characterization of the noise margins.
2. Be able to create appropriate truth table from a description of a combinational logic function.

3. Be able to create a gate-level implementation of a combinational logic function described by a truth table using and/or/inv gates, MUXes or ROMs, and analyze its timing behavior.
4. Be able to describe the operation and timing constraints for latches and registers.
5. Properly incorporate synchronous and asynchronous memories into a circuit design.
6. Design and analyze circuits for digital arithmetic.

List of Assignments

1. Combinational Logic Circuits
2. Boolean function realization using decoders and multiplexers
3. Flip-flops
4. Counters
5. Shift Registers
6. Sequence Detector
7. Arithmetic Logic Unit
8. Traffic Light Controller
9. Elevator Control

MAL205 Numerical Methods and Probability Theory [(3-1-0); Credits: 4] **Back**

Course Outcomes

Students will

1. study basics of numerical Analysis: Solutions of algebraic and transcendental equations by Iteration method, method of false position, Newton-Raphson method and their convergence.
2. know details about the random variables, various methods for numerical analysis.
3. study numerical solution of ordinary differential equations: Taylor's series method, Euler's modified method, Runge-Kutta method, Adam's Bashforth and Adam's Moulton, Milne's predictor corrector method
4. study random processes, autocorrelation and cross correlation applicable in the field of electronics and communication engineering.
5. be able to understand and analyze the problems associated with engineering applications

Contents

Numerical Analysis: Solutions of algebraic and transcendental equations by Iteration method, method offalse position, Newton-Raphson method and their convergence. Solutions of system of linear equations by Gauss elimination method, Gauss Seidal method, LU decomposition method. Newton-Raphson method for system of nonlinear equations. Eigen values and eigen vectors : Power and Jacobi methods. Numerical solution of ordinary differential equations: Taylor's series method, Euler's modified method, Runge-Kutta method, Adam's Bashforth and Adam's Moulton, Milne's predictor corrector method. Boundary value problems: Shooting method, finite difference methods. Probability theory: Random variables, discrete and continuous random variable, probability density function; probability distribution function for discrete and continuous random variable joint distributions. Definition of mathematical expectation, functions of random variables, The variance and standard deviations, moment generating function other measures of central tendency and dispersion, Skewness and Kurtosis. Binomial, Geometric distribution, Poisson distribution, Relation between Binomial and Poisson's distribution, Normal distribution, Relation between Binomial and Normal distribution. Random processes, continuous and discrete, determinism, stationarity, ergodicity etc. correlation functions, autocorrelation and cross-correlation, properties and applications of correlation functions. TEXTBOOKS 1.Jain, Iyengar and Jain : Numerical Methods for Engineers and Scientists, WileyEastern 2.V.K. Rohatgi and A.K.M. Ehsane

Reference Books

1. S. D. Cante and C. de Boor, “Elementary Numerical Analysis, an algorithmic approach”, McGraw-Hill.
2. Gerald and Wheatley : “Applied Numerical Analysis”, Addison-Wesley.
3. Spiegel, M.R.; “Theory and problems of Probability and statistics”; McGraw-HillBookCompany; 1980.
4. K.S. Trivedi: “Probability Statistics with Reliability, Queuing and Computer Science applications”, Prentice Hall ofIndia Pvt. Ltd.

ECL211 Signals and Systems [(3-1-0); Credits: 4] **Back**

Course Outcomes

Students will

1. Understand the terminology of signals and basic engineering systems.

2. Understand the use of signals and basic system building blocks and their roles in large/complex system design.
3. Understand frequency-domain representation and analysis concepts using Fourier Analysis tools, Z-transform
4. Be able to do Analysis and Characterization of the DT systems through classical method.
5. Develop mathematical and computational skills needed in application areas like communication, signal processing and control.

Contents

Elements of Signal Space Theory: Different types of signals, Linearity, Time invariance and causality, Impulse sequence, Impulse functions and other singularity functions.
Convolution: Convolution sum, Convolution integral and their evaluation, Time domain representation and analysis, of LTI systems based on convolution and differential equations.
Multi Input-Output Discrete and Continuous Systems: State model representation, Solution of state, equations, State transition matrix.
Transform Domain Considerations: Laplace transforms and Z-transforms, Application of transforms to discrete and continuous systems analysis, Transfer function, Block diagram representation, DFT. Fourier series and Fourier Transform: Sampling theorem, Discrete Fourier transform(DFT), Estimating Fourier Transform using (DFT).

Text Books

1. Alan V Oppenheim, Alan S Wilsky and Hamid Nawab S, “Signals & Systems”, Prentice Hall, New Delhi, 2005.
2. Simon Haykin and Barry Van Veen, “Signals & Systems”, John Wiley and Sons Inc., New Delhi, 2008.

Reference Books

1. Ashok Ambardar, “Introduction to Analog and Digital Signal Processing”, PWS Publishing Company, Newyork, 2002.
2. Rodger E Zaimer and William H Tranter, “Signals & Systems” – Continuous and Discrete, McMillan Publishing Company, Bangalore ,2005.
3. John .G.Proakis , “Digital Signal Processing Principles, Algorithms and Applications” , Prentice Hall, New Delhi 2006,.
4. Sanjit .K. Mitra “Digital Signal Processing A Computer based approach”, ‘Tata McGraw Hill Edition ,New Delhi,2001,
5. Emmanuel C.Ifeachor “Digital Signal Processing A Practical Approach”, Pearson Education Limited, England, 2002.

ECP211 Signals and Systems Lab [(0-0-2); Credits: 1] **Back**

Course Outcomes

Students will

1. understand basic signals operations such as convolution, correlation, signal shifting
2. Know and understand linear system dynamics.
3. Know methods for finding the system transient and steady state responses.
4. Understand basic linear dynamic systems concepts such as stability, observability and controllability.
5. understand Fourier, Laplace, and Z transforms and their inverses.

List of Experiments

Exp1:

1. To demonstrate generation of some simple signal.
2. To explore the commutation of even and odd symmetries in a signal with algebraic operations.
3. To explore the effect of transformation of signal parameters (amplitude-scaling, time-scaling and time-shifting).
4. To explore the various properties of the impulse signals.
5. To visualize the complex exponential signal and real sinusoids.

Exp2:

1. To identify a given system as linear or non-linear.
2. To explore the time variance and time invariance property of a given system.
3. To explore causality and non-causality property of a system.

Exp3:

1. To visualize the relationship between the continuous-time Fourier series and Fourier transform of a signal.
2. To visualize the relationship between the discrete-time Fourier series and Fourier transform of a signal.
3. To visualize the relationship between continuous-time and discrete-time Fourier transform of a signals.

4. To visualize the relationship among Fourier analysis methods.

Exp4:
1. To demonstrate the time domain sampling of bandlimited signals (Nyquist theorem).
2. To demonstrate the time domain sampling of non-bandlimited signals
3. To demonstrate the sampling in frequency domain (Discrete Fourier Transform).

Exp5:
1. To demonstrate the convolution of two continuous-time signals.
2. To demonstrate the convolution of two discrete-time signals

---

ECL305 Electromagnetic Field [(3-1-0); Credits: 4] **Back**

Course Outcomes
Students will

1. apply vector calculus to understand the behavior of static electric and magnetic fields in standard configurations in different coordinate systems.
2. calculate electric and magnetic field due to charge, charge distributions in space.
3. solve boundary value problems for electromagnetic fields.
4. describe and analyze electromagnetic wave propagation in free-space.
5. to understand the concept of power associated with an EM wave.

Contents

Vector calculus: Cartesian, Cylindrical and spherical co-ordinate systems, differential lengths, surfaces and volumes

Electrostatics: Coulomb's law, Electric field, intensity, electric flux density, Gauss's law and applications, divergence and divergence theorem, potential difference and potential gradient, Electric dipole and dipole moment, Energy in electric field.

Steady magnetic fields: Biot Savart's law, Amperes circuital law and application, Curl and Stroke's theorems, Magnetic flux density and magnetic flux, scalar and vector magnetic potentials, Maxwell's equations and time varying fields, Faraday's law, displacement current, Maxwell's Equations in point & integral form, Retarded potentials.

Uniform Plane waves: Maxwell's equation in phasor form, wave equation in general medium and perfect dielectric mediums, Solution of wave equations, intrinsic impedance, velocity and wavelength, conductors and dielectrics, depth of penetration, Poynting's vector theorem.

Reflection of Electromagnetic Waves: Reflection of Electromagnetic waves: Normal incidence, standing waves, laws of reflection, reflection of obliquely incident waves, Brewsters angle.

Text Books
1. David K. Cheng , “Field and Wave Electromagnetics” 2E, Pearson
2. William H. Hayt, Jr., John A. Buck, “Engineering Electromagnetics”, 6E, Tata McGraw Hill Ed.
3. M.N.O. Sadiku, “Elements of Electromagnetics” 3E, Oxford .

Reference Books
1. John D. Kraus, Keith R. Carver “Electromagnetics” McGraw-Hill.
2. Jorden, Ballman, “Electromagnetic Fields & Radiating Systems”, 3E, PHI.

ECL306 Microprocessors & Interfacing [(3-0-0); Credits: 3] **Back**

Course Outcomes
Students will
1. be able to identify the internal registers and memory organization
2. be able to do assembly language programming.
3. Be able to design interface circuits for microprocessors
4. Be able to design interface for controlling devices and data acquisition systems.
5. develop assembly language codes for microprocessor-based systems.

Contents

Architecture of Intel's 8085 microprocessor, Addressing modes of 8085 and its timing diagrams, Machine cycle, T-states, Bus structure.
Instruction set of 8085, Groping of instructions, Instruction cycle and their timing diagrams, Assembly language programming.
Stacks and sub routines, related instructions, Interrupts and associated instructions, Expanding interrupts, ALP for stacks and interrupt service routines.
Memory Interfacing, I / O mapped and memory mapped modes, interfacing of input and output devices, Multiplexed and matrix interfacing.
Architecture of 8086 and segmentation of memory, Odd-even memory and I / O interfacing, General and specific instructions of 8086, Assembly language programming with simple examples.
Study and Interfacing of 8255, 8254, 8251 with 8085 and 8086.

Reference Books

1. Gaonkar R.S, "Microprocessors Architecture, Programming and applications with 8085", Penram Publishing,Edition
2. Uffenbeck J, "Microprocessors and Microcontrollers", Prentice Hall of IndiaEdition

---

ECP306 Microprocessors & Interfacing Lab [(0-0-2); Credits: 1] Back

Course Outcomes

Students will
1. Comprehend the instruction set of 8085.
2. Use Assembly Language Programming in simple arithmetic and sorting problems
3. Use monitor utilities for interactive displays with subroutines
4. Work with standard microprocessor interfaces like 8255, 8253, 8251
5. Understand debugging techniques and firmware

List of Assignments

1. 8085 Programming covering all its instructions on microprocessor trainer kit
2. Addition of long numbers
3. Multiplication and division of unsigned numbers
4. Multiplication and division of signed numbers
5. Array multiplication
6. Sorting program
7. Interfacing and programming of 8255. (E.g. traffic light controller).
8. Interfacing and programming of 8254.
9. Display interface.
10. Small project

ECP307 Electronic Product Engg. Workshop [(0-0-2); Credits: 1] Back

Course Outcomes

Students will be familiar with the
1. Actual components
2. Printed circuit board design & fabrication
3. Soldering of the components
4. Mechanical assembly and enclosure
5. Heat management of the product

Contents

The aim of the Electonic Product Engineering Workshop lab is to provide the hands on learning to the students. In this lab the students are supposed to make completely working hardware projects.

ECL308 Analog Circuit Design [(3-0-0); Credits: 3] Back

Course Outcomes

Students will
1. This course provides in depth knowledge about operational amplifiers using BJT and FET.
2. Through the course student will learn about various op-amp based ICs for various applications.
3. Through the course student is able to design op-amp based circuits required in embedded system design, communications, instrumentation etc

4. It facilitates students to learn circuit design concept.
5. It helps students to know about analog filter design.

Contents

Differential amplifier, configurations, DC & AC analysis, constant current bias, current mirror, cascaded differential amplifier stages, level translator..
OPAMP, inverting, non-inverting, differential amplifier configurations, negative feedback, voltage gain, input & output impedance, Bandwidth. Input offset voltage, input bias and offset current, Thermal drift, CMRR, PSRR, Frequency response.
Linear applications, DC, ac amplifiers, summing differential amplifier, instrumentation amplifier, V to I and I to V converters, Integrator, Differentiator.
Non linear applications, Comparators, Schmitt Trigger, Clipping and Clamping circuits, Absolute value circuits, Peak detectors, Sample and hold circuits, Log and antilog amplifiers.
First / Second order low/ high/ bandpass, band reject active filters, All pass filter, phase shift oscillator, Wein bridge oscillator, Square wave and triangular waveform generators.
Study of ICs LM-741, LM-555, LM-566, LM-565, LM-339, LM-723.

Text Books

1 Tobey, Graeme ,Huelsman , "Operational amplifiers, Design and applications", McGraw Hills, Edition
2. Gaikwad R.A "Operational Amplifiers and Linear Integrated Circuits", PHI 1990 Edition

Reference Books

1. Fransis S , "Design with OPAMPS and Analog Ics", McGraw Hills
2. Fiore J.M , "OPAMPS and Linear Ics" , delmer-Thomson,USA 2001.

ECP308 Analog Circuit Design Lab [(0-0-2); Credits: 1] Back

Course Outcomes
Students will

1. Have good knowledge about operational amplifiers.
2. learn about various ICs such as 741 and 555.
3. be able to design op-amp based circuits required in embedded system design, communications, instrumentation etc
4. learn analog circuit design concept.
5. know about analog filter design.

List of assignments

- Design Experiments

1) op-amp characteristics
2) linear applications of op-amp
3) non-linear applications of op-amp
4) filter design
5) based on IC555

- Simulation Based Experiments

1) linear applications of op-amp using multisim or T-spice
2) non-linear applications of op-amp using multisim or T-spice
3) IC555 using multisim or T-spice

EEL310 Control Systems [(3-0-0); Credits: 3] Back

Course Outcomes
Students will

1. Do the mathematical modelling and derivation of transfer function of various systems.
2. Determine the stability of system and analyse the system in the time domain.
3. Analyse the systems in frequency domain.
4. Do state space modelling of system and its analysis.
5. Appreciate the concept of feedback to improve the system performance

Contents

Introduction to need for automation and automatic control. Use of Feedback, Broad spectrum of system application. Mathematical modelling, Diff. Equations, transfer functions, block diagram, signal flow graphs, Application to elementary system simplifications, Effect of feedback on parameter variation, disturbance signal, servomechanisms and regulators. Control system components, Electrical, Electromechanical, hydraulic, pneumatic and other components. Their functional analysis and input output representation.
Time response of systems, First order and second order system, standard inputs concept of gain and time constants. Steady state error, type of control system, approximate methods for higher order system. Root location and its effect on time response, Elementary idea of Root Locus, effect of adding pole and zero in proximity of imaginary axis.
Stability control systems, conditions of stability, characteristic equation, Routh Hurwitz criterion, special cases for determining relative stability.
Frequency response method of analyzing linear system. Nyquist and Bode plots stability and accuracy analysis from frequency responses, open loop and close loop frequency response. Nyquist criterion, Effect of variation of gain and addition of pole and zero on response plot, stability margins in frequency response.
State variable method of analysis, characteristic of system state, choice of state representation in vector matrix, different standard form, relation between transfer function and state variable.

Text/Reference Books

1. Nagrath & Gopal ; “Control System Analysis”
2. D'Azzo Houpis; “Linear System Analysis”; 1975. McGraw Hill,
3. Kuo. B. C.; “Automatic Control Systems”; Prentice Hall, 1991.
4. Noman Nise; “Control System Engineering”; John Wiley & Sons,INC 2000.
5. Gopal M.; “Control Systems : Principle of Design”

EEP310 Control Systems Lab [(0-0-2); Credits: 1] **Back**

Course Outcomes
Students will

1. Be familiar with various components used in building control systems
2. Do higher studies to model various systems.
3. Check for system stability.
4. Learn simulation of control systems using software tools.

