17LSU101	தமிழ் முதல் தாள்	Semester - I			
		L	T	P	C
		4	-	-	4

பாடத்திட்டப்பொதுநோக்கம்

- கற்றல் வழி சிந்தனைத் திறனையும், கருத்து வெளிப்பாட்டுத் திறனையும், மேம்படுத்துதல்.
- ஆய்வுநோக்கைமேம்படுத்துதல்.
- இலக்கியங்கள் உணர்த்தும் வாழ்வின் நுட்பமான பகுதிகளை உணர்த்துதல்.
- மனித மனத்தினைப் பக்குவப்படுத்துதலில் இலக்கியம் தரும் பங்கினை உணர்த்துதல்.
- வளர்ந்து வரும் சமூகத்தில் அறஉணர்வு, பண்பாடு போன்றவை குறித்து அறிவூட்டல்.
- அரசுத் தேர்வுகளுக்கு மாணவர்களை ஆயத்தமாக்குதல்.

பாடத்திட்டப்பயன்விளைவு

- இந்தியகுடியுரிமைப்பணிமுதலானபோட்டித்தேர்வுகளில், விருப்பப்பாடமாகஇடம்பெறுகின்ற, ' தமிழ்இலக்கியவரலாறு' குறித்தமுழுமையானஅறிமுகம்பெற்றிருத்தல்.
- கல்வெட்டியல், ஓலைச்சுவடியியல்மற்றும்தொல்லியல்சார்ந்தஆவணத்தேடலுக்குரியஆய்வுமனப்பான்மையுடன், இலக்கியங்களைஅணுகுதல்.
- தமிழின்வளர்ச்சித்துறையாகிய, 'அறிவியல்தமிழ்' ; 'இணையதமிழ்' குறித்தபன்நோக்குஅணுகுமுறையிலானஆய்வுச்சிந்தனைமேம்பாடு.
- வேலைவாய்ப்புக்குரியசுயதிறன்மேம்பாட்டுடன், படைப்பாக்கத்திறன்மேம்பாடும்பெற்றிருத்தல் .
- சமுதாயமற்றும்வாழ்வியல்மதிப்புகளைப்பேணுவதற்குக்கருவியாகஇலக்கியங்களைநாடுகின்றமனப்பான்மைவளர்ச்சி.
- மொழிபெயப்புத்துறைசார்ந்தவேலைவாய்புத்திறன்பெற்றிருத்தல்

தாள்கள்வரிசையும்தேர்வுச்செயல்திட்டமும்பகுதி-I தமிழ்

பருவம்	தாள்	கற்பிக்கும் நேரம்/வாரம்	தேர்வு மணிகள்	மதிப்பெண் அக/எழுத்து	மொத்தம்	மதிப்பீடு

அலகு – I : இக்கால இலக்கியம்: (10 மணிநேரம்)

கல்வி : மகாகவி பாரதியார் – சுயசரிதை - ஆங்கிலக் கல்வி.
இன்றைய நிலை : கவிமணி தேசிக விநாயகம் பிள்ளை – ஒற்றுமையே உயிர்நிலை.
மனிதநேயம் : கவிஞர் சிற்பி பாலசுப்பிரமணியன் –மலையாளக் காற்று.
சூழலியல் : கவிஞர் வைதீஸ்வரன் - விரல் மீட்டிய மழை.
பெண்ணியம் : கவிஞர் சுகந்தி சுப்பிரமணியம் – புதையுண்ட வாழ்க்கை.

அலகு – II : அற இலக்கியம்: (10 மணிநேரம்)

கொன்றை வேந்தன்: 1-50 பாடல்கள்
திருக்குறள்: பண்புடைமை, வினைத்திட்பம் – 20 குறள்கள்
பழமொழி நானூறு: 5 பாடல்கள்

அலகு - III : சிற்றிலக்கியம்: (10 மணிநேரம்)

மூவருலா: 1-26 கண்ணிகள்
திருச்செந்தூர் முருகன் பிள்ளைத்தமிழ்: 2 பாடல்கள்
கலிங்கத்துப் பரணி: போர்பாடியது - 9 பாடல்கள்

அலகு – IV : கட்டுரை: (10 மணிநேரம்)

1. உயர்தனிச் செம்மொழி - பரிதிமாற்கலைஞர்
2. கட்டிடக்கலை - அ. இராசமாணிக்கனார்
3. வாழ்க்கை - இளவழகனார்
4. ஆளுமைத்திறன் அறிவோம் - ஸ்ரீகண்ணன்
5. மணற்கேணி - நெ.து.சுந்தரவடிவேலு

அலகு- V : மொழிப்பயிற்சி: (8 மணிநேரம்)

1. படைப்பிலக்கியப் பயிற்சிகள் (கதை, கவிதை, கட்டுரை, உரைநடை)
2. மொழிபெயர்ப்பு
3. இலக்கணப் பயிற்சிகள்

பாட நூல்: கற்பகச்சோலை – தமிழ் ஏடு. கற்பகம் பல்கலைக்கழகத் தமிழ்த் துறை வெளியீடு.

17ECU101	BASIC CIRCUIT THEORY AND NETWORK ANALYSIS	Semester - I			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

- To identify the main circuit elements and apply Kirchoff's Laws to calculate currents, voltages and powers in typical DC electric circuits using a variety of analytical methods.
- To reduce more complicated circuits into the Thevenin's and Norton's equivalent circuits.
- To know the electrical circuit connection according to a given circuit diagram.
- To make the students capable of analyzing any given electrical network.
- To make the students learn how to synthesize an electrical network from a given impedance/admittance function.
- To understand frequency response in electrical circuits

COURSE OUTCOMES

- Apply the knowledge of basic circuital law and simplify the network using reduction techniques
- Analyze the circuit using Kirchhoff's law and Network simplification theorems
- Evaluate transient response, Steady state response, network functions
- Obtain the maximum power transfer to the load and Analyze the series resonant and parallel resonant circuit
- Evaluate two-port network parameters, design attenuators and equalizers
- Synthesize one port network using Foster Forms

UNIT I - Basic Circuit Concepts

Voltage and Current Sources - Resistors: Fixed and Variable resistors - Construction and Characteristics - Color coding of resistors - Resistors in series and parallel - Inductors: Fixed and Variable inductors - Self and mutual inductance - Faraday's law and Lenz's law of electromagnetic induction - Energy stored in an inductor - Inductance in series and parallel - Testing of resistance and inductance using multimeter.

UNIT II - Circuit Analysis

Kirchoff's Current Law (KCL) - Kirchoff's Voltage Law (KVL) - Node Analysis - Mesh Analysis – Star - Delta Conversion - DC Transient Analysis: RC Circuit - Charging and discharging with initial charge - RL Circuit with Initial Current - Time Constant - RL and RC Circuits With Sources - DC Response of Series RLC Circuits.

UNIT III – AC Circuit Analysis

Sinusoidal Voltage and Current - Definition of Instantaneous – Peak - Peak to Peak - Root Mean Square and Average Values – Voltage - Current relationship in Resistor - Inductor and Capacitor – Phasor - Complex Impedance - Capacitors: Principles of capacitance - Parallel plate capacitor – Permittivity - Definition of Dielectric Constant - Dielectric strength - Energy stored in a capacitor - Air, Paper, Mica, Teflon, Ceramic, Plastic and Electrolytic capacitor - Construction and application - Capacitors in series and parallel - Factors governing the value of capacitors - Testing of capacitors using multimeter.

UNIT IV - Power in AC Circuits

Instantaneous Power - Average Power - Reactive Power - Power Factor -Sinusoidal Circuit Analysis for RL, RC and RLC Circuits - Resonance in Series and Parallel RLC

Circuits - Frequency Response of Series and Parallel RLC Circuits, Quality (Q) Factor and Bandwidth - Passive Filters: Low Pass - High Pass - Band Pass and Band Stop.

UNIT V - Network Theorems

Principal of Duality - Superposition Theorem - Thevenin's Theorem - Norton's Theorem - Reciprocity Theorem - Millman's Theorem - Maximum Power Transfer Theorem - AC circuit analysis using Network theorems - Two Port Networks: Impedance (Z) Parameters - Admittance (Y) Parameters - Transmission (ABCD) Parameters.

Suggested Readings:

Text Book

1. David A. Bell, (2015). *Electronic Devices and Circuits.* (5th ed.). Oxford University Press.

Reference Books

1. Sedra, A.S., Smith, K.C., Chandorkar, A.N., (2014). *Microelectronic Circuits*, (6th ed.).
2. Oxford University Press.
3. Robert L. Boylestad, (2011). *Introductory Circuit Analysis*. (11th ed.). Pearson Publications.
4. Ernest S.Kuh, Charles A.Desoer, (2009). *Basic Circuit Theory*. (1st ed.). Tata McGraw
5. Hill Education.
6. Hayt W. H., Kemmerly, J. E., Durbin, S. M. (2005). *Engineering Circuit Analysis*. Tata
7. McGraw Hill.

Journals

1. International Journal of Electronics and Communication Engineering.
2. European Journal of Scientific Research

Websites:

1. www.allaboutcircuits.com
2. www.circuitstoday.com

17ECU102	MATHEMATICS FOUNDATION FOR ELECTRONICS	Semester - I			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVE

- This course provides a deep knowledge to the learners to understand the basic concepts of Matrices, Sequences, Complex Variable, Complex Function, First Order Ordinary Differential Equations, Power series method
- To provide students with mathematics fundamentals necessary to formulate, solve and analyses complex engineering problems.
- To prepare student to apply reasoning informed by the contextual knowledge to engineering practice.
- To build the strong foundation in Mathematics of students needed for the field of electronics and Telecommunication Engineering
- Linear differential equations of higher order using analytical methods and numerical methods applicable to Control systems and Network analysis.
- Vector differentiation and integration required in Electro-Magnetics and Wave theory.

COURSE OUTCOMES

- Able to solve qualitative problems based on vector analysis and matrix analysis such as linear independence and dependence of vectors, rank etc
- Understand the concepts of limit theory and nth order differential equations and their applications to our daily life
- Able to solve the problems of differentiation of functions of two variables and know about the maximization and minimization of functions of several variables
- Come to know the applications of double and triple integration in finding the area and volume
- Know about qualitative applications of Gauss , Stoke's and Green's theorem
- Use Vector differentiation and integration required in Electro-Magnetics and Wave theory

UNIT I - Matrices

Introduction to Matrices, System of Linear Algebraic Equations, Gaussian Elimination Method, Gauss-Seidel Method, LU decomposition, Solution of Linear System by LU decomposition. Eigen Values and Eigen Vectors, Linear Transformation, Properties of Eigen Values and Eigen Vectors, Cayley-Hamilton Theorem, Diagonalization, Powers of a Matrix. Real and Complex Matrices, Symmetric, Skew Symmetric, Orthogonal Quadratic Form, Hermitian, Skew Hermitian, Unitary Matrices.

UNIT II - Sequences and Series

Sequences, Limit of a sequence, Convergence, Divergence and Oscillation of a sequence, Infinite series, Necessary condition for Convergence, Cauchy's Integral Test, D'Alembert's Ratio Test, Cauchy's nth Root Test, Alternating Series, Leibnitz's Theorem, Absolute Convergence and Conditional Convergence, Power Series.