List of Experiments

1. A) To Study the characteristics of Potentiometer as an error detector.
   B) To Study the characteristics of a i) Synchro transmitter
   ii) Synchro as an error detector
2. To Study transient response of second order R-L-C Circuit using discrete components.
3. To study the Torque-Speed characteristics of Two Phase A.C Servo motor .
4. To Study the effect of addition of pole to the second order closed loop control system by using MATLAB.
5. To Study the frequency response of a second order R-L-C series circuit using discrete components.
6. To Study the phase lead and phase lag networks using discrete components.
   A) To study the effect of addition of pole on frequency response of second order closed loop system by using MATLAB
   B) To study the effect of Zero and pole to open loop transfer function of a second order system with unity feed back by using MATLAB.
7. To study the effect of PID controller using a Kit.

ECL204 Measurement and Instrumentation [(3-0-0); Credits: 3] **Back**

Course Outcomes
Students will

1. Understand and respond to the need for rigorous and formal metrology concepts in designing and using measurement systems.
2. Understand the errors in measurements and their rectification
3. Apply the knowledge to select and identify specific sensors (or complete instruments) for controlling machines and processes.
4. Understand the operating principles of a range of widely used instruments
5. Design of signal conditioning circuit for measurement systems

Contents

Accuracy and precision, Significant figures, Types of errors, statistical, Probability of errors, Limiting errors. Functional elements of an instrument, Active and Passive transducers, Analog and Digital mode of operation, Null deflection methods,

Input and output configuration of measuring instrument and instrument system. Wheat stone bridge : Basic operation, measurement errors, Thevenin's equivalent circuit, Guarded Wheat-stone bridge, Kelvin bridge: Effects of connecting leads, Kelvin double Bridge. AC Bridges and their application: Condition and application of the balance equation. Maxwell's bridge, Hay Bridge, Schering Bridge, Wein Bridge unbalanced condition. PMMC galvanometer, DC ammeters , Ohmmeter: Series and shunt type, VOM, watt hour meter,

instrument transformers power factor meter, Q- meter. Transducers as input elementsto instrumentation system. Basic methods of Force measurement, Torque measurement of rotating shafts, shaft power measurement (Dynamometers)

Pressure and Sound Measurement : Standards and calibration, Basic methods of pressure measurement, high pressure and low-pressure measurement, sound measurement. Temperature and Heat Measurement: Standards and calibration, Thermal expansion methods, Thermocouples (Thermoelectric sensors), Resistance thermometers Junction semiconductors sensors, Digital thermometers. Heat-flux sensors, Radiation types. Strain Measurement: Bonded and un-bonded electrical strain gauges, gauge factor, temperature compensation methods.

Introduction, Amplified DC meter, AC voltmeter using rectifiers, Electronic multi-meter, Digital voltmeters, Q meter. Oscilloscope : Introduction, Oscilloscope block Diagram, Cathode Ray tube (CRT), CRT circuits, Deflection systems, Delay line. Multiple trace , Simple frequency counters. Strip XY recorder, CRO, signal conditioning Techniques used in various transducers, Gain clipping, filtering, amplification, data logger.IEEE488Bus: Principles of operation, protocols

Text Books

1. Albert.D. Helfrick and William. D. Cooper, “Modern Electronic Instrumentation and Measurement Techniques” , Pearson education
2. Earnest .O Doeblin, “Measurement Systems Application and Design”, McGraw Hill International editions, the edition, 1990.

Reference Books

1. R1. John P. Bentley, “Principles of Measurement Systems”, Third edition, Addison Wesley Longman Ltd., UK, 2000
2. R2. A.K.Sawhney, “A Course in Electrical and Electronic Measurements and Instrumentation”, Dhanapat Rai & Sons, 2000.
3. R3. A.J.Bouwens, “Digital Instrumentation”, McGraw Hill, 1986.
4. R4. Geroge C. Barney, “Intelligent Instrumentation”, IEEE, 1992.
5. R5. H. S. Kalsi, “Electronic Instrumentation”, Tata McGraw Hill Publishing Company Ltd., 1995

ECP204 Measurement and Instrumentation Lab [(0-0-2); Credits: 1] **Back**

Course Outcomes

Students will

1. Design and validate DC and AC bridges
2. Study the dynamic response and the calibration of few instruments
3. Learn about various measurement devices, their characteristics, their operation and their limitations
4. understand statistical data analysis
5. Understand computerized data acquisition.

List of Experiments

1. Designing DC bridge for Resistance Measurement (Quarter, Half and Full bridge)
2. Designing AC bridge Circuit for capacitance measurement
3. Designing signal Conditioning circuit for Pressure Measurement
4. Designing signal Conditioning circuit for Temperature Measurement
5. Designing signal Conditioning circuit for Torque Measurement
6. Designing signal Conditioning circuit for Strain Measurement

7. Experimental study for the characteristics of ADC and DAC
8. Error compensation study using Numerical analysis using MATLAB (regression)

ECL301 Analog Communication [(3-1-0); Credits: 4] **Back**

Course Outcomes
Students will
1. understand issues related to transmission of signals through communication channels
2. understand analog communication systems using amplitude modulation and demodulation.
3. understand analog communication systems using angle modulation and demodulation.
4. Be familiar with analog radio transmitters and receivers.
5. be familiar with analog pulse communication systems.

Contents

Signal Analysis: Fourier Series representation of periodic signals, Fourier transform, Properties of Fourier transform, Convolution, Analysis of Linear time invariant system.
Transmission of signals through systems: Criteria for distortion less transmission, ideal filters, distortions in practical systems, power and energy of signals.
Amplitude modulation: Need of modulation, AM DSB-SC, SSB-SC and vestigial side band modulation and demodulation, AM transmitter (broadcast and low power), FDM.
Angle modulation: FM and PM, reactance FET modulator Armstrong method, Foster-Seely discriminator, PLL detector, Stereophonic FM, Spectrum of FM, Narrow band and wide band FM, FM transmitter (broadcast and low power).
Radio receivers : TRF and super-heterodyne receiver, AGC, FM receiver, sensitivity, selectivity, image frequency rejection measurements, block schematic of communication receiver and its special features. Transceivers for wireless mobile communication devices.
Analog pulse modulation: Sampling theorem, PAM, PWM, PPM, generation & detection of these pulse modulated signals, TDM, Noise in communication systems.

Books
1. Haykin Simon; "Introduction to Analog & Digital Communication Systems"; John Wiley
2. Lathi B.P.; "Modern Analog & Digital Communication Systems"; John Wiley
3. Kennedy; "Electronic Communication Systems"; TMH
4. Frenzel Louis; "Communication Electronics" (3e); TMH
5. Gandhi Abhay; "Analog and Digital Communication, Theory and Lab Work", Cengage Learning
6. Schoenbeck, "Electronic Communication Modulation and Transmission", PHI

ECP301 Analog Communication Lab [(0-0-2); Credits: 1] **Back**

Course Outcomes
Students will
1. be able to use laboratory instruments such as analog & digital oscilloscopes and spectrum analyzer.
2. verify the spectra of commonly used test signals and transfer functions (magnitude) of various analog filters.
3. be able to characterize modulated signals such as AM, FM, PAM, PPM and PWM.
4. gain working knowledge of various modulators and demodulators.
5. Gain working knowledge of radio transmission and reception

Lab Assignments
1. Testing of analog oscilloscope, digital oscilloscope & function generator
2. Testing of Spectrum analyzer
3. To analyze responses of various filters using Spectrum Analyzer
4. Spectrum Analyzer for measurement of broadcast signal characteristics.
5. To perform measurement for an A-V signal using Spectrum Analyzer.
6. Study of AM spectrum using AM signal generator and Spectrum Analyzer
7. Study of standard AM and DSB-SC with single tone modulation.
8. Study of FDM
9. Demodulation of AM
10. Study of FM signal spectrum
11. Frequency Modulation and Demodulation Trainer
12. PAM, PPM, PWM, Modulation and demodulation

ECL401 Hardware Description Languages [(3-0-0); Credits: 3] **Back**

Course Outcomes
Students will
1. This course covers an introduction to hardware description languages and associated methodologies for digital system design.
2. It also provides in-depth coverage includes applications to the simulation and synthesis of digital systems.
3. The students will get familiar with the process of digital integrated circuit synthesis, together with place and route, starting from HDL code to silicon/gate array level.
4. Students will learn about various hardware description languages such as VHDL and Verilog
5. Students will be able to develop FPGA based digital systems.

Contents

Modeling digital systems, Hardware design environment, Design Flow, Hardware description languages, Various design styles..
Introduction to VHDL, Elements of VHDL, Basic concepts in VHDL, Simulation, Synthesis
Dataflow modeling, Concurrent signal assignment, delays, Behavioral modeling, processes.
Structural modeling, configurations, Subprogram, packages, parameterization Basic I/O
Synthesis, RTL description, constraints attributes, FPGA, CPLD structure, technology libraries
Introduction to Verilog Programming

Text Books
1 J.Bhaskar , "VHDL Primer", TMH.
2. Perry D , "VHDL Programming", TMH.

Reference Books
1. Nawabi Z, "VHDL", PHI

ECP401 Hardware Description Languages Lab [(0-0-2); Credits: 1] **Back**

Course Outcomes
Students will
1. Gain knowledge about hardware description languages.
2. will learn about VHDL and Verilog syntax.
3. Be able to design digital systems using FPGAs.
4. Will learn simulation and synthesis concept.
5. know about features of HDL desirable by Industry.

List of assignments

Development of programs based on
1. dataflow style
2. if-else construct
3. case construct
4. for loops
5. structural style
6. functions and procedures
7. testbench
8. file related operations

ECL405 Waveguides and Antennas [(3-0-0); Credits: 3] **Back**

Course Outcomes
Students will
1. Be able to understand and analyse guided wave propagation.
2. Be able to analyze and design transmission line based systems and components.
3. Be familiar with radiation theory, antenna theory and terminology.
4. Be able to achieve proficiency of antenna array analysis and design.
5. Be conversant with various types of antennas and related technologies for different applications.

Contents

Revision of Maxwell's equations for time varying fields and physical significance of Curl, Divergence and Gradient. Waves between parallel planes, TE, TM,& TEM and their characteristics. Attenuation in parallel plane guides wave impedances. TE, TM waves and impossibility of TEM mode in Rectangular waveguide. Different characteristics like group velocity, phase velocity, guide wavelength and wave impedances.

Transmission line equations and their solutions. Transmission line parameters, Characteristic impedances, Propagation constant, Attenuation constant, Phase constant, Waveform distortion, Distortion less transmission lines, Loading of transmission lines, Reflection coefficient and VSWR. Equivalent circuits of transmission lines, Transmission lines at radio frequency. Open circuited and Short circuited lines, Smith Chart, Stub matching.

Scalar and vector potentials related potentials, field due to a current element, power radiated and radiation resistance for field due to a dipole, power radiated and radiated resistance. Reciprocity theorem applied to antennas. Antenna terminology: Gain, Aperture, Radiation intensity, Directivity, Directive gain, Beam width, Radiation patterns, FBR, Antenna bandwidth etc.

Concept of antenna arrays, Two element arrays and their directional characteristics, Linear array analysis, Broadside and end fire arrays, Principles of pattern multiplication & their application. Polynomial representation, Binomial arrays, Design of broadcast array for a specific pattern, Chebyshev array synthesis.

Analysis of power patterns of various antennas like Parabolic reflectors, Lens antenna, folded dipole, Turnstile antenna, Yagi antenna, Log-periodic antenna, Horn antenna & feeding, Traveling wave antenna, Printed antennas, Case grain antenna, Patch & Micro strip antennas, Superconducting antenna, Rhombic, Helical, Open ended waveguide radiator, Small design problems & applications.

Signal processing antennas or smart antenna, DOA, Principle beam formation & Digital beam formatting, Switched beam systems, Adaptive antennas, introduction to concepts of various signal processing algorithms, Principle of special filtering, Antenna diversity, TRB, SRB and Nulling of interference. Introduction to antenna measurement methods: measurement of Gain, Radiation pattern, Time domain gating, Antenna noise temperature & G/T, Impedance & Bandwidth. Introduction to measurement of cellular radio handset antenna.

Text Books

1. K.D.Prasad, "Antennas and Wave Propagation", Khanna or Satya Publications
2. Jhordan & Balmin, "Electromagneting waves and radiating systems", Pearson

Reference Books

1. Raju, "Electromagnetic field theory and transmission lines", Pearson
2. Raju, "Antennas and wave propagation", Pearson
3. Kraus, "Antennas for all applications", TMH
4. Sadiku, "Elements of electromagnetism", Oxford
5. Shevgaonkar, "Electromagnetic Waves" TMH

ENL302 Device Modelling [(3-0-0); Credits: 3] **Back**

Course Outcomes

Students will

1. Have an introduction to numerical modelling of semiconductor devices
2. Be able to deal with advanced concepts in semiconductor electronic devices.
3. Understand the physical, electrical, and optical properties of semiconductor materials and their use in microelectronic circuits.
4. Be able to analyze the relation of atomic and physical properties of semiconductor materials to device and circuit performance issues.
5. Understand the connection between device-level and circuit-level performance of microelectronic systems.
6. Perform analysis of device structures and behaviors using modeling software.

Contents

Introduction to SPICE Simulation, Analysis of complex electronic circuits, simulation and analysis using SPICE, AC/DC operation, DC sweep transfer function, frequency response, feedback control analysis, transient response, device models, simulation and analysis of electronic circuits and systems.
Review of semiconductor physics, The pn junction, , The built-in voltage, Depletion width and junction capacitance, Diode current/voltage characteristic, Minority carrier charge storage
MOS transistors, Threshold voltage and the body effect, Current/voltage characteristics, Subthreshold current, Short channel effect and narrow width effect, Drain induced barrier lowering Channel length modulation, Hot carrier effects, Effective mobility and velocity saturation
SPICE models, MOS inverter circuits
Bipolar transistors, Current gain, Gummel plots and output characteristics, Recombination in the emitter/base depletion region, Charge storage and forward transit time, Cut-off frequency, TTL gates.
Basic SPICE Models, Ebers-Moll and basic Gummel-Poon model, Small-signal model, Parameter extraction

Reference Books

1. B.G.Streetman and S.Banerjee, “Solid State Electronic Devices”, Prentice Hall India
2. D.A.Hodges, and H.G.Jackson , “Analysis and Design of Digital Integrated Circuits”, McGrraw-Hill International
3. J.P.Uyemura, “Introduction to VLSI Circuit and Systems”, John Wiley and Sons
4. Y.Taur, T.H.Ning, “Fundamentals of Modern VLSI devices”, Cambridge University Press
5. Eshraghian K, “Principles of CMOS VLSI Design, A systems perspective”, Addison Wesley.

ENP302 Device Modelling Lab [(0-0-2); Credits: 1] **Back**

Course Outcomes

Students will

1. understand modelling of semiconductor devices and deal with the advanced concepts in semiconductor electronic devices.
2. understand the physical and electrical properties of semiconductor devices and their use in microelectronic circuits through simulations.
3. understand the device/circuit co-design issues for the implementation of microelectronic systems.
4. perform analysis of device structures and behaviours using modelling software.

List of Experiments

1. Design and simulation of rectifiers.
   a) Half-wave rectifier
   b) Half-wave rectifier with capacitor filter.
   c) Full-wave rectifier
   d) Bridge rectifier.
2. Plot the output response of clipper and clamper circuits
   a) Positive clipper.
   b) Negative clipper
   c) Combination clipper
   d) Clamper
3. Design and simulation of RC phase shift oscillator
4. Plot output response of following op-amp based circuits
   a) inverting and non-inverting amplifier.
   b) integrator.
   c) differentiator.
5. Design and simulation of static CMOS logic circuits
   a) Inverter
   b) NAND gate
   c) NOR gate
6. Realize a 1-bit full adder using half adder and NAND gates as sub-circuits.
7. Realize a 4-bit Full adder using four 1-bit full adder as sub-circuits.
8. Plot the output response of a level triggered and edge triggered D- Flip-Flops.
9. Extract parasitic capacitances of NMOS and PMOS transistors.
10. Study the impact of channel length, width and power supply variations on rise time and fall time of an inverter. Further, investigate the impact of these parameters on static and dynamic power.
11. Perform transient and ac analysis of CE amplifier and plot the magnitude and phase response.