UNIT III - Complex Variables and Functions

Complex Variable, Complex Function, Continuity, Differentiability, Analyticity. Cauchy-Riemann (C-R) Equations, Harmonic and Conjugate Harmonic Functions, Exponential Function, Trigonometric Functions, Hyperbolic Functions. Line Integral in Complex Plane, Cauchy's Integral Theorem, Cauchy's Integral Formula, Derivative of Analytic Functions. Sequences, Series and Power Series, Taylor's Series, Laurent Series,

Zeroes and Poles. Residue integration method, Residue integration of real Integrals.

UNIT IV - Ordinary Differential Equations

First Order Ordinary Differential Equations, Basic Concepts, Separable Ordinary Differential Equations, Exact Ordinary Differential Equations, Linear Ordinary Differential Equations. Second Order homogeneous and non-homogeneous Differential Equations.

UNIT V - Series solution of differential equations and special functions

Power series method, Legendre Polynomials, Frobenius Method, Bessel's equations and Bessel's functions of first and second kind. Error functions and gamma function.

Suggested Readings:

Text Books

1. Kreyszig, E. (2008). *Advanced Engineering Mathematics*. (9^{th} ed.). Wiley India.
2. Jain,R.K., Iyengar,S.R.K. (2007). *Advanced Engineering Mathematics*. India: Narosa Publishing House.

Reference Books

1. Murray Spiegel, Seymour Lipschutz, & John Schiller, (2007). *Outline of Complex Variables, Schaum Outline Series*. Tata McGraw Hill.
2. Wylie C .R., & Barrett L. C., (2004), *Advanced Engineering Mathematics*, Tata McGraw Hill.
3. Ramana, B.V. (2007). *Higher Engineering Mathematics*, Tata McGraw Hill.

17ECU103	SEMICONDUCTOR DEVICES	Semester - I			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

- To learn the fundamentals of operation of the main semiconductor electronic devices.
- To understand the basic parameters of electronic devices, their performance, and limiting factors.
- To understand the basic principles of electronic device operation with emphasis on bipolar transistors, and unipolar microwave devices.
- Acquire the fundamental knowledge and expose to the field of semiconductor theory and devices and their applications.
- To give knowledge about semiconductor and discus working and applications of basic devices, including p-n junctions, BJTs and FETs
- Introduce students to the physics of semiconductors and the inner working of semiconductor devices.

COURSE OUTCOMES

- Apply the knowledge of basic circuital law and simplify the network using reduction techniques
- Apply the knowledge of semiconductors to illustrate the functioning of basic electronic devices.
- Demonstrate the switching and amplification application of the semiconductor devices.
- Demonstrate the control applications using semiconductor devices.
- Apply concepts of semiconductor devices to design and analyze circuits.
- Ability to understand and analyze the inner working of semiconductor p-n diodes

UNIT I - Semiconductor Basics

Introduction to Semiconductor Materials - Crystal Structure - Planes and Miller Indices - Energy Band in Solids - Concept of Effective Mass - Density of States - Carrier Concentration at Normal Equilibrium in Intrinsic Semiconductors - Derivation of Fermi Level for Intrinsic & Extrinsic Semiconductors – Donors – Acceptors - Dependence of Fermi Level on Temperature and Doping Concentration - Temperature Dependence of Carrier Concentrations - Carrier Transport Phenomena: Carrier Drift - Mobility – Resistivity - Hall Effect - Diffusion Process - Einstein Relation - Current Density Equation - Carrier Injection - Generation and Recombination Processes - Continuity Equation.

UNIT II - PN Junction Diode

Formation of Depletion Layer - Space Charge at a Junction - Derivation of Electrostatic Potential Difference at Thermal Equilibrium - Depletion Width and Depletion Capacitance of an Abrupt Junction - Concept of Linearly Graded Junction - Derivation of Diode Equation and I-V Characteristics - Zener and Avalanche Junction Breakdown Mechanism - Tunnel diode - Varactor diode - Solar cell: Circuit symbol – Characteristics - Applications.

Unit III - Bipolar Junction Transistors (BJT)

PNP and NPN Transistors - Basic Transistor Action - Emitter Efficiency - Base Transport Factor - Current Gain - Energy Band Diagram of Transistor in Thermal Equilibrium - Quantitative Analysis of Static Characteristics (Minority Carrier Distribution and Terminal Currents) – Base - Width Modulation - Modes of operation - Input and Output

Characteristics of CB – CE - CC Configurations - Metal Semiconductor Junctions: Ohmic and Rectifying Contacts.

UNIT IV - Field Effect Transistors

JFET – Construction - Idea of Channel Formation – Pinch - Off and Saturation Voltage – Current - Voltage Output Characteristics - MOSFET - Types of MOSFET - Circuit symbols - Working and Characteristic curves of Depletion type MOSFET (both N channel and P Channel) - Enhancement type MOSFET (both N channel and P channel) - Complimentary MOS (CMOS).

UNIT V - Power Devices

UJT - Basic construction and working - Equivalent circuit - Intrinsic Standoff Ratio - Characteristics and relaxation oscillator – Expression – SCR – Construction – Working – Characteristics – Triac – Diac – IGBT – MESFET - Circuit symbols - Basic constructional features – Operation - Applications.

Suggested Readings:

Text Books

1. Sanjay Sharm S.K, (2013). *Advance Semiconductor Devices*, (1st ed.). Kataria & Sons.
2. Nair B.Somanathan, & Deepa S.R. (2010). *Solid State Devices*, PHI Learning Private Limited.

Reference Books

1. Kano Kannan, (2009). *Semiconductor Devices*, (2nd ed.). PHI Learning Private Limited.
2. Ben G Streetman, & Banerjee S. (2009). *Solid State Electronic Devices*, (6th ed.). Pearson Education.

Journals

1. International Journal of Electronics and Communication Engineering.
2. International Journal of Emerging Science and Engineering.

Websites:

1. www.ustudy.com
2. www.circuitstoday.com

17ECU111	BASIC CIRCUIT THEORY AND NETWORK ANALYSIS - PRACTICAL	Semester - I			
		L	T	P	C
		-	-	3	2

COURSE OBJECTIVES

- To give knowledge about semiconductor physics and discus working and applications of basic devices, including p-n junctions, BJTs and FETs
- Introduce students to the semiconductor devices and the inner working of semiconductor devices.
- Know the formation and properties of semiconductor materials
- Understand the operation of diode
- Know the usage of electronic equipments
- Know the testing of components

COURSE OUTCOMES

- Apply the knowledge of basic circuital law and simplify the network using reduction techniques
- Apply the knowledge of semiconductors to illustrate the functioning of basic electronic devices.
- Demonstrate the switching and amplification application of the semiconductor devices.
- Demonstrate the control applications using semiconductor devices.
- Apply concepts of semiconductor devices to design and analyze circuits.
- Ability to understand and analyze the inner working of semiconductor p-n diodes

(Any 8 Experiments)

1. Familiarization with

   a) Resistance in series, parallel and series – Parallel.

   b) Capacitors & Inductors in series & Parallel.

2. Measurement of Amplitude, Frequency & Phase difference using CRO.

3. Verification of Ohm's Law.

4. Verification of Kirchoff's Law.

5. Verification of Norton's theorem.

6. Verification of Thevenin's Theorem.

7. Verification of Superposition Theorem.

8. Verification of Maximum Power Transfer Theorem.

9. Verification of Millman's Theorem.

10. Study of the Frequency Response of a Series LCR Circuit and determination of its

    (a) Resonant Frequency (b) Impedance at Resonance (c) Quality Factor Q
    (d) Band Width

17ECU112	MATHEMATICS FOUNDATION FOR ELECTRONICS - PRACTICAL	Semester - I			
		L	T	P	C
		-	-	3	2

COURSE OBJECTIVES

- To give knowledge about semiconductor physics and discus working and applications of
- definite Integral, Improper integrals and some special integrals as Beta functions, Gamma Functions and Error functions
- Linear differential equations of higher order using analytical methods and numerical methods applicable to Control systems and Network analysis.
- Applications of the definite Integral to derive different important quantities as Arc Length, Area, Volume, Work and Moments
- Details of set theory which is basic of all sciences
- Different types of matrices and their properties.

COURSE OUTCOMES

- Understand the problems and solve them with correlation and regression analysis
- Find the nth derivatives of the function, evaluate its indeterminate forms and way to expand a function in series form
- Analytically and graphically understand the nature and forms of function
- Apply the principles of integral to solve a variety of practical problems
- Equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics
- Enhance and develop the ability of using the language of mathematics in analyzing the real world problems of sciences and engineering

(Any 8 Experiments)

(Sci(PRACTICAL/MAT(PRACTICAL/ any other Mathematical Simulation Software)

1. Solution of First Order Differential Equations
2. Solution of Second Order homogeneous Differential Equations
3. Solution of Second Order non-homogeneous Differential Equations
4. Convergence of a given series.
5. Divergence of a given series.
6. Solution of linear system of equations using Gauss Elimination method.
7. Solution of linear system of equations using Gauss – Seidel method.
8. Solution of linear system of equations using L-U decomposition method.
9. Solution of coupled differential equations.
10. Solution of Differential equation using Euler's method.

17ECU113	SEMICONDUCTOR DEVICES - PRACTICAL	Semester - I			
		L	T	P	C
		-	-	4	2

COURSE OBJECTIVES

- To give knowledge about semiconductor physics and discus working and applications of diodes.
- Know the formation and properties of semiconductor materials Understand the operation of diode
- Understand the formation and properties of semiconductor materials which forms the basis for the formation of PN diode, zener diode etc
- Explain the operation of transistor
- Know the need for biasing of transistor
- Know the operation of FET and MOSFET

COURSE OUTCOMES

- Know the characteristics of diodes and transistors
- Measure the characteristics of electronic circuits and present experimental results
- Understand the construction and operation of transistor and its usage in applications like amplifiers etc
- Know the need for biasing of transistor for the design of amplifier
- Designing electronic circuits
- Performance analysis of electronic circuits

(Any 10 Experiments)

1. VI Characteristics of PN Junction Diode
2. VI Characteristics of Zener Diode.
3. VI Characteristics of the Common Base Configuration of BJT and to obtain ri, ro, α.
4. VI Characteristics of the Common Collector Configuration of BJT and obtain voltage gain, ri, ro.
5. VI Characteristics of UJT.
6. VI Characteristics of SCR.
7. VI Characteristics of TRIAC
8. VI Characteristics of DIAC
9. VI Characteristics of JFET.
10. Study of Characteristics of Solar Cell.
11. Band Gap Energy of Silicon Diode
12. LDR Characteristics

17AEC101	ENVIRONMENTAL STUDIES	Semester - I			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

- Creating the awareness about environmental problems among people.
- Developing an attitude of concern for the environment.
- Motivating public to participate in environment protection and improvement.
- Recognize the interconnectedness of multiple factors in environmental challenges
- Engage constructively with diverse forms of knowledge and experience
- Recognize and apply methodological approaches of the social sciences, natural sciences, and humanities

COURSE OUTCOMES

- Understand key concepts in the life and physical sciences and will apply them to environmental issues
- Apply knowledge of the sciences within an interdisciplinary context in solving environmental issues such as environmental health, food and agriculture, energy, waste and pollution, and loss of biodiversity.
- Possess the intellectual flexibility necessary to view environmental questions from multiple perspectives, prepared to alter their understanding as they learn new ways of understanding.
- Solve problems systematically, creatively, and reflexively, ready to assemble knowledge and formulate strategy
- Identify, interpret, and apply basic measures (metrics and formulae) of social system variables to assess socio-environmental conditions.
- Analyze and evaluate ideological and philosophical approaches used to understand environmental relationships.

UNIT I - Environment

Environment Definition - Scope and importance - Components - Ecosystem Definition - Concept - Scope - Importance - Structure and functions of ecosystem - Energy flow - Ecological succession Food chains and food webs - Classification of ecosystem.

UNIT II - Natural Resources - Renewable and Non-renewable Resources

Natural resources and associated problems - Forest resources - Water resources - Mineral resources - Food resources - Energy resources - Land resources : Use and over-utilization – exploitation - Role of an individual in conservation of natural resources - Equitable use of resources for sustainable lifestyles - Ill-effects of fire works.

UNIT III - Biodiversity and Its Conservation

Introduction – Definition - Genetic - Species and ecosystem diversity - Biogeographical classification of India - Value of biodiversity: consumptive use - Productive use - Social - Ethical - Aesthetic and option values - Biodiversity at global - National and local levels - India as a mega - Diversity nation - Hot-spots of biodiversity - Threats to biodiversity: habitat loss - Poaching of wildlife - man-wildlife conflicts - Endangered and endemic species of India - Conservation of biodiversity - in-situ and ex-situ conservation of biodiversity.

UNIT IV - Environmental Pollution

Definition - Causes - Effects and control measures of Air pollution - Water pollution - Soil pollution - Marine pollution - Noise pollution - Thermal pollution - Nuclear hazards - Solid waste management - Causes - Effects and control measures of urban and industrial wastes - Role of an individual in prevention of pollution - Pollution case studies - Disaster management: Foods - Earthquake - Cyclone and landslides.

UNIT V - Social Issues and the Environment

From unsustainable to sustainable development - Urban problems related to energy - Water conservation - Rain water harvesting - Watershed management - Resettlement and rehabilitation of people - Its problems and concerns - Environmental ethics: Issues and possible solutions - Climate change - Global warming - Acid rain - Ozone layer depletion - Nuclear accidents and holocaust - Case studies - Wasteland reclamation - Consumerism and waste products Environment Protection Act - Air (Prevention and Control of Pollution) Act - Water (Prevention and Control of Pollution) Act - Wildlife Protection Act - Forest Conservation Act - Issues involved in enforcement of environmental legislation - Public awareness - Population growth - variation among nations - Population explosion - Family Welfare Programme - Environment and human health - Human rights - Value education - HIV/AIDS - Women and Child Welfare - Role of Information Technology in environment and human health.

Suggested Readings:

Text Books

1. Tripathy.S.N. & Sunakar Panda, (2004). *Fundamentals of Environmental Studies*. (2nd ed.)., New Delhi: Vrianda Publications Private Ltd.,
2. Arvind Kumar, (2004). *A Textbook of Environmental Science*. New Delhi, APH Publishing Corporation.

Reference Books

1. Verma, P.S. & Agarwal, V.K. (2001). *Environmental Biology (Principles of Ecology)*. New Delhi, S. Chand and Company Limited.
2. Anubha Kaushik, & Kaushik, C.P. (2004). *Perspectives in Environmental Studies*. New Delhi, New Age International Pvt. Limited.
3. Singh, M.P., Singh, B.S., & Soma S. Dey, (2004). *Conservation of Biodiversity and Natural Resources*. Delhi, Daya Publishing House.
4. Daniel B.Botkin & Edward A. Keller. (1995). *Environmental Science*. New York, John Wiley and Sons.
5. Uberoi, N.K. (2005). *Environmental Studies*. New Delhi, India: Excel Books Publications.

17LSU201	தமிழ் இரண்டாம் தாள்	Semester - II			
		L	T	P	C
		4	-	-	4

பாடத்திட்டப்பொதுநோக்கம்

- கற்றல் வழி சிந்தனைத் திறனையும், கருத்து வெளிப்பாட்டுத் திறனையும், மேம்படுத்துதல்.
- ஆய்வுநோக்கைமேம்படுத்துதல்.
- இலக்கியங்கள் உணர்த்தும் வாழ்வின் நுட்பமான பகுதிகளை உணர்த்துதல்.
- மனித மனத்தினைப் பக்குவப்படுத்துதலில் இலக்கியம் தரும் பங்கினை உணர்த்துதல்.
- வளர்ந்து வரும் சமூகத்தில் அறஉணர்வு, பண்பாடு போன்றவை குறித்து அறிவூட்டல்.
- அரசுத் தேர்வுகளுக்கு மாணவர்களை ஆயத்தமாக்குதல்.

பாடத்திட்டப்பயன்விளைவு

- இந்தியகுடியுரிமைப்பணிமுதலானபோட்டித்தேர்வுகளில்,
  விருப்பப்பாடமாகஇந்தியகுடியுரிமைப்பணிமுதலானபோட்டித்தேர்வுகளில்,
  விருப்பப்பாடமாகஇடம்பெறுகின்ற, 'தமிழ்இலக்கியவரலாறு' குறித்தமுழுமையானஅறிமுகம்பெற்றிருத்தல்.
- கல்வெட்டியல், ஓலைச்சுவடியியல்மற்றும்தொல்லியல்சார்ந்தஆவணத்தேடலுக்குரியஆய்வுமனப்பான்மையுடன், இலக்கியங்களைஅணுகுதல்.
- தமிழின்வளர்ச்சித்துறையாகிய, 'அறிவியல்தமிழ்' ; 'இணையதமிழ்' குறித்தபன்நோக்குஅணுகுமுறையிலானஆய்வுச்சிந்தனைமேம்பாடு.
- வேலைவாய்ப்புக்குரியசுயதிறன்மேம்பாட்டுடன், படைப்பாக்கத்திறன்மேம்பாடும்பெற்றிருத்தல் .
- சமுதாயமற்றும்வாழ்வியல்மதிப்புகளைப்பேணுவதற்குக்கருவியாகஇலக்கியங்களைநாடுகின்றமனப்பான்மைவளர்ச்சி.
- மொழிபெயப்புத்துறைசார்ந்தவேலைவாய்புத்திறன்பெற்றிருத்தல்

தாள்கள்வரிசையும்தேர்வுச்செயல்திட்டமும்பகுதி-I தமிழ்

பருவம்	தாள்	கற்பிக்கும் நேரம்/வாரம்	தேர்வு மணிகள்	மதிப்பெண் அக/எழுத்து	மொத்தம்	மதிப்பீடு
இரண்டு	II	4	3	40 / 60	100	4

அலகு – I : பக்தி இலக்கியம் (10 மணிநேரம்)

சைவ, வைணவ இலக்கியங்கள் - தோற்றம் ,வளர்ச்சி, வரலாறு.

1. **சைவம்** - பெரியபுராணம் - திருமூலநாயனார் புராணம்.
2. **வைணவம்** - பெரியாழ்வார் திருமொழி: 10 பாடல்கள்.

அலகு – II : சங்க இலக்கியம் : (15 மணிநேரம்)

சங்க இலக்கியங்கள் அறிமுகம்

அ). எட்டுத்தொகை

நற்றிணை : பிரசம் கலந்த – பாலை -110

குறுந்தொகை : கருங்கட்டாக் கலை – குறிஞ்சி- 69

ஐங்குறுநூறு : நெய்தல்-தொண்டிப்பத்து:

திரைஇமிழ் இன்னிசை-171

பதிற்றுப்பத்து : சிதைந்தது மன்ற - 27

பரிபாடல்: பரிபாடல் திரட்டு-மதுரை நகர்ச்சிறப்பு –

உலகம் ஒரு நிறையாத்தான்-6, மாயோன் கொப்பூழ்-7, செய்யாட்கு இழைத்த-9, கார்த்திகை காதில்-10, ஈவாரைக் கொண்டாடி-11.

கலித்தொகை : சுடர்தொடீ கேளாய்: குறிஞ்சிக்கலி- 36

அகநானூறு : அன்னாய் வாழி வேண்டன்னை - குறிஞ்சி - 48

புறநானூறு : யாதும் ஊரே யாவருங் கேளிர் –பொதுவியல்- 192

ஆ). பத்துப்பாட்டு

திருமுருகாற்றுப்படை - பழமுதிர்ச்சோலையின் சிறப்பு

முருகன் இருப்பிடங்கள் – 'சிறுதினை மலரொடு' என்பதிலிருந்துதொடங்கி, 'அறிந்தவாறே' என்பது வரையிலான தொடர்கள்: 218-249.

முருகன் அருள்புரிதல் – 'தெய்வம் சான்ற' என்பதிலிருந்து தொடங்கி, 'நல்குமதி' என்பது வரையிலான தொடர்கள்: 286-295.

அலகு - III : காப்பியம் (6 மணிநேரம்)

சிலப்பதிகாரம்:

மங்கல வாழ்த்துப் பாடல்: (21-29) – கண்ணகியின் சிறப்பு:

'நாகநீள் நகரொடு' என்பதிலிருந்து தொடங்கி,

'கண்ணகி என்பாண் மன்னோ' என்பது வரையிலான தொடர்கள்.

நடுகற்காதை: (207-234) - சேரன் செங்குட்டுவன் கண்ணகிக்குக் கோயில் எடுத்தல்: 'அருந்திறலரசர்' என்பதிலிருந்து தொடங்கி, 'மன்னவரேறென்' என்பது வரையிலான தொடர்கள்.

வாழ்த்துக்காதை: (482-485) - செங்குட்டுவனுக்குக் கண்ணகி காட்சியளித்தல்: 'என்னே' என்பதிலிருந்து தொடங்கி, 'விசும்பில் தோன்றுமால்' என்பது வரையிலான தொடர்கள்.

வழக்குரை காதை: பத்தினிப் பெண்டிர் எழுவர் கதை: 'நீர்வார் கண்ணை' என்பதிலிருந்து தொடங்கி, 'புகாரென் பதியே' என்பது வரையிலான தொடர்கள்.

வஞ்சினமாலை: 'வன்னி மரமும்' என்பதிலிருந்து தொடங்கி, 'பதிப்பிறந்தேன்' என்பது வரையிலான தொடர்கள்.