ECL303 Digital Communication [(3-0-0); Credits: 3] Back

Course Outcomes
Students will
1. be familiar with concepts of information theory and their applications to efficient coding of speech, audio, image and video signals.
2. be familiar with applications of information theory in efficient coding of data sources.
3. fully understand issues related to digital transmission and reception in baseband format.
4. fully understand issues related to digital transmission and reception in modulated format
5. be familiar with applications of information theory to error control coding.

Contents
Introduction to digital communication. Comparison of analog and digital communication. Advantages and disadvantages of digital communication.
Source Coding of Analog Sources: PCM-TDM, Practical PCM-30 system, Delta modulation, Adaptive DM, DPCM, ADPCM.
Source coding of digital sources: Information, entropy, Shannon's source coding theorem, Huffman algorithm, prefix codes.
Generalized digital communication system, geometric interpretation of signals, performance of matched filter receiver and correlator receive in the presence of white noise. Threshold setting and error probability.
Base band transmission: Line coding fundamentals, transmission formats, spectral requirements.
Media used for digital communication; storage and transmission, guided and unguided. types of noise and other impairments. Inter-symbol interference, Nyquist's results for ISI, Eye pattern and adaptive equalization.
Pass-band transmission methods: Binary ASK, PSK and FSK, Quadrature multiplexing, QPSK and QAM methods. Geometric interpretation of signals, performance of matched filter receiver and correlator receive in the presence of white noise.
Spread spectrum methods: Properties of PN sequences, DSSS system, slow and fast FHSS. Block diagrams and performance analysis, carrier and symbol synchronization.
Case studies of transmission methods in telecommunications and computer networking. For example ISDN, XDSL, 802.3 LANs, WiFi LANs, GSM and CDMA mobile wireless networks.
Error control coding: Shannon's channel capacity theorem, significance of the theorem. Linear block codes generation and decoding, Hamming distance considerations, Cyclic codes and their applications, Convolutional codes and Viterbi decoding algorithm.
Data link layer protocols; ARQ and sliding window protocols; flow control methods; elementary analysis of protocol correctness and performance; Case studies of HDLC and PPP.

Books
1. Abhay Gandhi, "Analog and Digital Communication, Theory and Lab Work", Cengage Learning
2. Haykin Simon; "Introduction to Analog & Digital Communication Systems";John Wiley,Edition
3. Lathi B.P, "Modern Analog & Digital Communication Systems", John WileyEdition
4. Haykin Simon, "Digital communication", WileyEdition
5. Haykin, Simon, "Communication systems", Wiley,(4e)
6. Proakis John, "Digital communication", Tata- McGraw-Hill,(3e)

ECP303 Digital Communication Lab [(0-0-2); Credits: 1] Back

Course Outcomes
Students will
1. Be able to analyse simple systems for digital representation of analog signals.
2. Be able to characterize digital transmission in baseband and modulated format
3. Understand receiver design issues in baseband and modulated format.
4. Understand error control coding applied in digital communication
5. Be able to simulate working of digital communication systems through software tools such as Matlab or Scilab.

List of Assignments

1. Signal sampling and reconstruction techniques
    a. Verify Nyquist Criteria and aliasing.
    b. Analyze the effect of SAMPLE/HOLD circuitry on reconstructed waveform.
    c. verify effect of sampling pulse duty cycle on the reconstructed waveform in sample and sample hold output
    d. 2nd order and 4th order Butterworth Low Pass Filter for anti-aliasing and signal reconstruction.
2. Study Analog to Digital conversion. Observe control signal and their timing.
3. Delta modulation and demodulation.
4. Adaptive Delta Modulation and Demodulation
5. Delta Sigma Modulation and Demodulation.
6. Working of Error Check Code.
7. Time Division Multiplexing.
8. Data communication using RS 232 interface
9. Baseband Data formats NRZ (L), NRZ (M), RZ, Biphase (Manchester), Biphase (Mark), RB, AMI
10. Digital modulation formats ASK, FSK, PSK, QPSK & DPSK.
11. Eye diagram Observation
12. MATLAB or Scilab simulations.

ECL304 Digital Signal Processing [(3-0-0); Credits: 3] **Back**

Course Outcomes
Students will

1. Familiarity with DSP concepts and how do they relate to real applications
2. What are the methods of time domain and frequency domain implementation?
3. Understand the implementation of the DFT in term of the FFT, as well as some of its applications like computation of convolution sums, spectral efficiency etc.
4. Learn the basic FIR and IIR filters, and how to design filters with desired frequency response characteristics.
5. This course is designed to provide students with a comprehensive treatment of the important issues in design, implementation and applications of digital signal processing concepts and algorithms.

Contents

Discrete time signals; Sequences, representation of signals on orthogonal basis, Sampling and reconstruction of signals.

Discrete time systems; attributes, Z- Transform, Analysis of LSI systems, frequency analysis, Inverse Systems, Signal flow graph representation, DF1, DF2, parallel and cascade form.

Finite word-length effect: Digital Filters Discrete Fourier Transform (DFT), Fast Fourier Transform algorithms.

Design of FIR Digital Filters: Window method, ParkMcClellan's Method Design of IIR Digital Filters: Butterworth, Chebyschev approximations. Lowpass, Bandpass Bandstop and High pass filters.Bilinear, impulse invariant frequency

Books
1. Oppenheim & Schafer, “Discrete Time Signal Processing”, PHI Ltd, Third Edition
2. Proakis John and Manolakis, “Digital Signal Processing: Principles Algorithms and Applications”

ECP304 Digital Signal Processing Lab [(0-0-2); Credits: 1] **Back**

Course Outcomes

Students will

1. study common discrete time signals
2. implement linear and circular convolution
3. implement FFT algorithm
4. design different FIR filters
5. design different IIR filters

List of Experiments

1. Generation of common discrete time signals using MATLAB
2. Recursive discrete-time sine-cosine generator
3. Discrete linear convolution
4. Computation of circular convolution
5. Generation and detection of DTMF signal using Goertzel algorithm
6. Design of FIR filter using windowing method
7. FFT implementation using following algorithms
    a. Decimation in time
    b. Decimation in frequency
8. Design of Butterworth IIR filter using impulse variant method.

PHL208 Physics of Semiconductor Devices [(3-0-0); Credits: 3] **Back**

Course Outcomes

Students will

1. Understand the physics and properties of various semiconductor devices.
2. Understand the applications of these devices in electronics industries.
3. Understand device operation with more emphasis than circuit properties.
4. Know the physics of semiconductor junctions, metal-semiconductor junctions and metal-insulator semiconductor junctions.
5. Understand the fundamental principles and applications of modern electronic and optoelectronic semiconductor devices.
6. Gain updated knowledge in the most advanced development of low dimensional semiconductor hetero-structures and their applications.

Contents

Physics and properties of semiconductors: Crystal structure energy bands, carrier concentration at thermal equilibrium, carrier transport phenomenon, phonon spectra, optical thermal and high field properties of semiconductors. Basic equation for device operation.

P-n junction diode, basic device technology, depletion region and depletion capacitance, current voltage characteristics, junction breakdown, heterojunctions.

Schrodinger wave equation for a finite potential step, metal semiconductor contacts, energy band relations, depletion layer, Schottky effect, current transport processes, thermionic emission, diffusion, tunneling current, minority carrier injection ratio, characterization of barrier height, measurement of barrier height, device structures, ohmic contact.

Photonic devices: radiative transitions, LED and semiconductor lasers, photoconductor, photodiode, solar cells.

Reference Books

1. S.M. Sze, “Physics of semiconductor devices”, John Wiley and Sons, 2001.
2. S.S. Islam, “Semiconductor physics and devices”, Oxford University press.

CSL 311 Computer Architecture and Organization [(3-0-0); Credits: 3] Back

Course Outcomes

Students will

1. help to learn how computers work
2. know basic principles of computer's working
3. be able to analyze the performance of computers
4. know how computers are designed and built
5. have understanding of issues affecting modern processors (caches, pipelines etc.).

Contents

Basic Structure of Computers, Functional units, software, performance issues software, machine instructions and programs, Types of instructions, Instruction sets: Instruction formats, Assembly language, Stacks, Ques, Subroutines.

Processor organisation, Information representation, number formats.

multiplication & division ALU design, Floating Point arithmetic, IEEE 754 floating point formats

Control Design, Instruction sequencing, Interpretation, Hard wired control - Design methods, and CPU control unit. Microprogrammed Control - Basic concepts, minimizing microinstruction size, multiplier control unit. Microprogrammed computers - CPU control unit

Memory organization, device characteristics, RAM, ROM, Memory management, Concept of Cache & associative memories, Virtual memory,.

System organization, Input - Output systems, Interrupt, DMA, Standard I/O interfaces

Concept of parallel processing, Pipelining, Forms of parallel processing, interconnect network

Books

1. V.Carl Hammacher, "Computer Organisation", Fifth Edition.
2. A.S.Tanenbum, "Structured Computer Organisation", PHI,Third edition
3. Y.Chu, "Computer Organisation and Microprogramming", II, Englewood Chiffs, N.J.,Prentice Hall,Edition
4. M.M.Mano, "Computer System Architecture", Edition
5. C.W.Gear, "Computer Organisation and Programming", McGraw Hill, N.V,Edition
6. Hayes J.P, "Computer Architecture and Organisation", PHI,Second edition

---

ECL309 Finite Automata [(3-0-0); Credits: 3] Back

Course Outcomes

Students will

1. Understand structure and behavior of logical machines used for wide variety of applications.
2. Understand limitations and capability of logical machines.
3. Understand applications of digital logic to fault analysis of digital circuits
4. formulate digital logical design methods
5. develop algorithms useful for wide range of applications

Contents

Review of combinational circuit design and optimization; functional decomposition and symmetric functions; identification of symmetric functions.

Threshold logic; synthesis of threshold networks.

Fault detection in combinational circuits; Boolean differences and Path sensitization.

Synchronous sequential circuits and iterative networks; memory elements and their excitation functions; synthesis of synchronous sequential circuits; Moore and Mealy machines;

Applications to controller design; finite state machine flow charts, tables, ASM charts. Machine minimization.

Asynchronous Sequential circuits; synthesis; state assignment; minimization.

Text Books
1. Zvi Kohavi, "Switching and Finite Automata Theory", TMH,2 edition
2. Herbert Taub, "Digital Circuits and Microprocessor", TMHEdition

Reference Books
1. M.Morris Mano , "Digital Logic and Computer Design", PHIEdition
2. Lee S.C, "Modern Switching Theory and Digital Design", PHIEdition

---

ECP309 Finite Automata Lab [(0-0-2); Credits: 1] Back

Course Outcomes
Students will
1. Develop design based thinking for Electronic Design Automation.
2. Be familiar with Hardware description language (HDL) standards.
3. Do practical implementation of logic synthesis involving electronic systems.
4. Use VHDL as a programing language for electronic system design.
5. Be able to do event driven programing using FSM approach.

List of Experiments
1 Design a FSM for seat belt warning for the car driver
2 Design a FSM for a two floor elevator system
3 Design of Mod-n Counter
4 Design of ring counter
5 Design a FSM for Home Automation System
6 Design a sequence detector
7 Design of crossroad traffic controller
8 Design of vending machine

ECL310 CMOS Design [(3-0-0); Credits: 3] Back

Course Outcomes
Students will
1. know fundamental principles of VLSI (Very Large Scale Integrated) circuit design and layout.
2. have an overview of CMOS fabrication technologies, physical VLSI design issues (bottom-up design), basic CMOS logic gates,
3. be familiar with architectural building blocks and system design (top-down design), with a stronger emphasis on physical design principles.
4. know building blocks of large-scale CMOS digital integrated circuits
5. have hands-on design experience using a professional IC design platform.

Contents

CMOS Design Introduction: Flow of circuit design, Fabrication Process Flow: Basic Steps, Layout Design Rules
CMOS Digital Circuits: Inverters, Static logic gates, Transmission gates and Flip-Flops, Dynamic logic Gate.
Memory Circuits.
CMOS Analog Circuits: MOS Analog models, Current Sources and sinks, References, amplifiers, Differential Amplifiers, Operational Amplifiers.
CMOS Mixed- Signal Circuits:
Data converter: Fundamentals and Converter architectures.

Reference Books
1. Behzad Razavi, "Fundamentals of Microelectronics", 2nd Edition, March 2014.
2. Behzad Razavi. 2000. "Design of Analog CMOS Integrated Circuits", (1ed.). McGraw-Hill, Inc., New York, NY, USA.
3. R. J. Baker, H W Li, D. E. Boyce, "CMOS Circuit design, Layout and Simulation", PHI EEE
4. Neil H. E. Weste, Kamran Eshraghian, Addison Wesley, "Principles of CMOS VLSI Design"
5. Etienne Sicard, "Basics of CMOS Cell Design"
6. John P. Uyemura, "CIRCUIT DESIGN for CMOS VLSI"
7. R. Jacob Baker, "CMOS Circuit Design, Layout, and Simulation", 3E.

8. SUNG- MO (STEVE) KANG and YUSUF LEBLEBICI "CMOS DIGITAL INTEGRATED CIRCUITS: Analysis and Design"

ECL311 Automotive Electronics [(3-0-0); Credits: 3] **Back**

Course Outcomes
Students will

1. be familiar with various systems and sub-systems in automobiles
2. understand applications of electronics in various systems in automobiles
3. be conversant with various industry standards in automotive industry
4. be able to design embedded systems for automobiles
5. be familiar with advancements taking place in the field of automobiles

Contents

Fundamentals:- Engines, Fuel systems, Steering, Suspension & braking system, Transmission system, passenger amenities like air conditioning ,anti theft & safety systems.
Electrical systems in automobiles:- Charging , Alternators & motors &their applications ,wiring technology components , lighting systems ,dash board instruments.

Engine Control systems :- Microcomputer instrumentation &control, basics of electronic engine control ,sensors, actuators, digital engine control systems, engine mapping for optimum performance.
Vehicle motion control:- Antilock braking ,electronic power steering, advanced suspension automatic transmission, cruise control.

Integration of control systems:- Embedded real time controllers ,diagnostics, ISO 9141-2,vehicle networks CAN bus ,LIN,TTCAN & FTTCAN, hardware design using embedded controllers ,microprocessors and FPGA's.
Advances in automobile technology :- Navigation aids, driver information systems, anticollosion systems,intelligent transport systems, hybrid engine vehicles, alternative fuel technologies, emission control systems & regulations, onboard diagnostics.

Books

1. William Ribbens, "Understanding Automotive Electronics" (6E)- Elsevier.
2. Bolton, "Mechatronics" (3E) Pearson.
3. Necsulescu, "Mechatronics" Pearson.
4. Crouse & Anglin, "Automotive Mechanics"

ECL414 Electronic Product Design and Reliability [(3-0-0); Credits: 3] **Back**

Course Outcomes
Students will
1. Be familiar with process of defining product specifications
2. Be familiar with impact of various technical and non-technical aspects on product design
3. Be able to define goals of product design
4. Be able to identify factors affecting reliability of the product
5. Be conversant with data analysis methods for reliability improvement

Contents
An introduction to electronic product design: Product development management, establishing needs and specifications, Exploiting the market opportunity

System design, costs and product development, Packaging, noise and heat management, Fundamentals of PCB and PCB design, Hardware design and testing methods, Product documentation

Introduction to design for manufacture, design for testing

Design for reliability, Generic stress factors and de-rating, Selection and application of components Failure mode and effects analysis, failure data management and analysis Reliability evaluation of equipment

Books
1. V. S. Bangad, "Electronic Product Design", Technical Publications Pune
2. James Angus, Anthony Ward, "Electronic Product Design", CRC Press
3. R.G. Kaduskar, V.B. Baru, "Electronic Product Design", Wiley
4. Natarajan, Dhanasekharan, "Reliable Design of Electronic Equipment,An Engineering", Guide,Springer

5. Norman B. Fuqua, “Reliability Engineering for Electronic Design”, Jenson Books Inc.

ECL421 Advanced Sensors and Instrumentation [(3-0-0); Credits: 3] Back

Course Outcomes

Students will

1. Understand basics and operating principle of a few advanced sensors.
2. Understand the behaviour of various physical systems and model them using some advanced technology.
3. learn charteristics of different controllers.
4. have fundamental and some special knowledge in process automation in industries using PLC\SCADA.
5. know basic process parameters that are applied in most processing industries for both measurement and control applications.