அலகு – IV : சிறுகதை (10 மணிநேரம்)

1. குளத்தங்கரை அரசமரம் – வ.வே.சு.ஐயர்
2. காட்டில் ஒரு மான் - அம்பை
3. நாற்காலி – கி.ராஜநாராயணன்
4. நகரம் – சுஜாதா

அலகு- V : மொழிப்பயிற்சி (7 மணிநேரம்)

படைப்பிலக்கியப் பயிற்சிகள் (கதை, கவிதை, கட்டுரை, உரைநடை)
மொழிபெயர்ப்பு

17ENU201	ENGLISH	Semester - II			
		L	T	P	C
		4	-	-	4

Course Objectives:

- To help students enhance their Language skills
- To introduce different kinds of literary works
- To familiarize different genres of Literature
- To instruct moral values through literature.
- To improvise their productive and receptive skills
- To strengthen the basic knowledge about grammar

Course Outcome:

- Develop the four types of skills
- Reading and comprehending literary works
- Genres of literature to provide moral education
- Develop communication skills in business environment
- Interpersonal skills will be developed.
- Betterment of language competence

UNIT I

Prose: Google Guys (Extract) – Richard L Brandt
Poetry: The Blind Pedlar – Osbert Sitwell
Short Story: A Garden So Rich – Christie Craig
Vocabulary: Prefix, Antonyms, Sentence Completion
Grammar: Article, Adverb, Pronoun

UNIT II

Prose: Happiness 101 – Geeta Padmanabhan
Poetry: An Old Woman **–** Arun Kolatkar
Vocabulary: Suffix, Analogies
Grammar: Noun, Adjective

UNIT III

Prose: Structured Procrastination – John Perry
Short Story: The Umbrella Man – Roald Dahl
One-Act Play: The Boy Who Stopped Smiling – Ramu Ramanathan
Vocabulary: Synonyms, Euphemisms, Word Definitions
Grammar: Verb, Conjunction and Interjection, Indirect/Reported Speech

UNIT IV

Poetry: No Sentence – Anjum Hassan
One-Act Play: While the Auto Waits- O' Henry
Vocabulary: Words Often Confused, Anagrams
Grammar: Preposition, Voice- Active and Passive

UNIT V

Short Story: The Bird **–** Amar Jalil
One-Act Play: The Cellphone Epidemic – Claudia I. Haas
Vocabulary: Portmanteau Words, One Word Substitution
Grammar: Question, Pronunciation

Prescribed Text:

Rao, G. Chandralekha et al. *Spring* 2013**.** Emerald Publishers: Chennai.

Suggested Reading:

Shyamala, V. (2006). *English for Communication.* : Chennai, Emerald Publishers.

17ECU201	ELECTRONIC CIRCUITS	Semester - II			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

- Ability to design different types of Electronic Circuits such as Amplifiers and Oscillators.
- To understand and implement the advanced electronic circuits such as amplifiers etc with the help of theoretical and practical problem solving.
- Ability to analyze the different types of configurations and applications of Transistor.
- Ability to determine the stability of feedback amplifiers and their steady state performance.
- To analyze the Circuits in time and frequency domain
- Calculation and measurement of parameters for electronic circuits, to introduce the students to the advanced concepts of electronics.

COURSE OUTCOMES

- Know the characteristics of diodes and transistors
- Design simple circuits and know the benefits of feedback in amplifier
- Apply their knowledge in analyzing Circuits by using network theorems.
- Measure the characteristics of electronic circuits and present experimental results
- Compare and classify oscillators
- Analyze electrical circuits and calculate the main parameters

UNIT I - Diode Circuits

Ideal diode - Piecewise linear equivalent circuit - DC load line analysis - Quiescent (Q) point. Clipping - Clamping circuits - Rectifiers: HWR, FWR (center tapped and bridge) - Circuit diagrams – Working – Waveforms - Ripple factor – Efficiency - Comparison. Filters: Types - Circuit diagram - Shunt Capacitor filter with waveforms - Zener diode regulator circuit diagram - Load and Line regulation - Disadvantages of Zener diode regulator.

UNIT II - Bipolar Junction Transistor

Review of CE - CB Characteristics - Regions of operation - Hybrid parameters - Transistor biasing - DC load line - Operating point - Thermal runaway – Stability - Stability factor - Fixed bias without and with RE - Collector to base bias - Voltage divider bias - Emitter bias (+VCC and –VEE bias) - Circuit diagrams – Working - Transistor as a switch - Circuit and working - Darlington pair and its applications - BJT amplifier (CE) - DC and AC load line analysis - Hybrid model of CE configuration - Quantitative study of the frequency response of a CE amplifier - Effect on gain and bandwidth for Cascaded CE amplifiers (RC coupled).

UNIT III - Feedback Amplifiers

Concept of feedback - Negative and positive feedback - Advantages and disadvantages of negative feedback - Voltage (series and shunt) - Current (series and shunt) feedback amplifiers - gain, input and output impedances Barkhausen criteria for oscillations, Study of phase shift oscillator, Colpitts oscillator and Hartley oscillator.

UNIT IV - MOSFET Circuits

Review of Depletion and Enhancement MOSFET - Biasing of MOSFETs - Small Signal Parameters - Common Source amplifier circuit analysis - CMOS circuits - MOSFET Current -Voltage characteristics - MOSFET scaling and small geometry effects - MOSFET capacitances

UNIT IV - Power Amplifiers

Difference between voltage and power amplifier - Classification of power amplifiers - Class A, Class B, Class C and their comparisons - Operation of a Class A single ended power amplifier - Operation of Transformer coupled Class A power amplifier - Overall efficiency - Circuit operation of complementary symmetry Class B push pull power amplifier - Crossover distortion - Heat sinks - Single tuned amplifiers: Circuit diagram - Working and Frequency Response - Limitations of single tuned amplifier - Applications of tuned amplifiers in communication circuits.

Suggested Readings:

Text Book

1. Salivahanan, S., Suresh Kumar, N., & Vallavaraj A. (2012). *Electronic Devices and Circuits*. (3rd ed.). Tata Mc Graw Hill publishing Company Limited.

Reference Books

1. Robert B oylstead & Louis Nashelsky, (2013). *Electronic Devices and Circuit Theory*. (9th ed.). PHI Learning Private Limited.
2. Jacob Millman, Christos.C.Halkias & Satyabrata Jit, (2010). *Electronic Devices and Circuits*. (3rd ed.). Tata Mc Graw–Hill Publications.
3. Bakshi, I.U.A. & Godse, A.P. (2010). *Electronic Devices and Circuits*, Technical Publications.

Journals

1. International Journal of Applied Engineering Research
2. International Journal of Emerging Science and Engineering.

Websites

1. www.ustudy.com
2. www.circuitstoday.com

17ECU202	C PROGRAMMING AND DATA STRUCTURES	Semester - II			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

- To understand various features in C
- To help students to understand the implementation of C language
- To prepare object-oriented design for small/medium scale problems
- To understand the fundamental algorithms such as searching, and sorting
- To understand the fundamental data structures such as lists, trees, and graphs
- Correctly determine the relative runtimes of different algorithms

COURSE OUTCOMES

- Analyze unstructured problems and design computer solutions
- Apply or a create suitable algorithm to solve a particular problem
- An ability to apply knowledge of computing and mathematics appropriate to the discipline
- An ability to analyze a problem and identify the computing requirements appropriate for its solution
- An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs, and use current techniques
- Able to design and analyze the time and space efficiency of the data structure

UNIT I - C Programming Language

Introduction: Importance of C - Character set – Tokens – Keywords – Identifier – Constants - Basic data types Variables: declaration & assigning values - Structure of C program Operators : Arithmetic operators - Relational operators - Logical operators - Assignment operators - Increment and decrement operators - Conditional operators - Bit wise operators - Expressions and evaluation of expressions - Type cast operator - Implicit conversions - Precedence of operators.

UNIT II - Decision Making, Branching & Looping

Decision making - Branching and looping: If - If-else - Else-if - Switch statement – Break - For loop - While loop and Do-loop - Functions: Defining functions - Function arguments and passing - Returning values from functions - Arrays: concepts – Declaration - Accessing elements - Storing elements - two-dimensional and multi-dimensional arrays - Input/output statement and library functions (math and string related functions).

UNIT III - Structures

Defining and declaring a structure variables - Accessing structure members - initializing a structure - Copying and comparing structure variables - Array of structures - Arrays within structures - Structures within structures - Structures – Functions – Pointers - Introduction to C++: Object oriented programming - Characteristics of an object -oriented language.

UNIT IV - Data Structures

Definition of stack - Array implementation of stack - Conversion of infix expression to prefix - Postfix expressions - Evaluation of postfix expression - Definition of Queue -

Circular queues - Array implementation of queues - Linked List and its implementation - Link list implementation of stack and queue - Circular and doubly linked list.

UNIT V - Searching and Sorting

Insertion sort - Selection sort - Bubble sort - Merge sort - linear Search - Binary search. Trees : Introduction to trees - Binary search tree - Insertion and searching in a BST - Preorder - Postorder - Inorder traversal (recursive)

Suggested Readings:

Text Books

1. Yashavant Kanetkar, *Let Us C*, BPB Publications.
2. Balagurusamy C. *Programming in ANSI*, (2^{nd} ed.). TMH.

Reference Books

1. Byron S Gottfried, *Programming with C*, Schaum Series.
2. Brian W. Kernighan, Dennis M. Ritchie, *The C Programming Language*, Prentice Hall
3. Yashavant Kanetkar, Pointers in C, BPB Publications
4. S. Sahni and E. Horowitz, Data Structure, Galgotia Publications.
5. Tanenbaum, *Data Structures using C*, Pearson/PHI.
6. Ellis Horowitz & Sartaz Sahani, *Fundamentals of Computer Algorithms*, Computer Science Press.

17ECU203	COMMUNICATION ELECTRONICS	Semester - II			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

- To learn the designing procedure and operation of circuits used for communication.
- To understand the basic concepts of AM, FM, and PM transmission and reception.
- To assess and evaluate different modulation and demodulation techniques.
- To evaluate the influence of noise on communications signals.
- To introduce students to various modulation and demodulation techniques of analog communication
- To analyze different parameters of analog communication techniques. 3. It also focuses on pulse modulation and demodulation

COURSE OUTCOMES

- Apply or a create suitable algorithm to solve a particular problem
- Understand and identify the fundamental concepts and various components of analog communication systems
- Explain signal to noise ratio, noise figure and noise temperature for single and cascaded stages in a communication system.
- Describe analog pulse modulation techniques and digital modulation technique
- Develop the ability to compare and contrast the strengths and weaknesses of various communication systems.
- Use of different modulation and demodulation techniques used in analog communication

UNIT I - Electronic communication

Block diagram of an electronic communication system - Electromagnetic spectrum - Band designations and applications - Need for modulation - Concept of channels – Baseband signals - Concept of Noise - Types of Noise - Signal to noise ratio - Noise Figure - Noise Temperature - Friss formula.

UNIT II – Amplitude Modulation

Amplitude Modulation - Modulation index - Frequency spectrum - Generation of AM, Amplitude Demodulation (diode detector) - Concept of Double side band suppressed carrier -Single side band suppressed carrier - Other forms of AM (Pilot Carrier Modulation - Vestigial Side Band modulation - Independent Side Band Modulation) - Block diagram of AM Transmitter - Receiver.

UNIT III - Angle modulation

Frequency and Phase modulation - Modulation index - Frequency spectrum - Equivalence between FM and PM - Generation of FM (direct and indirect methods) - FM detector (PLL) - Block diagram of FM Transmitter and Receiver - Comparison between AM, FM and PM.

UNIT IV - Pulse Analog Modulation

Channel capacity - Sampling theorem – PAM – PDM - PPM modulation and detection techniques – Multiplexing - TDM and FDM - Pulse Code Modulation: Need for digital transmission – Quantizing - Uniform and Non-uniform Quantization - Quantization Noise – Companding – Coding – Decoding - Regeneration.

UNIT V - Digital Carrier Modulation Techniques

Block diagram of digital transmission and reception - Information capacity - Bit Rate -Baud Rate and M-ary coding - Amplitude Shift Keying (ASK) - Frequency Shift Keying (FSK) - Phase Shift Keying (PSK) - Binary Phase Shift Keying (BPSK) - Quadrature Phase Shift Keying.

Suggested Readings:

Text Books

1. Kennedy and Davis, 2012, Electronic Communication Systems, Fifth Edition, Tata McGraw Hill.
2. Dennis Roddy and John Coolen, 2008, Electronic Communications, Pearson Education, Fourth Edition.

Reference Books

1. Frenzel, 2015, Principles of Electronic communication systems, Fourth Edition, McGraw Hill.
2. Tomasi, 2013, Advanced Electronic Communications Systems, Sixth Edition, PHI Limited.
3. S. Haykin, 2013, Communication Systems, Fifth Edition, Wiley India.
4. Anok Singh & A K Chhabra, 2010, Principles of Communication Engineering, Seventeenth Edition, S.Chand Publications.

Journals

1. International Journal of Emerging Science and Engineering.
2. International Journal of Computer and Communication Technology

Websites:

1. www.allaboutcircuits.com
2. www.circuitstoday.com

17ECU211	ELECTRONIC CIRCUITS - PRACTICAL	Semester - II			
		L	T	P	C
		-	-	3	2

COURSE OBJECTIVES

- To identify and test various electronic components
- To use DSO for various measurements
- To plot the characteristics of diode and transistor
- To design and implement feedback amplifier circuits
- To measure the frequency of oscillators.
- To design and test regulated power supplies

COURSE OUTCOMES

- Verify the rectifier circuits using diodes and implement them using hardware
- Design the biasing circuits like self biasing
- Understand the construction, operation and characteristics of FET which can be used in the design of amplifiers
- Design simple circuits
- Know the benefits of feedback in amplifier
- Compare and classify oscillators.

(Any 8 Experiments)

1. Half wave rectifier and Full wave rectifier
2. Capacitor, Inductor and Pi filters
3. Designing and testing of 5V/9V DC regulated power supply
4. Clipping and clamping circuit
5. RC coupled amplifier
6. Class A, B and C Power Amplifier
7. Colpitt's Oscillator
8. Hartley's Oscillator
9. Phase Shift Oscillator
10. Frequency response of Common Source FET amplifier

17ECU212	C PROGRAMMING AND DATA STRUCTURES - PRACTICAL	Semester - II			
		L	T	P	C
		-	-	3	2

COURSE OBJECTIVES

- To make the student learn a programming language and to understand various features in C
- To develop skills to design and analyze simple linear and non linear data structures
- To learn problem solving techniques.
- To write programs in C and to solve the problems.
- Gain knowledge in practical applications of data structures
- Analyze unstructured problems and design computer solutions

COURSE OUTCOMES

- Able to design and analyze the time and space efficiency of the data structure
- Be capable to identity the appropriate data structure for given problem
- Read, understand and trace the execution of programs written in C language
- Write the C code for a given algorithm
- Implement Programs with pointers and arrays, perform pointer arithmetic, and use the pre-processor.
- Write programs that perform operations using derived data types.

(Any 8 Experiments)

1. Generate the Fibonacci series up to the given limit N and also print the number of elements in the series.
2. Find minimum and maximum of N numbers.
3. Find the GCD of two integer numbers.
4. Calculate factorial of a given number.
5. Find all the roots of a quadratic equation Ax2 + Bx + C = 0 for non – zero coefficients A, B and C. Else report error.
6. Calculate the value of sin (x) and cos (x) using the series. Also print sin (x) and cos (x) value using library function.
7. Generate and print prime numbers up to an integer N.
8. Sort given N numbers in ascending order.
9. Find the sum & difference of two matrices of order MxN and PxQ.
10. Find the product of two matrices of order MxN and PxQ.

17ECU213	COMMUNICATION ELECTRONICS - PRACTICAL	Semester - II			
		L	T	P	C
		-	-	4	2

COURSE OBJECTIVES

- Convert analog signals to digital format and describe Pulse and digital Modulation techniques
- To introduce students to various modulation and demodulation techniques of analog communication.
- To analyze different parameters of analog communication techniques
- It also focuses on pulse modulation and demodulation
- To understand the concept in communication system to use it in solving the global complex problems.
- Evaluate the performance levels (Signal-to-Noise Ratio) of AM, FM and PM systems in the presence of additive white noise.

COURSE OUTCOMES

- Able to identify and describe different analog modulation techniques.
- Able to understand basic theories of Digital communication system in practical
- Able to design and implement different modulation and demodulation techniques
- Able to analyze digital modulation techniques by using various tools.
- Able to identify and describe different techniques in modern digital communications, in particular in source coding using various tools
- Implement different types of Amplitude, Frequency, Phase and Pulse modulation and demodulation schemes

(Any 10 Experiments)

1. Amplitude Modulation and Demodulation
2. Frequency Modulation and Demodulation
3. Pulse Amplitude Modulation
4. AM Transmitter/Receiver
5. FM Transmitter/Receiver
6. Time Division Multiplexing
7. Frequency Division Multiplexing
8. Function generator using IC 8038
9. Pulse Width Modulation
10. Pulse Position Modulation
11. Pulse Code Modulation
12. BPSK Modulation and Demodulation

17ECU301	DIGITAL ELECTRONICS AND VHDL	Semester - III			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

- To enable the students to represent numerical values in various number systems and perform number conversions between different number systems.
- To analyze and design digital combinational circuits like decoders, encoders, multiplexers, and de-multiplexers including arithmetic circuits (half adder, full adder, multiplier).
- To design sequential digital circuits like flip-flops, registers and counters.
- To acquaint the students with the fundamental principles of two-valued logic and various devices used to implement logical operations on variables.
- To lay the foundation for further studies in areas such as communication, VLSI, computer, microprocessor.
- To understand number representation and conversion between different representation in digital electronic circuits.

COURSE OUTCOMES

- Use the basic logic gates and various reduction techniques of digital logic circuit in detail.
- Design combinational and sequential circuits.
- Design and implement hardware circuit to test performance and application.
- Implement combinational and sequential circuits using VHDL
- Classify different semiconductor memories
- Analyze, design and implement sequential logic circuits

UNIT I - Number System and Codes

Decimal - Binary - Hexadecimal and Octal number systems - Base conversions – Binary - Octal – Hexadecimal - Arithmetic (addition, subtraction by complement method, multiplication) - Representation of signed and unsigned numbers - Binary Coded Decimal code - Logic Gates - Boolean algebra - Introduction to Boolean Algebra and Boolean operators - Truth Tables of OR, AND, NOT - Basic postulates - Fundamental theorems of Boolean algebra - Truth tables – Construction - Symbolic representation of XOR, XNOR - Universal (NOR and NAND) gates - Digital Logic families: Fan-in - Fan out - Noise Margin - Power Dissipation - Figure of merit - Speed power product - TTL and CMOS families and their comparison.

UNIT II - Combinational Circuits

Standard representation of logic functions (SOP and POS) - Karnaugh map minimization - Encoder and Decoder - Multiplexers and Demultiplexers - Implementing logic functions with multiplexer - Binary Adder - Binary Subtractor - Parallel adder/subtractor.

UNIT III - Sequential Circuits

Latches and Flip flop - S-R Flip flop - J-K Flip flop – T - D type Flip flop - Clocked and edge triggered Flip flops - Master slave flip flop – Registers - Counters (synchronous and asynchronous and modulo-N) - State Table - State Diagrams - Counter design using

excitation table and equations - Ring counter - Johnson counter - Analog to Digital Converter - Digital to Analog Converter.

UNIT IV - Introduction to Verilog

A Brief History of HDL-Structure of HDL Module - Comparison of VHDL and Verilog - Introduction to Simulation and Synthesis Tools - Test Benches - Verilog Modules – Delays - data flow style - Behavioral style - Structural style - Mixed design style -Simulating design - Introduction to Language Elements – Keywords – Identifiers -White Space Characters - Comments – Format – Integers – Reals – strings - Logic Values - Data Types - Net types - undeclared nets - Scalars and vector nets - Register type – Parameters – Expressions – Operand – Operators -Types of Expressions - Data flow Modeling -Behavioral Modeling.

UNIT V - Data flow Modeling

Continuous assignment - Net declaration assignments – Delays - Net delays - Behavioral Modeling - Procedural constructs - Timing controls - Block statement - Procedural assignments - conditional statement - Loop statement - Procedural continuous assignment - Gate level modeling – Introduction - Built in Primitive Gates - Multiple input gates - Tri-state gates - Pull gates - MOS switches - Bidirectional switches - Gate delay - Array instances - Implicit nets.

Suggested Readings:

Text Books

1. Salivahanan, (2014). *Digital Electronics and its Principles*. (10th ed.). McGraw Hill Education Private Limited.
2. Albert Paul Malvino, Donald P. Leach & Goutam Saha, (2010). *Digital Principles and Application*. (7th ed.). Tata McGraw Hill.

Reference Books

1. Morris Mano, M. (2014). *Digital System Design*. (4th ed.). Pearson Education Asia.
2. Sumathi, S. (2011). *Principles of VLSI Design*. Scitech Publications.
3. Pucknell D.A., & Eshraghian K. (2009). *Basic VLSI Design*. (3rd ed.). PHI.
4. Phadke, A.A., & Deokar, S.M., (2009). *Digital Logic Design and VHDL*. 4th ed.). Tata Mc-Graw Hill Publications.

Journals

1. International Journal of Emerging trends in Electrical and Electronics.
2. International Journal of Computer and Communication Technology

Websites

1. www.makezine.com
2. www.circuitstoday.com

17ECU302	DIGITAL AND CELLULAR COMMUNICATION	Semester - III			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

- To enable the students to learn the digital and cellular technology
- To identify the functions of different components
- Learn about theoretical bounds on the rates of digital communication system
- To represent a digital signal using several modulation methods
- Draw signal space diagrams compute spectra of modulated signals and apply redundancy for reliable communication.
- To make students familiar with fundamentals of mobile communication systems

COURSE OUTCOMES

- Understand the basics of information theory, source coding techniques and calculate Entropy of source
- To know the various types of noises in communication systems and reduction techniques
- Describe and determine the performance of line codes and methods to mitigate inter symbol interference
- Learn the generation and detection of base band system
- Understand the generation, detection signal space diagram, spectrum, bandwidth efficiency, and probability of error analysis of different band pass modulation techniques
- Describe and determine the performance of different error control coding schemes for the reliable transmission of digital representation of signals and information over the channel.

UNIT I - Data Transmission

Introduction – Representation of data signal – Parallel and serial data transmission – 20milli amps loop and line drivers – Transient noise – Data signal – Signal shaping and signaling speed – Noise and error analysis – Repeaters.

UNIT II - Communication System

Model of communication system – Elements of digital communication system: Information source - Source encoder/decoder - Communication channel - Modulator – Demodulator - Channel encoder/decoder - Other functional blocks – Analysis of communication system – Design of communication system.

UNIT III - Digital Carrier Modulation Schemes

Binary phase shift keying – Differential phase shift keying – Differentially encoded PSK – Quadrature phase shift keying – Base band signal receiver – Phase shift keying – Frequency shift keying – Non-coherent detection of FSK.

UNIT IV - Pulse Modulation And Quantization

Pulse amplitude modulation - Pulse width modulation - Pulse position modulation - Quantization of signals – Quantization error – Pulse code modulation – Electrical representation of Binary digits – PCM system – Companding – Multiplexing PCM signals – Differential PCM – Delta modulation – Adaptive delta modulation.