Contents

Smart sensors : Definitions, Comparisons, Smart Sensor Interface Standards.
Recent / Advanced trends in sensor technology
MEMS Sensors Comparison with Past technologies. , Fabrication Techniques
Case study of MEMS Sensors.
Sensors and their applications. Basics of computer aided process control systems. Microcomputer based process control. i) A programmable logic controller ii) A distributed control system
Controllers : - On-off controllers , Analog controllers, Digital controllers, Fuzzy controllers, Working Principle, Merits- Demerits, Typical Application Areas and comparisons.
Controller tuning and system design, Optimal control theory, Case study of Temperature controller, Case study of position controller, Case study of fuzzy controller.
Study of PLC and Microcontroller based instrumentation Systems.

Text Books

1. D.Patranabis, “Principles of Industrial Instrumentation”, Tata McGraw-Hill Publishing Co., New Delhi, 1999
2. A.K.Sawhney, “A course in Electrical and Electronic Measurement and Instrumentation”, Dhanpat Raj and Sons, New Delhi, 1999
3. Stephanopoulis, G, Chemical, “Process Control”, Prentice Hall of India, New Delhi, 1990.

Reference Books

1. Ernest O.Doebelin, “Measurement systems application and design”, international student 4th Edition, Tata McGraw Hill Publishing Co., New Delhi, 1999.
2. Frank D. Petruzella, “Programmable Logic Controllers”, Glencoe McGraw Hill Second Edition,
3. M.Elwenspoek, R.Wiegerink, “Mechanical Microsensors”, Springer-Verlag Berlin Heidelberg, 2001
4. Eckman D.P.M, “Industrial Instrumentation”, Wiley Eastern Limited, 1990.
5. Donald E. Kirk, “Optimal Control Theory: An Introduction”, Prentice-Hall networks series, 1970

CSL312 Concepts in Operating Systems [(3-0-0); Credits: 3] Back

Course Outcomes

Students will

1. know models of Operating Systems from the uni-processor and multiprocessor perspectives.
2. Know frame of reference on which the existing designs have emerged and the future design possibilities are likely to evolve.
3. Know paradigm that views an Operating System environment in the collective interplay of processes requiring economic resources.
4. gain knowledge about the Operating Systems concepts such as process, main memory management, secondary memory management, CPU and disk scheduling etc.
5. be aware of security issues in operating systems.

Contents

Introduction to Operating Systems, simple batch Systems, time sharing systems etc., computer system structures, I/O structure, storage structure, operating system structures, operating system services, system calls
Process management, Concept of a process, operations on a process, interprocess communication, CPU scheduling, scheduling criteria, scheduling algorithms, process synchronization, critical section problem, synchronization primitives, semaphores, monitors, deadlocks, deadlock prevention, avoidance and detection
Storage Management, memory management, logical vs. physical address space, paging and segmentation, virtual memory, demand paging, page replacement algorithms, thrashing
File system interface, file concept, access methods, directory structure, protection, file-system implementation,

allocation methods, free-space management
I/O Systems, I/O hardware, secondary-storage structure, disk structure, disk scheduling, disk management
Protection and security, goals of protection, domain of protection, access matrix, capability based systems, security issues, authentication, encryption

Books

1. Galvin P.B, “Operating System Concepts”, Silberchatz A,Wesley
2. Stallings W, “Operating Systems”, PHI, New Delhi
3. Tanenbaum A.S, “Modern Operating Systems”, PHI, New Delhi

ECL403 Embedded Systems [(3-0-0); Credits: 3] **Back**

Course Outcomes
Students will

1. understand importance of Embedded Systems in Real life, Engineering and Industrial applications and also to observe importance of embedded processors over general systems.
2. consolidate theoretical concepts of Embedded Systems and microcontrollers architecture.
3. learn, practice and implement programming using concepts of microcontroller.
4. learn peripherals, interfacing and their programming to solve prototype problems.
5. design Real life/ Engineering and Industry problems using Embedded Systems.
6. learn, understand concepts of ARM (Advance RISK machine) and RTOS (Real Time Operating System)

Contents

Introduction to embedded systems, microcontrollers 8051 family, architecture, register set, instruction set, programming, interrupts, stack, timers on-chip and off chip peripherals interfacing and programming, Keys, keyboards, LEDs, 7Seg multiplexed display interfacing, ADC,DAC, Stepper motor LCD dot matrix interfacing, Serial communication, sensors and actuators, instrumentation amplifier, Design examples , introduction to ARM, features, architecture, instruction set features, Concepts of RTOS.

Books

1. M A Mazidi, J G Mazidi, R D McKinlay, “The 8051 Microcontroller and Embedded Systems Using Assemble and C”, Pearson/Prentice Hall, 2^{nd} Ed
2. Kenneth Ayala, “The 8051 Microcontroller”, Cengage learning, India, 2004 3^{rd} Ed
3. Lyla B Das; “Embedded Systems and Integrated Approach”, Pearson, India, 2013, first edition,
4. K M Bhurchandi, A K Ray, “Advanced microprocessors and Peripherals”, McGraw Hill Education India, 2012, 3^{rd} ed
5. Rajkamal, “Microcontrollers”, Archi, Progr, interfacing and Sys design, Pearson, India, 2^{nd} ed, 2012
6. K V Shibu, “Introduction to Embedded Systems”, Tata McGraw Hill Education, India, 2009

ECP403 Embedded Systems Lab [(0-0-2); Credits: 1] **Back**

Course Outcomes
Students will

1. implement and test numerical programs on Keil 8051 and the hardware platform.
2. interface simple peripherals like Keys, LED's, etc. with 8051 with loading considerations.
3. interface higher level peripherals like 7-Segment Displays, MUX Displays, Keyboards, etc. also DAC, ADC and understand the timing and loading considerations.
4. Form a simple but complete Embedded System product with LCD, and with other peripherals.
5. Understand any five embedded system products using internet knowledge survey.
6. Do simple Embedded boards programming using HLL.

List of Experiments

1. Write an assembly language program to find largest and smallest number in an array using Keil software.
2. Write an assembly language program to find Least Common Multiple (LCM) and Greatest Common Divisor (GCD) of two given numbers using Keil software.
3. Write an assembly language program to find HCF of five numbers in an array using Keil software.
4. Write an assembly language program to generate Fibonacci Series using Keil software.
5. Write an assembly language program to sort an array in ascending and descending order using Keil software.
6. Write an assembly language program to find sum and count of numbers divisible by 4 using Keil software.

7. Write an assembly language program to find the given number is prime using Keil software.
8. Write an assembly language program to interface LED with 8051 microcontroller using Keil software.
9. Write an assembly language program to interface 7 segment LED display with 8051 microcontroller using Keil software.
10. Write an assembly language program to interface HEX Keypad with 8051 microcontroller using Keil software.
11. Write an assembly language program to interface Digital to Analog Convertor (DAC) with 8051 microcontroller
    a. To generate Square Wave
    b. To generate Triangular Wave
    c. To generate Saw-tooth Wave
12. Write an assembly language program to interface stepper motor with 8051 microcontroller.
13. Write an assembly language program to interface servo motor with 8051 microcontroller.
14. Write an assembly language program to interface DC motor with 8051 microcontroller.
15. Write an assembly language program to interface LCD module with 8051 microcontroller.
16. Write an assembly language program to generate PWM signal.
17. Programming with Embedded Boards: ATMEGA / PIC / ARDUINO / Beagle Board.
18. Projects with Embedded Boards: ATMEGA / PIC / ARDUINO / Beagle Board.

ECL404 RF & Microwave Engineering [(3-0-0); Credits: 3] **Back**

Course Outcomes

Students will

1. Familiarity with basic concepts and theory of RF & Microwave Engineering.
2. Ability to demonstrate waveguide components, assemble them.
3. Ability to solve problems on microwave communication system.
4. Ability to design, implement, analyse and maintain a high frequency communication system
5. Ability to get idea about different microwave network circuit.

Contents

Introduction: RF & Microwave spectrum, Historical Background, Typical application of RF & Microwaves,
Microwave Tubes: Limitation of conventional tubes in microwaves, Two cavity and multicavity Klystron, Reflex Klystron, Magnetron, Travelling wave tube, Backward wave oscillator – working principles, characteristics.
Semiconductor Microwave Device: Tunnel diode, Gunn diode, IMPATT diode, TRAPATT diode, Microwave bipolar transistor, hetrojunction bipolar transistor, Parametric amplifier
Passive Components: S- matrix, Directional coupler, Bethe-hole coupler, Magic tee, Hybrid ring, Circulator, Isolator.
Microwave Measurement: Measurement of VSWR-Low, Medium and High, Measurement of power, Bolometer, Frequency measurement, Impedance measurement.
Application of Microwaves: Introduction to satellite communication, Radar, Industrial application of microwaves.

Books

1. S.Y.Liao, "Microwave Devices & Circuits", Pearson Education/PHI
2. Monojit Mitra, "Microwave Engineering", Dhanpath Rai New Delhi
3. K.C.Gupta, "Microwaves", New Age Publishers
4. Kulkarni , "Microwave Engineering", Dhanpat Rai New Delhi

ECP404 RF & Microwave Engineering Lab [(0-0-2); Credits: 1] **Back**

Course Outcomes

Students will

1. have familiarity with basic concepts and theory of RF & Microwave Engineering.
2. demonstrate waveguide components, assemble them.
3. solve problems on microwave communication system.
4. design, implement, analyse and maintain a high frequency communication system
5. get idea about different microwave network circuit.

List of Experiments

1. V-I Characteristic of Gunn diode
2. Variation of power & frequency of Reflex Klystron Amplifier
3. V.S.W.R measurement
4. Frequency Measurement
5. Impedance measurement
6. Experiment of E Plane Tee, H Plane Tee and Magic Tee.
7. Experiment of Isolator (scattering matrix measurement)

8. Experiment of circulator (scattering matrix measurement)
9. Experiment of transmission line.
10. Dielectric constant measurement.
11. After completion of exp 1-10 , student have to complete 3-4 design type of experiment with the Help of microwave test bench

---

ECL408 Biomedical Engineering [(3-0-0); Credits: 3] **Back**

Course Outcomes

Students will

1. Be aware of human body functioning for the purpose of bio-medical measurements
2. Have working knowledge of biomedical engineering in industries, hospitals, government or national and international industries
3. Be able to work in areas such as biomedical electronics, medical instrumentation, medical imaging, biomedical signal processing, rehabilitation engineering, and neuro engineering.
4. Be aware of safety and reliability issues of bio-medical equipment
5. Be aware of current trends in biomedical instrumentation

Contents

Human body, physiology and sub system, Biochemistry Measurement of electrical activities in human body, Electrocardiography, Electroanephalography, Electromygraphy and interpretation of records.

Measurement of non-electrical quantity in human body, Measurement of blood flow respiration rate and depth heart rate, blood pressure, temperature, pH impedance of various CSR.

Biotelemetry X Ray and Radio isotrope instruments, A scan, B scan, fital monitoring, X ray component Tomography.

Cardiac pacemaker. Defibrillator, Neuropathophysiology of the Nervous System, Detection and treatment of nervous system disorder. Detection & treatment of nerway system disorders. Prosynthesis for hearing, visual, limb impairments students design & test a nueroprosthesis.

Non inveasive diagnosis instrumentation. Blood pump Respiration controller.

Latest trends in Biomedical Instrumentation. Electrical safety & Laser-Tissue interaction (Optical)

Books

1. Cromwell, “Biomedical Inst. & Measurement”, McGraw Hill
2. Cromwell, “Biomedical Engg. System”, McGraw HILL
3. Plonsay Robert, “Biomedical Phenomenon”, McGraw Hill
4. Khandpur, “Biomedical Engg,”, Tata McGraw Hill

ECL415 Electronics System Design [(3-0-0); Credits: 3] **Back**

Course Outcomes

Students will

1. Understand the basic principles and operations of devices such as Bipolar Junction Transistors, Operational Amplifiers, Filters, Data converters (D/A, A/D), Timer and Power Supply Systems
2. Analysis and modelling of circuits for the given specifications
3. Understand the complex behavior of the circuits using mathematical techniques
4. Understand various applications of the analog integrated circuits
5. Study and analyze the function generators and oscillators

Contents

Design of Power supply system: Unregulated D.C. power supply system with rectifiers and filters. Design of emitter follower regulator, series regulators, overload protection circuits for regulators. Design of SMPS: Step up and step down.

Design of class A small signal amplifiers: Emitter follower, Darlington pair amplifiers with and without Bootstrapping, Two stage direct coupled amplifier. Design of class A, Class AB, audio power amplifier with drivers.

Design of sinusoidal oscillators: OPAMP based Wein bridge and Phase Shift oscillators with AGC circuits, Transistor based Hartley, Colpittsand Crystal oscillators, Evaluation of figure of merit for all above oscillator circuits.

Design of constant current sources, Design of function generators, Design of tuned amplifiers. Design of A/D and D/A converters.

Design of Butterworth, Chebyshev filters upto sixth order with VCVS and IGMF configuration.

Text Books

1 “Regulated Power supply” Handbook, Texas Instruments
2. Angelo, Electronics: “BJT's, FETS and Microcircuits”, 1969 edition, Mcgraw-Hill

Reference Books
1. Goyal & Khetan, "Monograph on Electronic circuit Design", Fifth edition, Khanna publishers
2. Tobey, Grame, Huelsman, "Operational Amplifiers", 1971 edition, McGraw-Hill

---

ECL420 Smart Antennas [(3-0-0); Credits: 3] **Back**

Course Outcomes
Students will
1. Be acquainted with fundamentals and terminology of antenna arrays.
2. Be familiar with working of smart arrays.
3. Be able to utilize various signal processing techniques for smart arrays.
4. Be conversant with smart array implementation for different communication technologies and standards.
5. Be able to assess impact of channel characteristics on antenna arrays.

Contents

Array Antenna Fundamentals: Linear Arrays , Array Weighting, Beamsteered Arrays , Circular Arrays ,Fixed Beam and Sectorized Arrays. Sidelobe Cancellors , Retrodirective Arrays. Smart Antennas, benefits of smart antennas, Adaptive Algorithm Basics , Gradient Based Methods, Howells Applebaum Processor , Adaptive Beamforming Elimination of the Effects of Mutual Coupling on Adaptive Antennas. Adaptive Arrays for CDMA , Waveform Diversity Methods, MIMO ExamplesAngle-of-Arrival Estimation, Array Correlation Matrix ,Bartlett AOA Estimation method ,Capon AOA Estimation method , Spectral Estimation Methods .Channel Characterization ,Channel Impulse Response, Slow Fading; Fast Fading; Fast Fading Modeling ,Spreading , Channel Equalization. Methods for Optimizing the Location of Base Stations for Indoor Wireless Communication, Identification and Elimination of Multipath Effects, Signal Enhancement in Multiuser Communication.

Books
1. Frank Gross, "Smart Antennas for Wireless Communications", McGraw hill
2. Tapan A. Sarkar ,M. C. Wicks, M. Salazar-Palma, R. J. Bonneau , "Smart Antennas", Wiley
3. Balanis, Constantine A. , Morgan & Claypool, "Introduction to Smart Antennas"

ECL426 Advanced Microprocessors and Interfacing [(3-0-0); Credits: 3] **Back**

Course Outcomes
Students will
1. Understanding the 8086/8088 µProcessor Architecture.
2. Introduction to the idea of instruction set programming (8086/8088 µProcessor).
3. Knowledge of segmentation of memory and Interfacing peripherals
4. knowledge of improvements in the architecture of 80386 µProcessor.
5. familiarity with Multimedia Interfacing (MMX) in Pentium class of µProcessor.