UNIT V - Digital Cellular Systems

GSM Architecture – Layer modeling – transmission – Data Service – Multiple Access Scheme – Channel Coding Inter leaving – Radio resource management – Mobility management – Communication management – Network management – TDMA Architecture – Transmission and Modulation – CDMA – Terms of CDMA Systems – Call Processing – Hand over Procedures

Suggested Readings:

Text Books

1. Chakrabarti, P. (2012). *Principles of Digital Communications*. (1st ed.). Dhanpat Rai Publications Private Limited.
2. Kennedy and Davis, (2012). *Electronic Communication Systems*. (5th ed.). Tata McGraw Hill.

Reference Books

1. John R.Barry, (2010). *Digital Communication*, Springer Publications.
2. Kanna, V.K. (2009). *Digital Communications*, S.Chand Publications.
3. Frenzel, (2015). *Principles of Electronic Communication Systems*. (4th ed.). McGraw Hill.
4. Tomasi, (2013). *Advanced Electronic Communications Systems*. (6th ed.). PHI.

Journals

1. International Journal of Emerging trends in Electrical and Electronics.
2. International Journal of Computer and Communication Technology.

Websites

1. www.allaboutcircuits.com
2. www.hackaday.io

17ECU303	INTERNET AND JAVA PROGRAMMING	Semester - III			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

- To understand the basic concepts of Internet
- To know the java path setting and programming techniques
- To understand the fundamental of Packages and access modifiers and interface in java
- To know the basic java programming and Applet programming
- To program in the Java programming language
- Knowledge of object-oriented paradigm in the Java programming language,

COURSE OUTCOMES

- Understand the basics of information theory, source coding techniques and calculate Entropy of source se an integrated development environment to write, compile, run, and test simple object-oriented Java programs
- Read and make elementary modifications to Java programs that solve real-world problems
- Validate input in a Java program
- Identify and fix defects and common security issues in code
- Document a Java program using Javadoc
- Use a version control system to track source code in a project.

UNIT I - Internet

Introduction, Understanding the Internet, Internet Addressing, Hardware Requirements to Connect to the Internet.

UNIT II - Data types, Arrays, Operators, Flow control

Branching, Looping. Classes, New Operator, Dot Operator, Method Declaration and Calling, Constructors.

UNIT III - Inheritance

Inheritance, Super, Method Overriding Final, Finalize, Static, Package and Import Statement, Interface and Implements

UNIT IV - Exception Handling

Exception Types, Uncaught and Calling, Nested Try Statements, Java Thread Model, and Thread, Runnable, Thread Priorities, Synchronization, Deadlock

UNIT V - File

Input Stream, Output Stream, and File Stream. Applets-Tag, Order of Applet Initialization, Repainting, Sizing Graphics- Abstract Window Tool Kit Components

Suggested Readings:

Text Books

1. James Gosling, Bill Joy, Guy L Steele Jr, GiladBracha, Alex Buckley, (2014). *The Java Language Specification, Java SE 8 Edition (Java Series*). Addison Wesley.

2. Joshua Bloch, (2008). *Effective Java*, (2nd ed.). Addison Wesley.

Reference Books

1. Cay S. Horstmann & GaryCornell, (2012). *Core Java 2 Volume 1*. (9th ed.). Prentice Hall.
2. Cay S. Horstmann & Gary Cornell, (2013). *Core Java 2 Volume 2*. (9th ed.). Prentice Hall.
3. Harley Hahn, (1997). *The Internet Complete Reference*. (2nd ed.). Tata McGraw Publication Ltd.

17ECU304A	DESIGN AND FABRICATION OF PRINTED CIRCUIT BOARDS	Semester - III			
		L	T	P	C
		3	-	-	3

COURSE OBJECTIVES

- To make familiar with PCB design and various processes involved.
- To provide in-depth core knowledge in design, performance analysis and fabrication of Printed Circuit Boards.
- To gain knowledge on PCB fabrication process and factors affecting PCB performance
- Understand the need for PCB Design and steps involved in PCB Design and Fabrication process.
- Familiarize Schematic and layout design flow using Electronic Design Automation (EDA) Tools
- Recognize the technologies used in electronic industry through the practical experience gained in the course

COURSE OUTCOMES

- Students can explore different aspect of Printed Circuit Board Design and fabrication
- Students can learn various types of PCBs. Schematic Design. entry Rules for Schematic Entry, Component Layout methods
- Placement Rules, Routing Techniques for Single Sided Board.
- Post Processing of design and Fabrication documents.
- After completing this course students can design and fabricate their own PCB for their Project and can also work in PCB Designing and Fabrication area
- Understand the steps involved in schematic, layout, fabrication and assembly process of PCB design

UNIT I - PCB Fundamentals

PCB Advantages - Components of PCB - Electronic components - Microprocessors and Microcontrollers - IC's - Surface Mount Devices (SMD) - Classification of PCB - single, double, multilayer and flexible boards - Manufacturing of PCB - PCB standards.

UNIT II - Schematic & Layout Design

Schematic diagram – General - Mechanical and Electrical design considerations - Placing and Mounting of components - Conductor spacing – Routing guidelines - Heat sinks - Package density - Net list - Creating components for library – Tracks – Pads – Vias - Power plane - Grounding.

UNIT III - Technology of PCB

Design automation - Design Rule Checking - Exporting Drill and Gerber Files – Drills - Footprints and Libraries Adding and Editing Pins - Copper clad laminates materials of copper clad laminates - Properties of laminates (electrical & physical) - Types of laminates - Soldering techniques.

UNIT IV – Etching and Soldering

Introduction - Film master preparation - Image transfer - Photo printing - Screen Printing - Plating techniques etching techniques - Mechanical Machining operations - Lead cutting and Soldering Techniques - Testing and quality controls.

UNIT V – Design Rules and Automation

Reflection – Crosstalk – Ground and Supply line noise – Electromagnetic Interference from pulse type EM fields and Automation – Automated artwork drafting - CAD - Environmental concerns in PCB industry.

Suggested Readings:

Text Books

1. Walter C.Bosshart, (2007). *PCB Design and Technology*, Tata McGraw Hill Publications.
2. Clyde F.Coombs, (2008). *Printed Circuits Handbook*, (6^{th} ed.). Tata McGraw Hill Publications.

Journals

1. International Asian Research Journal.
2. International Journal of Communication on Applied Electronics.

Websites

1. www.edx.org
2. www.circuitstoday.com

17ECU304B	ELECTRONIC INSTRUMENTATION	Semester - III			
		L	T	P	C
		3	-	-	3

COURSE OBJECTIVES

- To understand operation of different instruments
- To provide basic knowledge about the various sensors. and data acquisition systems applied in Wireless sensor network
- To provide fundamental concepts of control system.2 such as mathematical modeling, time response and frequency response
- To develop concepts of stability and its assessment.3 criteria.
- Explain basic concepts and definitions in measurement
- to find transfer functions for given system

COURSE OUTCOMES

- Able to understand operation of different instruments.
- Understand the principles of various types of transducers and sensors
- Able to calculate time domain and frequency domain parameter for given system
- Able to predict stability of given system using appropriate criteria
- Identify the various parameters that are measurable in electronic instrumentation
- Practice the construction of testing and measuring set up for electronic systems.

UNIT I - Measurements

Qualities of Measurement: Specifications of instruments - Static and dynamic characteristics - Error (Gross error, systematic error, absolute error and relative error) - Uncertainty analysis - Statistical analysis of data and curve fitting - Basic Measurement Instruments: PMMC instrument – Galvanometer - DC measurement – Ammeter – Voltmeter - Ohm meter - AC measurement - Digital voltmeter systems (integrating and non-integrating types) - Digital multimeters - Digital frequency meter system (different modes and universal counter). Connectors and Probes: low capacitance probes - High voltage probes - current probes - Identifying electronic connectors – audio and video - RF/Coaxial - USB etc.

UNIT II - Measurement of Resistance and Impedance

Low Resistance: Kelvin's double bridge method - Medium Resistance by Voltmeter Ammeter method - Wheatstone bridge method - High Resistance by Megger - A.C. bridges - Measurement of Self Inductance - Maxwell's bridge - Hay's bridge - Anderson's bridge - Measurement of Capacitance - Schering's bridge - DeSauty's bridge - Measurement of frequency - Wien's bridge. A-D and D-A Conversion: 4 bit binary weighted resistor type D-A conversion - Circuit and working - Circuit of R-2R ladder – A/D conversion characteristics - Successive approximation ADC.

UNIT III – Oscilloscopes

CRT - Wave form display and electrostatic focusing - Time base and sweep synchronization - Measurement of voltage - Frequency and phase by CRO - Oscilloscope probes - Dual trace oscilloscope - Sampling Oscilloscope - DSO and Powerscope: Block diagram - Principle and Working - Advantages and applications - CRO specifications (bandwidth, sensitivity, rise time). Signal Generators: Audio oscillator - Pulse Generator - Function generators.

UNIT IV - Transducers

Classification of transducers - Basic requirement/characteristics of transducers -

Active & passive transducers - Resistive (Potentiometer - Strain gauge – Theory, types - temperature compensation and applications) - Capacitive (Variable Area Type – Variable Air Gap type – Variable Permittivity type) - Inductive (LVDT) - Piezoelectric transducers - Measurement of displacement - Velocity - Acceleration - Measurement of pressure - Measurement of temperature - Light transducers.

UNIT V – Digital Instruments

Performance characteristics of instruments – Digital Multimeter – Digital frequency meter – Digital measurement of time – Digital measurement of mains frequency – Digital tacometer – Digital phase meter – Digital capacitance meter.

Suggested Readings:

Text Books

1. David A. Bell, (2013). *Electronic Instrumentation and Measurements*. Prentice Hall.
2. Kalsi, H. S. **(**2012). *Electronic Instrumentation*, (3rd ed.). TMH.

Reference Books

1. Joseph J Carr, (2011). *Elements of Electronic Instrumentation and Measurement*. Pearson Education.
2. Alan S. Morris, (2010). *Measurement and Instrumentation Principles*. Elsevier (Buterworth Heinmann.
3. Sawhney, A. K. (2009). *Electrical and Electronics Measurements and Instrumentation*. DhanpatRai and Sons.

Journals

1. International Asian Research Journal.
2. International Journal of Communication on Applied Electronics.

Websites

1. www.edx.org
2. www.coursera.org

17ECU311	DIGITAL ELECTRONICS AND VHDL - PRACTICAL	Semester - III			
		L	T	P	C
		-	-	4	2

COURSE OBJECTIVES

- Learn and understand the basics of digital electronics, Boolean algebra, and able to design the simple logic circuits and test/verify the functionality of the logic circuits
- Provide hands-on experience in digital circuits, which can be constructed by using standard integrated circuits (ICs)
- Investigate the operation of several digital circuits combinational and sequential
- To model complex digital systems at several level of abstractions; behavioral and structural, synthesis and rapid system prototyping.
- To develop and simulate register-level models of hierarchical digital systems
- To design and model complex digital system independently or in a team

COURSE OUTCOMES

- Identify the various digital ICs and understand their operation.
- Apply Boolean laws and K-map to simplify the digital circuits
- Understand the function of elementary digital circuits under real and simulated environment
- Describe and explain the operation of fundamental digital gates
- Analyze the operation of a flip-flop and examine relevant timing diagrams 4. Analyze the operation of counters and shift registers
- Design operate practical digital logic circuits

(Any 10 Experiments)

DIGITAL ELECTRONICS PRACTICAL

1. To verify and design AND, OR, NOT and XOR gates using universal gates.
2. Half Adder and Full Adder circuits
3. Comparator
4. Encoder and Decoder circuits
5. 4 X 1 Multiplexer using gates.
6. Counters

VHDL PRACTICAL

7. Design and Implementation of logic gates.
8. Design and Implementation of Half Subtractor and Full Subtractor
9. Design and Implementation of Up/Down Counter
10. Design and Implementation of flip-flop circuits
11. Design and Implementation of Multiplexer and Demultiplexer circuits.
12. Design and simulation of a 4 bit Adder.

17ECU312	DIGITAL AND CELLULAR COMMUNICATION - PRACTICAL	Semester - III			
		L	T	P	C
		-	-	4	2

COURSE OBJECTIVES

- To understand the building blocks of digital commutation system.
- To analyze error performance of a digital communication system in presence of noise and other interferences
- To understand information theoretic behavior of a communication system.
- To understand various source coding and channel coding techniques
- To develop to understand the concept of different types of coding.
- To understand Multiple Access and Spread Spectrum Techniques.

COURSE OUTCOMES

- Perform the time and frequency domain analysis of the signals in digital communication systems
- Design a suitable source and channel coding scheme for a communication system
- Analyze Performance of Multiple Access and Spread Spectrum Techniques
- Understand various spreading techniques and determine bit error performance of various digital communication systems
- determine the performance of different error control coding schemes for the reliable transmission of digital representation of signals and information over the channel
- Learn the generation and detection of base band system

(Any 10 Experiments)

1. Line Coding Schemes
2. Dibit Encoder
3. Delta modulation
4. Adaptive delta Modulation
5. Differential Pulse Code Modulation
6. Quadrature Phase Shift Keying
7. Time Division Multiplexing
8. Base Band Transceiver(Interpolation, Pairing)
9. Adaptive Linear Equalizer
10. Code Division Multiplexing
11. Direct Sequence Spread Spectrum (DSSS) CDMA
12. GSM Transmitter/Receiver

17ECU313	INTERNET AND JAVA PROGRAMMING - PRACTICAL	Semester-I			
		L	T	P	C
		-	-	4	2

COURSE OBJECTIVES

- To get familiar with basics of the Internet Programming.
- To gain ability to develop responsive web applications
- Gain knowledge about basic Java language syntax and semantics to write Java programs and use concepts such as variables, conditional and iterative execution methods etc.
- Concepts of inheritance, packages, interfaces and multithreading are introduced.
- Knowledge of object-oriented paradigm in the Java programming language
- The use of Java in a variety of technologies and on different platforms

COURSE OUTCOMES

- To understand the basic concepts of Internet
- Describe and differentiate different Web Extensions and Web Services
- Remember the fundamentals of Java programming language
- Understand the basics of Java programming, multi-threaded programs and Exception handling
- Analyze and use Java in a variety of applications
- Able to design, code and debug JAVA language programs

(Any 10 Experiments)

1. To find the sum of any number of integers entered as command line arguments
2. To find the factorial of a given number
3. To learn use of single dimensional array by defining the array dynamically.
4. To learn use of length in case of a two dimensional array
5. To convert a decimal to binary number
6. To check if a number is prime or not, by taking the number as input from the keyboard
7. To find the sum of any number of integers interactively, i.e., entering every number from the keyboard, whereas the total number of integers is given as a command line argument
8. Write a program that show working of different functions of String and StringBufferclasss like setCharAt(, setLength(), append(), insert(), concat()and equals().
9. Write a program to create a distance class with methods where distance is computed in terms of feet and inches, how to create objects of a class and to see the use of this pointer
10. Modify the distance class by creating constructor for assigning values (feet and inches) to the distance object. Create another object and assign second object as reference variable to another object reference variable. Further create a third object which is a clone of the first object.
11. Write a program to show that during function overloading, if no matching argument is

found, then java will apply automatic type conversions(from lower to higher data type)

12. Write a program to show the difference between public and private access specifiers. The program should also show that primitive data types are passed by value and objects are passed by reference and to learn use of final keyword

17ECU314A	DESIGN AND FABRICATION OF PRINTED CIRCUIT BOARDS - PRACTICAL	Semester - III			
		L	T	P	C
		-	-	3	1

COURSE OBJECTIVES

- Understand the need for PCB Design and steps involved in PCB Design and Fabrication process
- To gain knowledge on PCB fabrication process and factors affecting PCB performance
- Familiarize Schematic and layout design flow using Electronic Design Automation (EDA) Tools
- To make familiar with PCB design and various processes involved.
- To provide in-depth core knowledge in design, performance analysis and fabrication of Printed Circuit Boards
- Recognize the technologies used in electronic industry through the practical experience gained in the course

COURSE OUTCOMES

- Appreciate the necessity and evolution of PCB, types and classes of PCB.
- Understand the steps involved in schematic, layout, fabrication and assembly process of PCB design.
- Understand basic concepts of transmission line, crosstalk and thermal issues
- Students can explore different aspect of Printed Circuit Board Design and fabrication
- Students can learn various types of PCBs, Schematic Design, entry Rules for Schematic Entry and Component Layout methods
- Design (schematic and layout) PCB for analog circuits, digital circuits and mixed circuits

(Any 8 Experiments)

1. Fabrication of Electronic Components
2. Etching process in PCB.
3. Soldering practice in PCB.
4. PCB fabrication process of DMM and Power supply.
5. PCB Design software simulation.
6. Generation of CAM Files for single side PCB (Measuring voltage Drop)
7. Generation of CAM Files for single side PCB (Full wave Rectifier)
8. PCB Assembly and Testing (Measuring voltage Drop)
9. PCB Assembly and Testing (Full wave Rectifier)
10. Study of single side PCB Fabrication process.

17ECU314B	ELECTRONIC INSTRUMENTATION - PRACTICAL	Semester - III			
		L	T	P	C
		-	-	3	1

COURSE OBJECTIVES

- To understand scientific measurement principles and concepts behind modern electronic instrumentation
- To understand the principle of various types of transducers
- To know the construction and working of frequently used equipment's like CRO, Signal generator, spectrum analyzer etc
- To know the fundamentals of measuring systems including the particular limitations and capabilities Of a number of measuring devices (pressure transducers, strain gages, thermocouples, etc.) and Equipment's (oscilloscope, spectrum analyzer, etc.)
- To provide fundamental concepts of control system such as mathematical modeling, time response and frequency response
- To develop concepts of stability and its assessment.

COURSE OUTCOMES

- Identify various errors in measurement system and correct them.
- Understand the principles of various types of transducers and sensors
- Able to understand operation of different instruments.
- Able to calculate time domain and frequency domain parameter for given system
- Identify the various parameters that are measurable in electronic instrumentation
- Practice the construction of testing and measuring set up for electronic systems

(Any 8 Experiments)

1. Design of multi range ammeter and voltmeter using galvanometer.
2. Measurement of resistance by Wheatstone bridge and measurement of bridge sensitivity.
3. Measurement of Capacitance by de'Sautys.
4. Measure of low resistance by Kelvin's double bridge.
5. To determine the Characteristics of resistance transducer - Strain Gauge (Measurement of Strain using half and full bridge.)
6. To determine the characteristics of LVDT.
7. To determine the characteristics of Thermistors and RTD.
8. Measurement of temperature by Thermocouples
9. To study the Characteristics of LDR, Photodiode, and Phototransistor
10. Characteristics of Solid State sensor/ Fiber optic sensor

17ECU401	OPERATIONAL AMPLIFIER AND IT'S APPLICATIONS	Semester - IV			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

- To develop an in-depth knowledge on IC fabrication technology
- To understand the basic concepts of operational amplifier and its various applications
- To understand the basics of PLL and its practical applications
- To know about analog multipliers
- To know about various analog switches and different A/D and D/A convertors
- To understand the concepts of switched capacitor filters,Voltage regulator and various• amplifiers

COURSE OUTCOMES

- Learn about the basic concepts for the circuit configuration for the design of linear integrated circuits and develops skill to solve engineering problems
- Develop skills to design simple circuits using OP-AMP
- Gain knowledge about various multiplier circuits, modulators and demodulators
- Gain knowledge about PL
- Learn about various techniques to develop A/D and D/A convertors
- Develop skills to develop simple filter circuits and various amplifiers and can solve problems related to it.

UNIT I - IC Fabrication Technology

Introduction to Integrated Circuit Fabrication – Classification – Integrated Circuit chip size and circuit complexity - Fundamentals of Monolithic Integrated Circuit technology –Basic planar process – Fabrication of a Typical circuit – Active and Passive Components Integrated Circuits - Thin and Thick film technology – Technology Trends.

UNIT II - Basic Operational Amplifier

Concept of differential amplifiers (Dual input balanced and unbalanced output) - Constant current bias - Current mirror - Cascaded differential amplifier stages with concept of level translator - Block diagram of an operational amplifier (IC 741) - Op-Amp parameters: Input offset voltage - Input offset current - Input bias current Differential input resistance - Input capacitance - Offset voltage adjustment range - Input voltage range - Common mode rejection ratio - Slew rate - Supply voltage rejection ratio.

UNIT III – Operational Amplifier Circuits

Open and closed loop configuration - Frequency response of an op-amp in open loop and closed loop configurations – Inverting - Non-inverting - Summing and difference amplifier – Integrator – Differentiator - Voltage to current converter - Current to voltage converter – Comparators.

UNIT IV – Comparator

Basic comparator - Level detector - Voltage limiters - Schmitt Trigger - Signal generators: Phase shift oscillator - Wein bridge oscillator - Square wave generator - Triangle wave generator - Saw tooth wave generator - Voltage controlled oscillator(IC 566) - Multivibrators (IC 555): Block diagram - Astable and monostable multivibrator circuit -

Applications of Monostable and Astable multivibrators.

UNIT V - Phase locked loops (PLL)

Block diagram - Phase detectors - IC565 - Fixed and variable IC regulators: IC 78xx and IC 79xx - Concepts only - IC LM317 - Output voltage equation - Signal Conditioning circuits: Sample and hold systems - Active filters: First order low pass and high pass butterworth filter - Second order filters - Band pass filter - Band reject filter - All pass filter - Log and antilog amplifiers.

Suggested Readings:

Text Books

1. Choudhury, D. R., & Jain, S. (2014). *Linear integrated circuits* (4th ed.). New York: Wiley.
2. Salivahanan, S. (2008). *Linear Integrated Circuits*, (4th ed.). Tata McGraw Hill Publications.

Reference Books

1. Kishore, K.L. (2011). *OP-AMP and Linear Integrated Circuits*. Pearson Education.
2. Chitode, J.S. (2010). *Linear Integrated Circuits*. (6th ed.). Pune: Technical Publications.
3. Botkar, K.R. (2008). *Integrated Circuits*. Khanna Publications.

Journals

1. International Education and Research Journal
2. International Journal for Research and Development in Technology

Websites

1. www.engineersgarage.com
2. www.circuitstoday.com

17ECU402	MICROPROCESSOR AND MICROCONTROLLER	Semester - IV			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

- To know the fundamental concept of microprocessor 8085 and microcontroller architecture and to program in assembly language.
- To learn the interfacing of different peripherals for various typical applications
- To develop background knowledge and core expertise of microcontroller
- To know the importance of different peripheral devices and their interfacing to microcontrollers
- To know the design aspects of microcontrollers. 4. To write assembly language programs of microcontrollers for various applications.
- To provide a strong practical knowledge in the application areas.