Contents

8086/8088 Architecture, register set, memory organization, signal descriptions, basic memory read/write operations, minimum and maximum mode systems.
Addressing modes, Instruction formats, Instruction set, Assembler directives, pseudo ops assembly language programming,
Stack, Interrupts, Interfacing peripherals: 8255 and applications,8254,8279,8251, Study of 8237, 8272, 8275. Architecture and interfacing of 8087.
80386 Architecture, Register set, flag Register, Real address mode, Protected Virtual address mode, Paging unit, Implementation of Virtual memory concept in advanced microprocessors, Virtual 8086 mode
Pentium Superscalar architecture and special features of Pentium, MMX, Data types, MMX Instructions, Introduction to P IV architecture, Branch prediction, TLB,
Hyperthreading, concept of multi core processors, Advantages and feature of RISC Architectures.

Books

1. D V Hall, "Microprocessors and Interfacing", MGH
2. Kenneth Ayala, "The 8086 microprocessor: programming and interfacing", IE India edition
3. K M Bhurchandi, AK Ray, "Advanced Microprocessors and Peripherals", MGH

ECP426 Advanced Microprocessors and Interfacing Lab [(0-0-2); Credits: 1] **Back**

Course Outcomes
Students will

1. Able to interface 8086 microprocessor with various peripherals
2. Able to write ALPs using 8086/88 instruction set.
3. Able to use 8087 instructions in ALPs
4. Able to write ALPs for hardware interfaces
5. Knowing details of interfacing with PIV machine

Assignments covering

1. Interfacing under following guidelines.
2. ALPs using 8086/8088 instruction set, ALPs using 8087 instructions
3. ALPs for hardware interfaces with either kit or PIV machine.

ECD401 Project Phase I [(0-0-4); Credits: 2] **Back**

Course Outcomes
Students will
1. Students will get an opportunity to apply knowledge of several courses in developing a new algorithm or circuit or a larger system.
2. Students will implement innovative ideas and publish them as a research paper or file a patent.
3. Students will learn working as a team.
4. Students will acquire additional skills otherwise not covered in the curriculum
5. Students will gain practical knowledge about the topic including social, commercial, manufacturing, testing, measurements, simulation, marketing and legal issues (as applicable).

EEL309 Power Electronics [(3-0-0); Credits: 3] **Back**

Course Outcomes
Students will
1. Know concepts of semiconductor switches.
2. Understand operation and applications of different power electronics converters.
3. Appreciate working of PWM techniques.
4. Comprehend operation of inverter.
5. To develop skills to build, and troubleshoot power electronics circuits.

Contents

Semiconductor devices used in power electronics: SCR, ASCR, RCT , LASCR, TRIAC, IGBT, Power MOSFET, GTO, Triggering devices: UJT, PUT, construction characteristics, ratings, Applications.ce treatment should deal with, Application. Thermal equivalent circuit, Heat sink calculation, protection requirements and methods.

Thyristor as power controller, phase angle control, Extinction angle control, Symmetrical angle control, time ratio control, pulse width modulation, Burst Integral cycle, Turn on methods: Circuits for single phase line communicated converter, single phase converter , single phase inverter, Digital methods,.
Turn off (commutation) Methods: type A, B, C, D, E and F.

Uncontrolled Rectifiers: single phase: (M-2), (B-2),(M-3), B-6; Single phase/three phase half control(one quadrant operation); Single phase full wave converter, Three phase converter, three pulse, six pulse, (Bridge & midpoint type), Semi converter, Dual converter operation, Single phase bridge, therr
phase bridge (circulating & non circulating).

Invertors : Types-series, parallel, bridge, PWM voltage source inverter (CSI), Current source invertors (CSI), Filters-Types, calculation. Commutations methods, transistorized power controllers circuits
Choppers: Types A, B, C, D, E Multiphase, line filter; one, two and four quadrant operation of choppers, commutation methods: AC Regulator: Single phase and three phase Manual, Auto solid state, servo control

Text Books
1. Sen P. C. ; “Morden Power Electronics”; Wheeler Publishers,1998
2. Singh. M. G., K.B. Khanchandani; “Power Electronics”; Tata MaGraw Hill, 2000.

Reference Books

1. Bose. B. K.; "Modern Power Electronics and AC Drives"; Pearson education India, Indian Reprint, 2003.
2. Ned Mohan, etal; "Power Electronics"; John Willey, 2000.
3. Lander C. Y; "Power Electronics": McGraw Hill International, 1993

EEP309 Power Electronics Lab [(0-0-2); Credits: 1] **Back**

Course Outcomes

Students are able to understand

1. Operation and applications of various power electronics converters.
2. AC voltage controllers and cyclo-converters.

List of Experiments

1. To study the Vt , It characteristics of SCR.
2. To study DC circuit breaker using SCR.
3. To study phase control AC-DC converter using SCR.
4. To study the relaxation oscillator using UJT.
5. Simulation of
   i) Single phase half wave rectifier.
   ii) Single phase full wave fully controlled rectifier [R, R-L, R & high L].
6. To study four modes of operation of TRIAC
7. To study AC Voltage regulator using SCR.
8. To study single phase inverter using self controlled devices as IGBT/MOSFET(single PWM, Multiple PWM, Sinusoidal PWM)
9. To study the Three phase inverter.
10. To study DC-DC converter i) Buck converter ii) Boost converter.
11. simulation of following experiments using PSIM
    i) AC Voltage regulator using SCR
    ii) Single phase inverter using self controlled devices as IGBT/MOSFET (Single PWM, Multiple PWM, sinusoidal PWM).
    iii) Three phase inverter.
    iv) DC-DC converter : - a) Buck converter. b) Boost converter.

ECL402 Comm. Net. & Network Applications [(3-0-0); Credits: 3] **Back**

Course Outcomes

Students will

1. Be able to distinguish between various network topologies and types of switching
2. Be knowing various medium access protocols and network hardware components
3. Be knowing details of network layer protocols IPv4 and IPv6
4. Be familiar with various protocols used for network control, management and testing.
5. Be conversant with application layer of internet (web technology)

Contents

Networks and services; network topologies; switching methods; network evolution; concept of layered architecture; the OSI model; the TCP/IP model; standardization and standards organizations. Study of telephone network; PCM-TDM based IDN; circuit switching; space and time division switching; signaling methods; store-and-forward switching. ISDN fundamentals; SS#7; Frame relay and ATM networks; SONET and SDH;

LANs and MAC protocols; ALOHA, slotted ALOHA, CSMA and CSMA-CD protocols; IEEE 802.3 protocol and MAC frame format. Details of 802.3 hardware options; 100 Mbps and 1000 Mbps Ethernet LANs, switches, bridges and VPN; Wireless LANs; LAN applications; client-server architecture;

Network Layer: services offered to the transport layer, internal organization as datagram or virtual circuit subnets; routing algorithms; congestion control; internetworking; Study of IPv4 and IP v6, DNS and Internet routing protocols.

Transport Layer: Design issues; study of TCP; connection setup and removal; flow control; reliable and efficient delivery, timer management. The TCP/IP protocol stack: ICMP, IGMP, UDP, BOOTP, DHCP etc.

Network applications: World Wide Web and HTTP; Web servers and browsers, Content Engines; FTP and TFTP; SMTP and MIME; DNS; multimedia networking; streaming stored audio and video; Internet audio and video communications.

Books

1. Leon-Garcia and Widjaja, "Communication Networks", TMH 3e
2. Peterson and Davie- Morgan Kauffman, "Computer Networks, a systems approach", Harcourt India 3e ,
3. Tanenbaum A. S.; "Computer Networks", PHI, 4e,
4. B. Forouzan, "Data Comuncation and Networking", TMH ,4e
5. Stallings William, "Data and Computer Communication", PHI, 6e
6. Kurose and Ross; "Computer Networking, a top-down approach featuring the Internet", Addison Wesley, (Low Price Edition)
7. Gallo and Hancock; "Communications and Networking Technologies", Thomson Learning 2e
8. Behrouz A. Forouzan, "Cryptography and Network Security", McGraw Hill

---

ECP402 Comm. Net. & Network Applications Lab [(0-0-2); Credits: 1] **Back**

Course Outcomes

Students will

1. Be able to configure user machines, switches and routers
2. Perform network functioning analysis tools using packet sniffer tools such as WireShark.
3. Be able to gather information on status, configuration and settings of various equipment on the network.
4. Be able to use the network for file sharing, printer sharing etc.
5. Be able to understand working of higher layer protocols.

Contents

1. Using utilities such as 'net help', 'netstart', 'netview' etc.
2. Study of networking devices, topologies and IEEE 802 series standards
3. Gathering information about NIC of a PC.
4. TCP/IP diagnostics and configuration using 'ping', 'ipconfig' etc.
5. Files sharing in LANs
6. User login and security settings
7. WireShark or similar open source packet sniffers and their use
8. Network protocol analyzer equipment.

ECL407 Radar Engineering [(3-0-0); Credits: 3] Back

Course Outcomes

Students will

1. To understand the basic concepts related with radar technology.
2. To understand various components and various antenna mechanism used for radar technology.
3. To know specific use of technology for various requirement.
4. Ability to design radar transmitter and receiver system
5. Ability to design, implements and analyse a radar system.

Contents

Radar range equation, CW and EM modulated radar.
Moving target, Indicated and pulse Doppler radar, Tracking radar.
Transmitters, Magnetron Oscillator, Modulators, Line Pulsing modulator.
Radar receiver, Receiver noise, Extraction of information from radar.
Radar Antennas, Parabolic reflector, Scanning feed, Reflector cassegrain, Lens Antennas.
Radar Clutter and interference-Radar Indicators.

Text / Reference Books

1. Skolink, "Introduction to Radar System", McGraw HillEdition
2. Heities & Coates, "Principles of Radar", McGraw HillEdition
3. Kingsley, "Introduction to Radar System", McGraw HillEdition

---

ECL412 Advanced Digital Signal Processing [(3-0-0); Credits: 3] Back

Course Outcomes

Student will

1. know basic concepts of digital signal processing
2. familiar with techniques for speech processing
3. be knowing techniques for multi-rate filtering
4. study different data compression methods
5. study Wavelet transform and various applications of DWT

Contents

Introduction to Speech processing, Speech production model, Linear predictive coding for speech, Yule-Walker equations, Short Time Fourier Transform (STFT) , analysis of speech signals using STFT.
Multirate signal processing, decimator, interpolator, poly - p h a s e decomposition, Noble identities, application to Discrete multi-carrier transmission, sigma-delta ADC.Data compression, lossy and lossless compression, LZW compression, Arithmetic coding, Discrete Cosine Transform (DCT) and its application to still image compression, audio compressionIntroduction to Wavelet transform: Properties of wavelet transform, DWT, filter implementation of DWT, applications of DWT for image denoising and Scaling functions as signaling pulses in communication.
Introduction to commercial DSP processors & DSP architecture

Text Books

1. S. Haykin, "Adaptive Filter Theory", 4th edition Prentice Hall
2. Khalid Sayood "Introduction to Data Compression" 2nd edition Morgan Kaufmann Publishers
3. S. K. Mitra "Digital Signal Processing: A Computer Based Approach" 4th edition TMH
4. R. M. Rao and A. S. Bopardikar "Wavelet Transforms: Introduction to theory and Application" 4th edition Pearson Edition

Reference Books

1. Dag Stranneby & William Walker, "Digital Signal Processing & Applications", 2nd Edition, Elsievier.

ECP412 Advanced Digital Signal Processing Lab [(0-0-2); Credits: 1] **Back**

Course Outcomes

Student will

1. implement basic digital signal processing techniques for different applications related to communication
2. study different systems related to advanced digital signal processing
3. implement STFT for different applications
4. implement DWT for different applications
5. implement basic digital processing algorithms in dedicated DSP platforms

List of Experiments

1. Speech Synthesis and reconstruction using LPC model
2. Study of interpolation and Decimation
3. Study of Sigma Delta ADC
4. Synthesis & Analysis of signal using STFT
5. Synthesis & Analysis of signal using DWT.
6. Study of OFDM system
7. Study of DFT algorithm using CC studio
8. Implementation of Speech signal analysis and synthesis using TMS DSP kit
9. Implementation of Matched filtering Algorithm using TMS DSP kit

---

ECL423 Image Analysis and Computer Vision [(3-0-0); Credits: 3] **Back**

Course Outcomes

Students will

1. learn about the difficulties associated with automated image content recognition and understand the imaging issues from the perspective of quantitative image analysis.
2. Know a broad range of computer vision techniques and apply methods that are most relevant to their research.
3. know computer vision algorithms, methods and concepts which will enable the student to implement computer vision systems with emphasis on applications and problem solving.
4. Have in-depth understanding of human vision system with its usefulness in development of machine vision algorithms by looking at stereoscopic(3D) vision systems.
5. be able to apply the knowledge imparted to develop a computer vision system.

Contents

Review of basics of Digital image processing, Introduction about computer vision: What is computer vision, advantages and disadvantages of computer vision, general applications of computer vision. Feature detection and matching: Points and patches, edges, lines, Segmentations: Feature based alignment: 2D and 3D feature based

alignments algorithms and applications, Pose estimation algorithms. Motion estimation: Differential motion analysis methods, optical flow, detection of specific motion patterns, image stitching, motion models for tracking, alignments, compositing. Image and video Compression techniques. Computational imaging: super resolution, blur removal, image matting and compositing, texture analysis and synthesis, stereo imaging, basic concepts, and applications.3D image processing techniques: basics of 3D images, 3D sensing, camera calibrations, and reconstructions, 3D from 2D image, surface based representations, point based representations, and volumetric based representations, and model based reconstruction, recovering textures from 3D images and applications of 3D imaging techniques, 3D shape recognition.
Object Recognition techniques Basics Color image processing: Color fundamentals, color models, color transformation, color segmentation, smoothing, and sharpening. Case studies of computer vision projects such as content-based image retrieval face recognition etc.

Text Books

1. Richard Szeliski Springer, "Computer Vision: Algorithms and Applications", 2010
2. Shapiro and Stockman, "Computer Vision", Prentice Hall, 2001
3. Sonka, Hlavac, and Boyle Cengage Learning, "Image Processing, Analysis, and Machine Vision", 2009.

Reference Books

1. Harley R. Myler, "Fundamentals Of Machine Vision", PHI Learning (2003)
2. Forsyth, David A., Ponce, "Computer Vision: A Modern Approach", Jean PHI Learning (2009)
3. Earl Gose Steve Jost and Richard Johnsonbaugh, "Pattern Recognition and Image Analysis", PHI (2009)
4. Anil K. Jain, "Fundamentals of Digital image processing", PHI, 2010
5. Rafael C. Gonzalez and Richard E. Woods, "Digital image processing", Pearson Education 3rd Edition.

ECP423 Image Analysis And Computer Vision Lab **[(0-0-2); Credits: 1]** **Back**

Course Outcomes
Students will
1. understand the basics of images, image processing and software tools used to implement various algorithms used in image.
2. Develop a balanced view of modern image processing studies between theoretical aspects and practical implementations.
3. learn about the problems and issues associated with automated image analysis algorithms and techniques from the perspective of quantitative image analysis.
4. Know implementation of broad range of computer vision techniques
5. Implement computer vision techniques with emphasis on practical aspect.

List of Experiments
Phase-I:

1. Understanding **basics of images** and understanding of **2D signal handling** by generation of various patterns
2. Performing simple **arithmetic operations** on images (Take Lena and Cameraman images)
   i) Add a constant
   ii) Subtract a constant
   iii) Multiply a constant
   iv) Divide a constant
   v) Addition of two images
   vi) Subtraction of two images
   vii) Multiplication of two images
   viii) Division of two images.

3. Perform **specific intensity search** operations on images (Take Lena and Cameraman Image)
4. Perform **Edge, point and line detection** operations on images.
5. **Image fusion** in spatial domain (Take Lena and cameraman image and perform the operation).
6. **Image Thresholding:** Apply the following thresholds on Lena and cameraman images and compare the results. (The thresholding curves are given in pages 4 of 5 and page 5 of 5):
7. **Image segmentation**: Understanding and implementation of various Image segmentation methods.

Phase-II:

8. **DCT**: Apply Discrete Cosine Transform (DCT) on two the images. (Take cameramen and Lena images)
9. **IDCT:** Apply Inverse Discrete Cosine Transform (IDCT) on the image. (Take cameramen and Lena images)
10. **Image Compression and Decompression:** Perform image compression and decompression using JPEG.

11. **DWT:** Apply Discrete Wavelet Transform (DWT) on two the images. (Take cameramen and Lena images)
12. **IDWT:** Apply Inverse Discrete Wavelet Transform (IDWT) on the image. (Take cameramen and Lena images)
13. **EZW:** Implement Embedded Zero Wavelet (EZW) algorithm on Images.
14. **Image Compression and Decompression:** Perform image compression and decompression using DWT (JPEG 2000).
15. **Color Image Processing:** Perform the following operations on color images (Take RGB color images)
    i) Color Replacement
    ii) Color Detection
    iii) Change of planes
    iv) Color Space Transformations

Phase-III:

16. **Video Processing:** Operations on gray scale videos
    i) Extracting frames from videos
    ii) Playing video in reverse
    iii) Applying background subtraction, frame differencing algorithm. (Take Video traffic Video)
17. **Video Processing:** Operations on Color videos
    i) Extracting frames from videos and dealing with color video frames
    ii) Playing video in reverse
    iii) Applying background subtraction, frame differencing algorithm.
18. **Motion Estimation:** Understanding and implementation of motion estimation techniques used in videos.
19. **Video Compression and decompression:** Perform video compression and decompression mechanisms.
20. **MRA:** Perform Multi Resolution Analysis (MRA) on images and videos.
21. **Image Sharpening:** Understanding and implement Image Sharpening algorithms.
22. **Image and Video Watermarking:** Study and Implement any one of the watermarking algorithm on image and video.
23. **Image Stitching:** Understanding and implement Image Stitching algorithms.

Phase-IV:

24. **Image Matting:** Understanding and implement Image matting algorithms.
25. **Object Detection:** Study and Implement the object detection method on videos for detecting the stationary and moving objects.
26. **SIFT/SURF:** Study about SIFT/SURF and implement any one of the method.
27. **Stereo Imaging:** Understanding and implement Stereo Imaging.
28. **Computer Vision Applications:** Study and implement at least one method for Content based image retrieval.
29. **Computer Vision Applications:** Karhunen – Loeve Transform (KLT) based face representation and recognition system.
30. **Computer Vision Applications:** Study and implement at least one method for video surveillance, human tracking, vehicle tracking, etc

---

ECL424 Optical Communication [(3-0-0); Credits: 3] **Back**

Course Outcomes

Students will

1. Familiarity with basic concepts and theory of Optical Communication.
2. Ability to demonstrate OPCOMM components, assemble them and solve problems on Optical Communication system.
3. Ability to design, implements, analyzes and maintains optical communication system
4. Knowledge of different source of light as well as receiver nd their comparative study
5. To get idea about power budget and ultimately be an engineer with adequate knowledge in optical domain

Contents

Optical Fiber: Basic concepts of optical communication. The nature of light. Light as an Electromagnetic Wave, Polarisation, Interference. Transmitting light on a Fibre Refractive index, Fibre refractive index profiles, Modes of propagation. Light Propagation in Multimode Fibre, Snell's Law Critical Angle, Numerical aperture.

Optical Sources: Light Emitting Diodes (LEDS), The Semiconductor Junction Diode, Construction and Operation of LED's , Heterojunctions (Practical LED's) , Characteristics of LED'S, Lasers, Principle of the LASER, Semiconductor Laser Diodes.

Optical Detectors: Photoconductors, Photodiodes, P-N Diodes, P-I-N Diodes, Schottky-Barrier Photodiodes, Avalanche Photodiodes (APDS), Hetero-interface Photodetectors, Travelling Wave photo detectors, Phototransistors.

Optical Communication Systems: Point-to-point Transmission Systems, Modulation techniques, On-off key, Multi state coding, Forward Error correction, Receiving the signal, Timing recovery, Bandwidth Occupancy.

Text/References Books

1. Senior, "Optical Fibre Communication Practice and Principles"
2. D. C. Agrawal, "Fibre Optic Communication"
3. Keiser, "Optical Communication"

ECP424 Optical Communication Lab [(0-0-2); Credits: 1] **Back**

Course Outcomes

Students will

1. Familiarity with basic concepts and theory of Optical Communication.
2. Ability to measure different optical fiber parameter.
3. Ability to measure and understand different characteristics of source and receiver
4. Visualise different scheme of communication in optical medium.
2. ability to design a optical communication link

List of Experiments

1. Measurement of propagation losses in an Optical Fiber
2. Measurement of Numerical Aperture of an Optical Fiber using 660 nm LED
3. Study of V-I , I-P characteristics of laser and V-I characteristics of 660 nm LED
4. (a). Study of Fiber optic transmission sensor
5. (b). Study of Fiber optic reflection sensor
6. (c). Transmission of light through fiber with gaps
7. Setting up of Fiber optic digital link
8. Setting up of Fiber optic analog link
9. Study and measurement of Bit Error Rate (BER)
10. Study of Pulse width modulation and demodulation
11. Study of Pulse amplitude modulation and demodulation
12. Study of Pulse position modulation and demodulation

ECL434 Wireless Digital Communication [(3-0-0); Credits: 3] **Back**

Course Outcomes

Students will

1. knowledge at theoretical & practical level in modern wireless digital communication systems
2. awareness about most advanced standards, the future of digital wireless communication systems & networks.
3. Familiarity with cellular concept, mobile radio environment,
4. Familiarity with signals generation, modulation & processing.
5. Ability to work in mobile communication networks.

Contents

Introduction to wireless digital communication systems; block diagram of a typical RF transceiver, radio propagation and cellular engineering concepts; frequency reuse, frequency management and channel assignment, handoff and handoff strategies, trunking theory, coverage and capacity improvements, medium access techniques, FDMA, TDMA, CDMA, SDMA.

Modulation methods: Basic digital modulation methods; ASK, PSK and FSK; Quadrature multiplexing and its applications; advanced modulation methods QPSK, QAM, MSK, GMSK, applications of
differential coding, OFDM, MIMO.

Spread Spectrum methods: basics; generation and properties of PN sequences, DS-SS system analysis; slow and fast FH-SS system; performance analysis.

Interference measurement and reduction, co-channel and other interference, Diversity methods for Mobile Wireless Radio Systems, concepts of diversity branch and signal paths, combining and switching methods, C/N and C/I ratio improvements, average Pe improvements

Books

1. Theodore Rappaport, "Wireless Communication: Principles and Practices", Pearson Education 2nd edition
2. Feher, "Wireless Digital Communication", PHI
3. John Proakis, "Digital communication", Tata- McGraw-Hill, 3rd edition
4. Simon Haykin , "Digital communication", Wiley
5. Simon Haykin, "Communication systems", Wiley, 4th edition

ECD402 Project Phase II [(0-0-8); Credits: 4] **Back**

Course Outcomes
Students will
1. get an opportunity to apply knowledge of several courses in developing a new algorithm or circuit or a larger system.
2. implement innovative ideas and publish them as a research paper or file a patent.
3. learn working as a team.
4. acquire additional skills otherwise not covered in the curriculum
5. gain practical knowledge about the topic including social, commercial, manufacturing, testing, measurements, simulation, marketing and legal issues (as applicable).

MAL408 Statistical Analysis & Queuing Theory [(3-0-0); Credits: 3] **Back**

Course Outcomes
Students will
1. be exposed to importance of statistical analysis.
2. Be aware of waiting time models.
3. Be able to use Markov chains for analysis.
4. Be able to apply queuing theory models to real life situations
5. Be able to use curve fitting methods

Contents

Testing of Hypotheses: Neyman Pearson theory of testing of Hypotheses: Some fundamental notions of hypotheses testing, Neyman Pearson lemma, unbiased and invariant tests, generalized likelihood ratio tests, Chi – Square test, t – tests, F – tests, Bayes and minimax procedures, methods of finding confidence intervals, unbiased and equivariant confidence intervals.

Stochastic Processes: Introduction, classification of stochastic processes, the Bernoulli process, the Poisson process, Renewal process, availability analysis, random incidence, renewal model of program behavior.

Discrete-Parameter Markov Chains: Introduction, computation of n- step transition probabilities, state classification and limiting distributions, distribution of times between state changes, irreducible finite change with A periodic states, the M/G/1 Queuing system, discrete parameter Birth-Death processes, finite Markov chains with absorbing states.

Continuous – Parameter Markov Chains: Introduction, the Birth and death process, other special cases of Birth – death Model, non Birth-Death processes, Markov chains with absorbing states.

Networks of Queues: Introduction, open queuing networks, closed queuing networks, non exponential service-time distributions and multiple job types, Non – product- Form Networks.

Regression , correlation and Analysis of Variance: Introduction, Least squares curve fitting, the coefficient of determination, confidence intervals in linear regression, correlation analysis, simple non linear regression, higher dimensional least squares fit, analysis of variance.

Books
1. Vijay K. Rohatgi& A.K. Md. EhsanesSaleh: “An Introduction to Probability and statistics” , John Wiley & Sons Inc., New York, 1976.
2. Kishor S. Trivedi : “Probability & Statistics with reliability, Queuing and computer Science applications”, PHI private Ltd, 2009.

ECL406 Mobile Communication Systems [(3-0-0); Credits: 3] **Back**

Course Outcomes
Students will
1. Be aware of generations of wireless mobile communication technologies
2. Be conversant with how various decisions were made while evolving the mobile communication system standards.
3. Be aware of functioning of mobile communication network
4. Be familiar with features of wireless LAN technologies
5. Be familiar with Bluetooth communication technology

Contents

The second generation (2G) systems
GSM: services, features, architecture, radio link, channel types, frames, call handling

CDMA IS95: forward and reverse channels, system architecture, call handling.
2.5G systems
GPRS: data rates, basic services, system architecture, protocols, coding schemes, mobility management, hardware and software components
EDGE: evolution, advanced modulation methods, radio transmission and data rates, services and protocols.
The 3G systems: Introduction, evolution of 3G networks, ITU IMT 2000,
CDMA 2000: bandwidth, chip rate, channels, spreading and modulation, power control, soft handoff, EV-DO, EV-DV
UMTS: radio access network, spreading and modulation, channels, core network.
Wireless LANs
IEEE 802.11 system and protocol architecture, physical layer and MAC, options like 802.11b, a g etc. and their purpose.
Bluetooth: User scenarios, layered architecture, link management, L2CAP, SDP, IEEE 802.15Mobile Communication

Books

1. Jochen Schiller Addison Wesley, "Wireless Communication: Principles and Practices", 2nd Edition
2. Theodre S. Rappaport, Pearson Education, "Wireless and Mobile Network Architecture", Yi-Bing Lin and Imrich Chlamtac Wiley Publication.
3. Gordon L., "Principles of Mobile Communication", Stuber Kluwer Academic Publishers, Norwell, Ma, USA 1st Edition
4.. Kasera Sumit, "3G Mobile Network: Architecture, Protocol and Procedures", Narang Nishit Tata McGraw Hill.

ECL409 Radio Frequency Circuit Design [(3-0-0); Credits: 3] **Back**

Course Outcomes

Students will

1. be able to design passive matching networks.
2. be familiar with RF amplifiers in general
3. be able to design LNA, PA for a specified application.
4. design other circuits such as mixer, oscillator and phase locked loops
5. be familiar with A/D and D/A converters for RF applications

Contents

Characteristics of passive components for RF circuits. Passive RLC networks. Transmission lines. Two-port network modeling. S-parameter model. The Smith Chart and its applications. Active devices for RF circuits: SiGe MOSFET, GaAs pHEMT, HBT and MESFET. PIN diode. Device parameters and their impact on circuit performance.
RF Amplifier design: single and multi-stage amplifiers. Review of analog filter design. Low-pass, high-pass, band-pass and band-reject filters. Bandwidth estimation methods. Voltage references and biasing. Low Noise Amplifier design: noise types and their characterization, LNA topologies, power match vs noise match. Linearity and large-signal performance.
RF Power amplifiers: General properties. Class A, AB and C PAs. Class D, E and F amplifiers. Modulation of power amplifiers. Analog communication circuits: Mixers, phase-locked loops, oscillators and synthesizers. Design and performance characterization. Transceiver design.

Text Books

1. Lee Thomas H, "The Design of CMOS Radio Frequency Integrated Circuits", Cambridge University Press.
2. Razavi Behzad, "Design of Analog CMOS integrated circuits", McGraw Hill
3. Bosco Leung, "VLSI for wireless communication" Pearson Education

---

ECP409 Radio Frequency Circuit Design Lab [(0-0-2); Credits: 1] **Back**

Course Outcomes

Students will

1. be able to analyze an impedance transformation network using a software tool and use the circuit in their design.
2. be able to design physical lay-out of a passive component and evaluate its performance with software tools such as ADS or Microwave Office.
3. will be able to characterize an RF component or circuit using S-parameter matrix
4. be able to design RF amplifier and related circuits and evaluate the performance using software tools.
5. Be able to design mixers and oscillators and evaluate performance using software tools

Contents

Phase-I: Simulation of impedance transformation passive networks

1. L- section upward transformation
2. L-section, downward transformation
3. π- circuit
4. T-circuit
5. Tapped capacitor resonator
6. Tapped inductor resonator
7. Double tapped resonator

For every network, plot the Zin as function of frequency and load resistance Rs.

Phase-II: Simulation of passive RF components.
(Layout design and simulation, circuit models and parameter extraction, circuit simulation)

1. Design of resistor using poly-silicon over field oxide.
2. Parallel plate capacitor using poly-insulator-poly and metal-insulator-metal layers.
3. Lateral flux capacitors (inter-digitated, simple fractal)
4. Spiral inductor and transformer. (Use of Razavi's formula and Lee's formula)
5. Active resistor and MOS capacitor using MOSFETs

Phase-III: S parameter characterization of passive and active components
Using the advanced micro-strip trainer, find the S-parameters of the following components

1. Patch antenna (transformer feed and inset feed)
2. Low-pass filter
3. Band-pass filter
4. Band-reject filter
5. Ring resonator
6. Power divider (with and without isolation resistor)
7. Rat race hybrid ring coupler
8. Parallel line coupler
9. Branched line coupler
10. Amplifier

Phase-IV: Design and simulation of active circuits

1. Common Source and Common Gate CMOS amplifier
2. Differential amplifier
3. Single ended LNA
4. Double ended LNA
5. Power amplifiers class A, B, C
6. Power amplifiers class D, E and F
7. Gilbert mixer
8. Colpitt and Hartley oscillators
9. Negative frequency oscillators

ECL410 Satellite Communication [(3-0-0); Credits: 3] **Back**

Course Outcomes
Students will

1. Be conversant with orbital aspects of satellite communication
2. Be able to design satellite link
3. Be knowing about digital satellite links
4. Be familiar with multi-access schemes
5. Be familiar with earth station technology

Contents

Orbital aspects of satellite communication, Orbit mechanisms, Equation of orbit, Locating satellite in orbit, Orbital elements, Orbital area coverage, Look angles, Slant range,
Space craft subsystems, Attitude and orbit control system, Telemetry tracking and command system (TTC), Power subsystems, Antennas, Reliability
Satellite link design, System noise temperature, G/T ratio, Down link design, Uplink design, Link for specified (C/N) base-band noise signal.
Digital Satellite Links, Frequencies and channel allocations, Modulation techniques, QPSK, QAM, BER analysis, medium access methods for satellite communication.
Earth station technology, Earth station design for low system noise temperature. Equipment for earth stations, LNA and HPA.

VSAT systems- overview of VSAT systems, Access control protocols, multiple access selection, modulation, coding and interference issues .

Books

1. Timothy Pratt, Charles Bostian, Jeremy Allnut, "Satellite communication", John Willey and Sons Inc. Second edition
2. W. L. Pritchard, H.G. Suyderhoud, R.A. Nelson, "Satellite Communication Systems Engineering", Pearson Education Second edition
3. Wayne Tomasi, "Advanced Electronic communications", Prentice Hall of India Pvt. Ltd Fifth edition
4. Frank.R. Dungan, "Electronic Communication Systems", International Thomson Publishing Company Third edition.
5. Roddy, "Satellite Communication", Second edition .
6. Dr. K. Miya, "Satellite Communication Technology", Second edition

---

ECL411 Digital Image Processing [(3-0-0); Credits: 3] **Back**

Course Outcomes

Students will

1. To understand and explore importance of Digital Image Processing.
2. To extend the theory concepts of Digital Signal Processing further to Digital Image Processing.
3. To physically understand concepts of digital image enhancement and filtering in spatial domain.
4. To implement frequency domain filters for image processing applications.
5. To visualize basic computer vision algorithms using the learned Image Processing concepts.

Contents

Elements of visual perception, Digital Image fundamentals, Basic image processing steps, Image Transforms, Image enhancement in spatial and frequeny domain, linear gray level transformations, Histogram equalization and specification ,smoothing & sharpening spatial filters, Image degradation models ,image restoration, inverse filtering, Wiener filtering. Image reconstructions from projections, radon transform, projection theorem of computerized tomography Morphological image processing ,dilation ,erosion, Basic morphological algorithms ,thinning algorithms Edge detection ,Edge linking & Boundary Detection ,watershed segmentation algorithm , Introduction to object recognition., colour image processing ,RGB and HSI color models, Gray level to color transformations

Books

1. Gonzalez R.C. and Woods R.E., "Digital Image Processing", Pearson, Second
2. Pratt W.K., "Digital Image Processing", Wiley, Third
3. A.K.Jain, "Fundamentals of Digital Image Processing", PHI

ECL413 Adaptive Signal Processing [(3-0-0); Credits: 3] **Back**

Course Outcomes

Students will

1. review the basic concepts related to vector space and Eigen analysis
2. review the basic concepts of stochastic signals and statistics of stationary signal
3. implement Wiener filter using different LMS algorithms
4. be familia with RLS algorithm
5. able to design adaptive filters for different applications

Contents

Vectors, Matrices and Eigen Analysis. Application to adaptive signal processing. Stochastic Processes, Ensemble average, mean, average power, auto and cross correlation functions, stationarity and white noise, Auto-regressive process. Least Squares and LMS algorithms, Normal equations, properties. Eigen System decomposition. Gradient search technique, convergence properties of LMS. Normalized LMS algorithm. Recursive solution techniques, RLS algorithm. Application to noise cancellation, modeling of physical processes, communications.

Text Books

1 S. Haykin, "Adaptive Filter Theory", Fourth Edition Prentice Hall
2. B. Widrow and S. D. Sterns, "Adaptive Signal Processing", Pearson Education

Reference Books

1. M. J. Larrimore, C. R. Johnson and J. R. , "Theory and Design of Adaptive Filters", publisher

---

ECP413 Adaptive Signal Processing Lab [(0-0-2); Credits: 1] **Back**

Course Outcomes
Students will

1. measure statistical parameters of stochastic process
2. model AR and MA stochastic process
3. implement Wiener filter using pure LMS algorithm
4. implement Wiener filter using block LMS algorithm
5. design adaptive filters for different applications

Contents
Computation of mean, standard deviation, correlation function, correlation matrix, covariance matrix and power spectral density of a stochastic process
Computation of frequency and amplitude of a noisy sinusoidal signal
Modeling AR process of different orders
Modeling MA process of different orders
Realization of different AR process using pure LMS algorithm
Investigation of the role of step size on convergence and mean square error for pure LMS algorithm
Investigation of the role of step size on convergence and mean square error for pure LMS algorithm
Implementation of Fast block LMS algorithm
Implementation of RLS algorithm
Performing predictive deconvolution using LMS algorithm
Performing adaptive noise cancelling using LMS algorithm

ECL417 Multimedia Networks [(3-0-0); Credits: 3] **Back**

Course Outcomes
Students will
1. Be aware of functioning of circuit switched and packet switched networks
2. Be familiar with reasons for emergence of converged communication networks
3. Be aware of various media coding algorithms
4. Be conversant with transport and signaling protocols
5. Be familiar with emerging trends in multimedia networks.

Contents

Review of circuit switched digital telephony, signaling and transmission, ISDN, SS7. Evolution of packet switched networks, Internet and LANs. The TCP/IP protocol stack.

Introduction to XoIP, network convergence, Needs of individual users, enterprises and network operators. How XoIP is expected to meet all these concerns.

Source coding (speech, audio and video coding)
PCM, ADPCM, LP coding, CELP, RPE-LTP, adaptive sub-band coding, MPEG standards for audio and video coding

Signaling protocols
Review of H.323, MEGACO protocols, Session Initiation Protocol (SIP), detailed study of SIP, implementation of SIP through Java.

Media Transport
Need of special media transport protocols, RTP, RTCP, RTSP, QoS issues, routing, security etc.

Modern network technologies: mobile communication 3G, 4G, IMS, wireless LANs, wired networks. New services like IP-TV, multimedia conference calls, presence management, device and access independent services. VXML based applications

Books

1. O. Hersent, D. Gurle and JP Petit- “IP Telephony”, Pearson Education Asia
2. J. D. Gibson (Editor) “Multimedia Communications” – Harcourt India
3. Bill Douskalis “IP Telephony”, Prentice Hall
4. R. Wittman, M.Zitterbart-Morgan Kaufman, “Multicast Communication”

ECL418 Network Planning And Management [(3-0-0); Credits: 3] **Back**

Course Outcomes

Students will

1. Understand applications of traffic analysis to network planning
2. Understand various procurement and installation procedures.
3. Understand operation and maintenance systems for telecom networks
4. Design an enterprise network based on the requirements of an organisation.
5. Understand protocols and applications for enterprise network management and diagnosis

Contents

Network traffic data analysis and forecasting, resource planning, procurement and installation
Telecom network operation and maintenance system. Case studies of ISDN, ATM, GSM, CDMA networks.
Enterprise need analysis and LAN design, component selection, procurement and installation.
Network management issues such as configuration management, fault and maintenance management, security and access management.
Management protocols such as SNMP, web based management tools such as Netconf, management protocol issues such as scalability, efficiency, effectiveness etc.

Text/References

1. Subramanian ; "Network Management" ; Addison Wesley (Low Price Edition)
2. McCabe J.D., "Network analysis, architecture and design", Elsevier
3. FitzGerald J., Dennis A., "Business Data Communications and networking".

ECL419 Wireless Sensor Networks [(3-0-0); Credits: 3] **Back**

Course Outcomes

Students will

1. This course provides an introduction to wireless sensors which have applications in many fields.
2. Students will be able to design wireless sensor networks for an application after completion of the course.
3. Students can know about emerging research areas in the field of sensor networks after successful completion of this course.
4. Students can know about various MAC protocols used for different communication standards used in WSN
5. Students can explore new protocols for WSN

Contents

Introduction to Sensor Networks, unique constraints and challenges, Advantage of Sensor Networks, Applications of Sensor Networks, Types of wireless sensor networks
Mobile Adhoc NETworks (MANETs) and Wireless Sensor Networks, Enabling technologies for Wireless Sensor Networks. Issues and challenges in wireless sensor networks
Routing protocols, MAC protocols: Classification of MAC Protocols, S-MAC Protocol, B-MAC protocol, IEEE 802.15.4 standard and ZigBee,
Dissemination protocol for large sensor network. Data dissemination, data gathering, and data fusion; Quality of a sensor network; Real-time traffic support and security protocols.
Design Principles for WSNs ,Gateway Concepts Need for gateway ,WSN to Internet Communication, Internet to WSN Communication.
Single-node architecture, Hardware components & design constraints,
Operating systems and execution environments, introduction to TinyOS and nesC.

Text Books

1 Waltenegus Dargie , Christian Poellabauer, "Fundamentals Of Wireless Sensor Networks Theory And Practice", By John Wiley & Sons Publications

Reference Books

1. Sabrie Soloman, "SENSORS" HANDBOOK by Mc Graw Hill publication.
2. Feng Zhao, Leonidas Guibas, "Wireless Sensor Networks", Elsevier Publications.
3. Kazem Sohrby, Daniel Minoli, "Wireless Sensor Networks": Technology, Protocols and Applications, Wiley-Inderscience
4. Philip Levis, And David Gay Tinyos "Programming" by Cambridge University Press.

ECP419 Wireless Sensor Networks Lab [(0-0-2); Credits: 1] Back

Course Outcomes

Students will

1. Know wireless sensors which have applications in many fields.
2. design wireless sensor networks for an application
3. know about emerging research areas in the field of sensor networks
4. know about various MAC protocols used for different communication standards used in WSN
5. explore new protocols for WSN

List of experiments

1. Introduction to various sensor networks simulators
2. Introduction to Tossim and Cooja simulator
3. Simulating WSN using NS-2
4. Compiling and building an application onto a mote
5. Sensing data using WSN motes.
6. Simulating WSNs made up of motes running TinyOS using the TinyOS simulation framework TOSSIM
7. QoS analysis for sensor networks
8. Experiments based on different routing protocols
9. MAC layer protocols implementation
10. Experiments on actual sensor hardware such as body sensor network kit

---

ECL427 Broadband Communication [(3-0-0); Credits: 3] Back

Course Outcomes

Students will

1. Be conversant with orbital aspects of satellite communication
2. Be able to design satellite link
3. Be knowing about digital satellite links
4. Be familiar with multi-access schemes
5. Be familiar with multi-carrier communication systems

Contents

Satellite Communication Systems

Orbital aspects of satellite communication, Attitude and orbit control system, Telemetry tracking and command system (TTC), Power subsystems, Antennas, Reliability

Satellite link design, System noise temperature, G/T ratio, Down link design, Uplink design, Link for specified (C/N) base-band noise signal.

Digital Satellite Links, Frequencies and channel allocations, Modulation techniques, QPSK, QAM, BER analysis, medium access methods for satellite communication.

Multicarrier communication systems:

DMT, OFDM, MIMO systems, space-time coding, WiFi, WiMax, UWB systems

Books

1. Timothy Pratt, Charles Bostian, Jeremy Allnut, “Satellite communication”, John Willey and Sons Inc. Second edition
2. W. L. Pritchard, H.G. Suyderhoud, R.A. Nelson, “Satellite Communication Systems Engineering”, Pearson Education Second edition
3. Wayne Tomasi, “Advanced Electronic communications”, PHI Learning, Fifth edition
4. Frank.R. Dungan, “Electronic Communication Systems”, International Thomson Publishing Company Third edition
5. J. Proakis, “Digital Communication”, 4e, TMH
6. Simon Haykin, “Communication Systems”, 4e, John Wiley

ECL241 Overview of Communication Systems [(3-0-0); Credits: 3] [**Back**]

Course Outcomes

Students will be aware of the concepts in

1. Analog radio broadcast systems
2. Digital communication
3. Medium sharing mechanisms
4. Mobile communication systems
5. Satellite communications

Contents

Introduction to communication system, Element of Communication Systems, Types of signals, Time and frequency domains, Noise and Communication, Spectral analysis, Modulation theory, Need and types of modulation, Overview of AM and FM modulation systems. AM & FM transmitters and Receivers.

Principles of Digital Communications, Merits and Demerits of Digital Communication over Analog Communications. Overview of various multiplexing techniques, FDM,TDM, CDMA, OFDM

Overview of wireless and cellular communication, Generation of Mobile communications, GSM and CDMA frequency bands, Concept of frequency reuse and various types of hand offs.

Introduction to optical fiber communications, principles, types of fibers, typical applications.

Introduction to Satellite communications – working principle, types, frequency, band of operations. TV broadcast standards. Working of HDTV and DTH systems.

Introduction to computer networking, concepts of layered architecture, OSI and TCP/IP, protocol, various topologies, standards, overview of working of internet.

Books

1. Roy Blake, “Electronic Communication Systems”, (2e) Cengage Learning
2. Joechen Schiller, “Mobile Communications”, Pearson
3. Louis Freznel, “Communication Electronics” – Principle and Applications, TMH

ECL242 Sensors and Instrumentation Applications [(3-0-0); Credits: 3] [**Back**]

Course Outcomes

Students will

1. Get an idea of how various electronic devices work
2. Be familiar with applications of operational amplifiers
3. Be aware of basic digital electronics
4. Be familiar with basic instrumentation
5. Be aware of measurement and control systems.

Contents

Introduction to Electronics

Semiconductor devices, Diode, zener diode, rectifiers Transistors, Amplifier CC,CB,CC configuration- JFET,FET,UJT,Thyristor

Operational Amplifiers, inverting, non-inverting, difference and instrumentation amplifier circuits. Basics of digital systems, binary numbers, Boolean algebra, gates AND, OR, NOT, NAND, NOR, EX-OR, flip-flops, SR, JK, D, T, counters and registers. Digital systems, processors, memories etc.

Introduction to Measurement

Static and dynamic characteristics - Active and passive transducers, Sensors and transducers, Pressure, Flow, Level, Temperature, humidity, light sensor ,piezo electric transducer

Actuation Systems ADC ,DAC types

Pneumatic: control Valves-types

Electrical :Solid state switches-DC motor-AC motor-Stepper Motor
Control Techniques
Controller :ON OFF,P,PI,PID
Study of PLC-simple problems-case study on microprocessor and microcontroller based control(temperature ,Level)

Books

1. Robert L. Boylestad, Louis Nashelsky; "Electronic Devices and Circuit theory"; PHI
2. Cooper, Helfrick, "Electronic instrumentation & Measurement Techniques"; Prentice Hall India(PHI)
3. Kalsi; "Electronic Instrumentation", Tata Mc-Grawhill
4. Currtis D.Jhonson, "Process control Instrumentation Technology"; Pearson edition
5. Clyde F Coombs, "Electonic Instrumentation Handbook" Mc-Graw Hill

---

ECP243 Introduction to Electronics and Instrumentation [(0-0-2); Credits: 1] Back

Course Outcomes

Students will
1. learn the basics of diodes, BJTs and FET semiconductor devices.
2. Acquire knowledge about basics of digital electronics.
3. have ability to identify, analyze and design combinational circuits
4. Acquire knowledge about Microprocessors and its need for measurement and control.
5. Acquire basic knowledge of Motors, generators and transformer
6. Understand basics working principle of instruments involved in chemical measurement.

Contents

Semiconductor devices, diodes, Transistors: BJT, FET JFET MOSFET Amplifier circuits,
ADC and DAC.

Introduction to measurements static and dynamic characteristics – Active and passive transducers Sensors and transducers, pH, ion detectors, pressure, flow, level, temperature, humidity, light spectral sensor, IR and UV sensors, piezo-electric transducer.

Actuation systems
Pneumatic: control valves- types Electrical: Solid- state switched DC motor-AC motor-Stepper motor
Control Techniques, Controller: On-off, P, PI, PID

Spectrophotometer(UV and IR), Gas and liquid Chromatograph Analyser, Thermo Gravimeter Analysis, Differential Thermo Gravimetric Analysis, Refractmeter, Polari meter

Books

1. Robert L. Boylested, Louis, Nashelsky, "Electronic Devices and Circuit theory", PHI
2. Curtis D. Johnson, "Process Control Instrumentation Technology", Fourth edition, Prentice Hall of India, New Delhi, 1999.
3. Doebelin E.O, "Measurement Systems - Application and Design", Fourth edition, McGraw-Hill International Edition, New York, 1992.
4. Clyde F Coombs, "Electronic Instrumentation handbook", McGraw – Hills
5. Cooper, Helfrick, "Electronic Instrumentation and Measurement Techniques", PHI
6. H. S. Strobel, "Chemical Instrumentation, A Systematic approach"
7. Skoog, Holler, Niemay, "Principles of Instrumental Analysis", Fifth edition

---

ECL 206 Electronics Devices And Circuits [(3-0-0); Credits: 3] Back

Course Outcomes

Students will
1. explain the concept of semiconductor physics
2. understand the operation of semiconductor diodes and their role in rectifier, clipper and clamper
3. understand the concept of bipolar transistor, biasing and amplifier topologies
4. analyze the performance of field effect transistors based on their operation and working

5. understand and define the concept of power amplifier and also the role of feedback in amplifier and oscillator circuits

Contents

Semiconductor Physics, P &N Type Semiconductors, Diodes and Power Supplies, Theory of P-N Junction Diode, Junction Capacitance, Characteristics & Applications of Following Diodes, Zener, Schottkey, Photodiode, LED, LCD, Varactor Diode &Tunnel Diode

Power Supplies, Halfwave & Fullwave, Rectifiers, Filters, Ripple-Factor, Zener & Emitter Follower Type Regulators

Junction Transistors Theory of Operation, Static Characteristics, Break Down Voltages, Current Voltage Power Limitations, Biasing of BJT Different Biasing Arrangements, Stability Factor, Thermal Runaway, Power Transistors

Power Amplifiers Classification A, B, AB, C Classes, Efficiency, Push Pull Configuration, Complimentary Symmetry, Second Harmonic & Cross Over Distortion. Positive and Negative Feedback Amplifiers Classification, Practical Circuits, Applications, Advantages. Oscillators Stability, Barkhausen Criteria, RC, LC & Crystal Oscillators

Field Effect Transistor & MOSFET, Principle of Operation & Characteristic, Biasing Arrangement, Small Signal Analysis of CG, CD & CS, High Frequency Analysis

Text Books

1. Milman and Halkias “Integrated Electronics” Second Edition McGraw Hill.
2. Bapat “Theory & Problem in Circuit analysis”, edition number McGraw Hill.

Reference Books

1. Boylestad and Nashelsky, “Electronic Devices & Circuit theory”, Tenth EditionPrentice Hall
2. Schilling &Belove. “Electronic Circuits - Discrete and Integrated”, Third EditionMcGraw Hill
3. I.J. Nagrath, “Electronics - Analog and Digital”, First EditionPHI

ECP 206 Electronics Devices and Circuits [(0-0-2); Credits: 1] Back

Course Outcome

Students will

1. know about fundamentals of devices using general purpose laboratory instruments.
2. verify the theoretical characteristics of devices.
3. be able to design small circuits based on the knowledge gained through experiments in the laboratory.
4. be able to design electronics circuits using devices for different applications.
5. be able to analyse various electronics circuits through simulation and actual circuit implementation.

List of Experiments

1. Diode characteristics
2. LED characteristics
3. Zener diode as a voltage regulator
4. Half wave rectifier
5. Full wave rectifier
6. BJT characteristics
7. Biasing techniques of transistors
8. Single stage BJT amplifier
9. Junction field effect transistor characteristics
10. RC phase shift oscillator

ECL207 Digital Circuits [(3-0-0); Credits: 3] Back

Course Outcomes

Students will

1. Develop basic understanding of analog and digital signals and processing of them.
2. be able to differentiate between analog and digital electronics engineering domain of circuit designing.
3. conceptualize the combinational and sequential circuits and application of different tools K-maps, Quine–McCluskey algorithm for circuit minimization.
4. Apply minimization techniques to Boolean expressions for design of the combinational and sequential circuits.

5. Understand the role of VHDL for conceptualization of PLD's and implementation of combinational and sequential circuits in VHDL.

Contents

Motivation for digital logic and digital circuits/systems, Analog vs. Digital Systems, basic concepts on SSI, MSI, VLSI circuit classification. Boolean algebra, Postulates and Theorems. Binary Codes: Weighted, non weighted, error detecting and error correcting codes.

Basics of PN Junction Diode, Diode applications in digital circuits, Basics of Transistor , CMOS characteristics, , CMOS Logic.

Logic Gates, Truth tables, Sum of products, product of sums, Minimization of functions, Karnaugh maps.

Combinational Circuit: Adders and subtractors Decoders/Encoders, multiplexers/ Demultiplexers, code converters, realizing fucntions using Decoders, Multiplexers.

Sequential Circuits: Flip-flops and latches: D, T, J/K flip-flops, Master Slave Flip flops, shift registers. Counters (Synchronous/Asynchronous), different module counters with reset/clear facility, asynchronous and synchronous design using state and excitation tables.

Overview of VLSI design process. PAL, PLAs, PROMS structure overview. Introduction to Hardware description language for digital circuit implementation (VHDL).

Text/References Books

1. Kohavi Zvi, "Switching & Finite Automata Theory", TMH
2. M.Morris Mano, "Digital Design", Pearson education
3. Stephen Brown , Vranesic Z, "Fundamentals of Digital Logic with VHDL Design", TMH
4. Bhaskar J, "VHDL Primer", B.S. Publication

ECP207 Digital Circuits Lab [(0-0-2); Credits: 1] Back

Course Outcomes

Students will

1. understand analog and digital signals and processing of them.
2. Know building blocks used in digital circuit designing.
3. To understand the implementation of combinational and sequential circuits using the minimization techniques (K-maps, Quine–McCluskey algorithm)
4. Be aware of applications of the combinational circuits and sequential circuits in the real world scenarios by implementing different circuits.
5. Know debugging and rectifying the design problems associated for minimizing the design error probability.

List of Experiments

1. Study of the basic and derived logic gates as electrical circuits.
2. Study and verification of truth tables of basic and derived gates.
3. Study, verification and implementation of universal gates using basic gates.
4. Study of combinational logic circuit designing with simple circuits (Study of POS and SOP implementations)
5. Study of K-maps (up to 6-variable K-maps) to simplify/optimize combinational circuits.
6. Implementation of combinational circuit such as half adder, full adder, multiplexers, de-multiplexers, encoders and decoders, Magnitude Comparator etc.
7. Understanding basics of multiplexers and de-multiplexers.
8. To study and implement 16:1 MUX using 2:1 MUX only.
9. To study and implement 1:16 De-MUX using 1:2 De-MUX only.
10. Study of basics of various codes used in digital circuits.
11. To study and implement Code Conversion circuits using combinational logic circuit designing.
    a. Binary to BCD
    b. Binary to Excess-3
    c. Binary to gray code
    d. BCD to Binary
    e. Excess-3 to Binary
    f. Gray code to Binary
12. To study and implement S-R Flip-flop using universal gates.
13. To study and implement J-K Flip-flop using universal gates.
14. To study and implement various types of shift registers.

15. To study and implement various types of counters.
16. Design problem: To implement one given design problem.

ECL320 Linear Electronics Circuits [(3-0-0); Credits: 3] **Back**

Course outcomes

Students will

1. Understand basic building blocks of Operational amplifiers
2. Understand characteristics of Operational amplifiers
3. design amplifier and waveform generating circuits using Operational amplifiers.
4. gain knowledge in designing stable voltage regulators and filter circuits.
5. gain knowledge on specialized ICs

Contents

Basic Operational Amplifier Circuit: Differential Amplifier Stage, Current Source, Biasing, Level Shifting Techniques, Common Mode and Differential Mode Gains and Impedance of a Differential Stage. Overload Protection Circuits, Frequency Response and Compensation, Characteristics of Ideal and Non -Ideal Operational Amplifier, Error Measurement of Various Parameters.

Simple Linear Circuits: Inverting, Non-Inverting Buffer Amplifiers,Summers,Integrators,Differentiators,Log,Anti-log,Multiplier,Divider circuits, Differential Amplifier Configuration, Bridge Amplifier, Instrumentation Amplifier, Grounding & Shielding Problems in Instrumentation Amplifier.

Precision Rectifier, RMS to DC Conversion, Constant Current & Voltage Sources, Sinusoidal Oscillators with Frequency & Amplitude Stabilization, Elementary Idea of Active filter with Butterworth 2^{nd} order filter design procedure

Application of Operational Amplifier for Clipping Clamping, Comparator circuits with Non-Linear Components, Multiplexers, De- Multiplexers, Astable, Monostable, BistableMultivibrator circuits using OA Sample/HOLD circuits D/A and A/D conversion circuits Phase-Locked Loops.

Study of Linear ICs like: LM741,LM555,LM565 and LM723

Text/Reference Books

1. Gayakwad R, “OP-AMPs and Linear Integrated Circuits”, PHI PUB,4^{th} Edition
2. Coughlin R, Driscoll F, “Operational Amplifiers and Linear Integrated Circuits”, PHI pub.
3. Tobey, Grames and Huelsman, “Operational Amplifiers: Design and Applications”, McGraw Hill.

ECP320 Linear Electronics Circuits Lab [(0-0-2); Credits: 1] **Back**

Course outcomes

Students will

1. know basic laboratory instruments, device and its handling.
2. Analyze fundamental concepts learned in theory by using general purpose laboratory instruments.
3. be able to design and develop Analog Circuits for different applications.
4. be able to analyze various analog circuits through simulation and actual circuit implementation.
5. be able to analyze theoretical, analytical and simulated results for various circuits so that project can be built on this.

List of Experiments

1. Familiarization with general purpose lab instruments and various devices.
2. Op Amp as Inverting Amplifier
3. Op Amp as Non Inverting Amplifier.
4. Op Amp as Integrator
5. Op Amp as Differentiator.
6. Op Amp as Low Pass Filter.
7. Op Amp as High Pass Filter.

8. OP Amp as a Comparator.
9. Op Amp as a Schmitt trigger.
10. Op Amp as Half wave rectifier.
11. Op Amp as Full wave rectifier.
12. IC555 and Op Amp as Astable multivibrator.
13. IC555 and Op Amp as Monostable multivibrator.

ECL321 Microprocessors [(3-0-0); Credits: 3] **Back**

Course Outcomes
Students will
1. be able to identify the internal registers and memory organization
2. be able to do assembly language programming.
3. Be able to design interface circuits for microprocessors
4. Be able to design interface for controlling devices and data acquisition systems.
5. develop assembly language codes for microprocessor-based systems.

Contents

Architecture of Intel's 8085 microprocessor, Addressing modes of 8085 and its timing diagrams, Machine cycle, T-states, Bus structure.
Instruction set of 8085, Groping of instructions, Instruction cycle and their timing diagrams, Assembly language programming.
Stacks and sub routines, related instructions, Interrupts and associated instructions, Expanding interrupts, ALP for stacks and interrupt service routines.
Memory Interfacing, I / O mapped and memory mapped modes, interfacing of input and output devices, Multiplexed and matrix interfacing.
Architecture of 8086 and segmentation of memory, Odd-even memory and I / O interfacing, General and specific instructions of 8086, Assembly language programming with simple examples.
Study and Interfacing of 8255, 8254, 8251 with 8085 and 8086.

Reference Books
7. Gaonkar R.S, "Microprocessors Architecture, Programming and applications with 8085", Penram Publishing,Edition
2. Uffenbeck J, "Microprocessors and Microcontrollers", Prentice Hall of IndiaEdition

---

ECP321 Microprocessors Lab [(0-0-2); Credits: 1] **Back**

Course Outcomes
Students will
1. be able to identify the internal registers and memory organization for assembly language programming.
2. able to design interface circuits for microprocessors and also interface controlling devices and data acquisition systems.
3. develop assembly language codes for microprocessor-based systems.

List of Experiments

1. Addition of two 16 bit numbers and store 17 bit result in B-C-D registers.
2. Subtraction of two 32 bit numbers stored in BC & HL register pairs. Store result in memory.
3. Subtraction of two 32 bit numbers stored in memory. Store result in consecutive locations (using register indirect Addressing Mode).
4. Subtraction of two 32 bit numbers stored in memory. Store result in memory. (Use direct Addressing Mode).
5. A block of 10 numbers is stored in memory. Arrange these numbers in reverse sequence in a) different memory locations, b) same memory locations.
6. A block of 10 bytes stored in memory. Scan for a byte FFH. If true then stored them in a) different memory locations, otherwise in b) same memory locations.
7. A block of 10 bytes stored in memory. Store all even bytes and odd bytes in different memory locations.
8. Arrange numbers in ascending or descending order in the same memory locations.
9. Solve logical function Y=D2 (D4bar).D5+D2(D3bar)+(D0bar)D7 (D0………..D7 are bits of number in memory).

10. Write subroutine fro generation of delay of 1ms.
11. Generation of square wave and rectangular wave using 8255 and power flow control.
12. Generation of square wave (Varying width) Using 8253.

ECL322 Signals And Systems [(3-0-0); Credits: 3] **Back**

Course Outcomes
Students will
1. Understand the terminology of signals and basic engineering systems.
2. Understand the use of signals and basic system building blocks and their roles in large/complex system design.
3. Understand frequency-domain representation and analysis concepts using Fourier Analysis tools

Contents

Elements of Signal Space Theory: Different types of signals, Linearity, Time invariance and causality, Impulse sequence, Impulse functions and other singularity functions.

Convolution: Convolution sum, Convolution integral and their evaluation, Time domain representation and analysis, of LTI systems based on convolution and differential equations.

Transform Domain Considerations: Laplace transforms and Z-transforms, Application of transforms to discrete and continuous systems analysis, Transferfunction,Block diagramrepresentation, DFT. Fourier series and Fourier Transform: Sampling theorem

Need for modulation –Amplitude Modulation- Generation of AM waves (SSB, DSB-SC,DSB-FC,SSB,VSM). AM Transmitters, AM Receivers, Super Heterodyne receiver.

Introduction to angle modulation, Direct FM & PM, Narrow band FM – Wide band FM – FM
Modulators - Direct method – FM Transmitters - FM Demodulators – Slope detector - Frequency discriminator, FM Receivers.

Pulse modulation systems – pulse amplitude modulation channel bandwidth for PAM –Detection of PAM signals pulse time modulation – generation of PDM and PPM – conversion of PDM to PPM.

Text Books
1. Alan V Oppenheim, Alan S Wilsky and Hamid Nawab S, "Signals & Systems", Prentice Hall, New Delhi, 2005.
2. Simon Haykins, "Introduction to Analog and Digital Communications", Wiley India.

Reference Books
1. Ashok Ambardar, "Introduction to Analog and Digital Signal Processing", PWS Publishing Company, Newyork, 2002.
2. Rodger E Zaimer and William H Tranter, "Signals & Systems – Continuous and Discrete", McMillan Publishing Company, Bangalore ,2005.
3. Kennedy, "Electronics of Communication Systems", McGraw Hill – 5th reprint – 2000.
4. Roddy D. and Coolen J., "Electronic Communications", Prentice Hall of India P. Ltd. 1987.,
5. B P Lathi,(2005) ―"Modern Digital and Analog Communication", 3e, Oxford University Press..

ECL445 Digital Signal Processing And Its Applications [(3-0-0); Credits: 3] **Back**

Course outcomes
Students will

1. describe the discrete signal, sampling and reconstruction process
2. understand the concept of discrete time Fourier and z-transform.
3. understand and differentiate the discrete and fast Fourier transform.
4. recognize the IIR and FIR systems and draw their different associated structures.
5. design digital FIR and IIR filter using different approaches and implement them to draw their frequency responses

Contents

Discrete time signals; Sequences; representation of signals on orthogonal basis; Sampling and reconstruction of signals. Discrete time systems; attributes, Z- Transform, Analysis of LSI systems, frequency analysis, Inverse Systems.
Signal flow graph representation, DF1, DF2, parallel and cascade form. Finite word-length effects in Digital Filters

Discrete Fourier Transform (DFT), Fast Fourier Transform algorithms.
Design of FIR Digital Filters: Window method, Park-McClellan's Method.

Design of IIR Digital Filters: Butterworth, Chebyschev approximations. Lowpass, Bandpass Bandstop and Highpass filters. Bilinear, impulse invariant frequency transformations.

Text Books

1 Proakis John and Manolakis D.G, "Digital Signal Processing", 4^{th} edition Pearson
2 Oppenheim and Schafer, "Discrete-Time Signal Processing" 2nd edition Pearson

Reference Books

1. Mitra S.K, "Digital Signal Processing A Computer -Based Approach", 2^{nd} edition TMH