COURSE OUTCOMES

- Apply basic concept of digital fundamentals to Microprocessor based personal computer system.
- Identify a detailed s/w & h/w structure of the Microprocessor.
- Illustrate how the different peripherals (8255, 8253 etc.) are interfaced with Microprocessor.
- Distinguish and analyze the properties of Microprocessors & Microcontrollers.
- Aanalyze the data transfer information through serial & parallel ports
- Train their practical knowledge through laboratory experiments.

UNIT I - Introduction to Microprocessor

Introduction – Applications - Basic block diagram – Speed - Word size - Memory capacity - Classification of microprocessors - Microprocessor 8085: Features - Architecture - Block diagram - General purpose registers - Register pairs – Flags - Stack pointer - Program counter - Types of buses - Multiplexed address and data bus - Generation of control signals - Pin description of microprocessor 8085 - Basic interfacing concepts - Memory mapped I/O and I/O mapped I/O.

UNIT II - 8085 Instruction Sets

Operation code - Operand and Mnemonics - Instruction set of 8085 - Instruction classification - Addressing modes - Instruction format - Data transfer instructions - Arithmetic instructions - Increment and decrement instructions - Logical instructions - Branch instructions - Machine control instructions - Assembly language programming examples.

UNIT III - Branch Instructions

Stack operations – Subroutine - Call and return instructions - Delay loops - Use of counters - Timing diagrams - Instruction cycle - Machine cycle - T- states - Time delay. Interrupt structure of 8085A microprocessor - Processing of vectored and non-vectored interrupts - Latency time and response time - Handling multiple interrupts - Microcontrollers: Introduction - different types of microcontrollers - Embedded microcontrollers - Processor architectures - Harvard vs. Princeton - CISC vs. RISC architectures - Microcontroller memory types - Microcontroller features – Clocking - I/O pins – Interrupts – Timers - Peripherals.

UNIT IV - PIC16F887 Microcontroller

Core features – Architecture - Pin diagram - Memory organization - Program and data memory organization - I/O Ports - Oscillator module - Timer modules - Comparator module - Analog-to-digital converter (ADC) module - Data EEPROM - Enhanced capture/compare/PWM module – EUSART - Master synchronous serial port (MSSP) module - Special features of the CPU - Interrupts - Addressing modes - Instruction set.

UNIT V - Interfacing to PIC16F887

LED – Switches - Solid State Relay - Seven Segment Display - 16x2 LCD display - 4x4 Matrix Keyboard – Traffic light controller - Digital to Analog Converter - Stepper Motor and DC Motor - Interfacing program examples using C language.

Suggested Readings:

Text Books

1. Kani, A. N. (2012). *Microprocessors and Microcontrollers: includes 8085*
2. *Microprocessors, 8086 Microprocessors, Advance Microprocessors Microcontrollers*. New Delhi: Tata McGraw Hill Publications.
3. Gaonkar, R. S., & Gaonkar, R. S. (2009). *Microprocessor Architecture,Programming, and Applications with the 8085* (4th ed.). Upper Saddle River, NJ: Prentice Hall.

Reference Books

1. Ayala, K. J. (2007). *The 8051 microcontroller* (3rd ed.). Clifton Park, NY: Thomson Delmar Learning.
2. Ray, & Bhurchnadi, (2008). *Advanced Microprocessor and Peripherals*. (6^{th} ed.). Tata McGraw Hill Publications.

Journals

1. International Journal of Advanced and Applied Sciences
2. International Education and Research Journal

Websites

1. www.sparkfun.com
2. www.circuitstoday.com

17ECU403	POWER ELECTRONICS	Semester - IV			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

- To know the fundamental concept of Power Electronics and its Applications
- To teach fundamental principles of thyristor family.
- To become familiar with power devices and their application in various fields
- Learners are expected to understand various controllers , converters , inverters and choppers
- To familiarize students to the principle of operation, design and synthesis of different power conversion circuits and their applications
- To provide strong foundation for further study of power electronic circuits and systems

COURSE OUTCOMES

- Apply basic concept of digital fundamentals to Microprocessor based personal computer system
- Demonstrate an understanding of fundamentals of thyristor family.
- Analyze the various applications and circuits based on thyristor .
- Build and test circuits using power devices such as SCR, IGBT and MOSFET.
- Analyze and design controlled rectifier, DC to DC converters, DC to AC
- Relate basic semiconductor physics to properties of power devices, and combine circuit mathematics and characteristics of linear and non-linear devices

UNIT I - Power Devices

Need for semiconductor power devices - Power diodes - Enhancement of reverse blocking capacity - Introduction to family of thyristors - Silicon Controlled Rectifier (SCR): Structure - I-V characteristics - Turn-On and Turn-Off characteristics – Ratings - Factors affecting the characteristics/ratings of SCR – Gate triggering circuits - Control circuits design and Protection circuits - Snubber circuit.

UNIT II – DIAC and TRIAC

Diac and Triac: Basic structure - Working and V-I characteristic of - Application of a Diac as a triggering device for a Triac - Insulated Gate Bipolar Transistors (IGBT): Basic structure - I-V Characteristics - Switching characteristics - Device limitations - Safe operating area (SOA).

Application of SCR: Static switch - Phase controlled rectification - Single phase half wave - Full wave and bridge rectifiers with inductive & non-inductive loads - AC voltage control using SCR - Triac as a switch - Power MOSFETs: operation modes - Switching characteristics - Power BJT - Second breakdown - Saturation and quasi-saturation state.

UNIT III - Power Inverters

Need for commutating circuits - Types - D.C. link invertors - Parallel capacitor commutated invertors with and without reactive feedback – Analysis - Series Invertor - Limitations – Bridge invertors.

UNIT IV - Choppers

Basic chopper circuit - Types of choppers – Step down chopper – Step up chopper - Operation of d.c. chopper circuits using self commutation - Cathode pulse turn-off chopper - Load sensitive cathode pulse turn-off chopper - Morgan's chopper.

UNIT V - Electromechanical Machines

DC Motors - Basic understanding of field and armature - Principle of operation - EMF equation - Back EMF - Factors controlling motor speed - Thyristor based speed control of dc motors - AC motor - Rotor and stator - Torque & speed of induction motor - Thyristor control of ac motors

Suggested Readings:

Text Books

1. Rashid, M. H. (2014). *Power Electronics: Circuits, Devices, and Applications* (3rd ed.). Englewood Cliffs, NJ: Prentice Hall.
2. Rai, H. C. (2013). *Industrial and Power Electronics*, (3rd ed.)., Millennium: Umesh Publications.

Reference Books

1. Joe., V. R. (2010). *Industrial Power Electronics*. Vanderbijlpark: Lerato.
2. HariBabu, K. (2009). *Power Electronics*. Scitech Publication.

Journals

1. International Journal of Electrical and Electronic Engineers
2. International Journal of Engineering and Technology

Websites

1. www.nptel.ac.in
2. www.quora.com

17ECU404A	ELECTRICAL CIRCUITS AND NETWORK SKILLS	Semester -IV			
		L	T	P	C
		3	-	-	3

COURSE OBJECTIVES

- To get technically expertise in electrical machines and drive systems, and being able to apply the knowledge to practical industry systems and appliances.
- To understand the new technological development in the field of electrical drive, and being skillful in numerical calculation, technical writing, and presentation of electrical machine technology.
- To explain the basic concepts and laws of DC and AC electrical networks and solve them using mesh and nodal analysis techniques
- To analyze circuits in time and frequency domain
- To introduce open circuit, short circuit, transmission, hybrid parameters and their interrelationship
- To synthesize the network using passive elements.

COURSE OUTCOMES

- Apply concepts of electric network topology, nodes, branches, loops to solve circuit problems including the use of computer simulation
- Understand the basic concepts of graph and analyze the basic electrical circuits using graph theory
- Apply time and frequency concepts of analysis
- Understand various functions of network and also the stability of network
- Learn the various parameters and their interrelationship, able to solve numericals with series, cascade and parallel connections.
- Synthesize the network using passive elements.

UNIT I - Basic Electricity Principles

Voltage – Current – Resistance – Power - Ohm's law – Series-parallel and parallel-series combinations - AC and DC Electricity - Familiarization with multimeter - Voltmeter and Ammeter - Electrical Circuits: Basic electric circuit elements and their combination - Rules to analyze DC sourced electrical circuits - Current and voltage drop across the DC circuit elements - Single-phase - Three-phase alternating current sources - Rules to analyze AC sourced electrical circuits - Real-imaginary and complex power components of AC source - Power factor - Saving energy and money.

UNIT II - Electrical Drawing and Symbols

Drawing symbols – Blueprints - Reading: Schematics - Ladder diagrams - Electrical Schematics - Power circuits - Control circuits - Reading: of circuit schematics - Tracking the connections of elements and identify current flow and voltage drop.

UNIT III - Generators and Transformers

DC Power sources - AC/DC generators – Inductance – Capacitance – Impedance - Operation of transformers - Electric Motors: Single-phase - Three-phase - DC motors - Basic design - Interfacing DC or AC sources to control heaters and motors - Speed and power of ac motor.

UNIT IV - Solid-State Devices

Resistors - Inductors – Capacitors - Diode and rectifiers - Components in Series or in shunt - Response of inductors and capacitors with DC or AC sources - Electrical Protection: Relays - Fuses and disconnect switches - Circuit breakers - Overload devices - Ground-fault protection - Grounding and isolating - Phase reversal - Surge protection - Relay protection device.

UNIT V - Electrical Wiring

Different types of conductors and cables - Basics of wiring - Star and delta connection - Voltage drop and losses across cables and conductors - Instruments to measure current – Voltage - Power in DC and AC circuits – Insulation - Solid and stranded cable – Conduit - Cable trays - Splices: Wire-nuts – Crimps - Terminal blocks – Solder - Preparation of extension board.

Suggested Readings:

Text Books

1. Smith, K. C., & Alley, R. E. (2014). *Electrical Circuits: An Introduction*. Cambridge: Cambridge University Press.
2. Bird, J. O. (2012). *Electrical Circuit Theory and Technology*. Amsterdam: Newnes.

Reference Books

1. Monier, C. J. (2008). *Electric Circuit Analysis*. Upper Saddle River, NJ: Prentice Hall.
2. Kumar, K. S. (2009). *Electric Circuits and Networks*. Delhi, India: Dorling Kindersley (India).

Journals

1. International Journal of Electrical and Electronic Engineers
2. International Journal of Engineering and Technology

Websites

1. www.nptel.ac.in
2. www.quora.com

17ECU404B	DIGITAL SYSTEM DESIGN	Semester - IV			
		L	T	P	C
		3	-	-	3

COURSE OBJECTIVES

- To provide strong knowledge on Programmable Logic Devices and its usage in industrial automation.
- To understand number representation and conversion between different representation in digital electronic circuits.
- To analyze logic processes and implement logical operations using combinational logic circuits.
- To understand concepts of sequential circuits and to analyze sequential systems in terms of state machines
- To understand concept of Programmable Devices, PLA, PAL, CPLD and FPGA and implement digital system using VHDL
- To implement combinational and sequential circuits using VHDL

COURSE OUTCOMES

- Develop a digital logic and apply it to solve circuit problems
- Analyze, design and implement combinational logic circuits
- Classify different semiconductor memories
- Analyze, design and implement sequential logic circuits
- Analyze digital system design using PLD
- Simulate and implement combinational and sequential circuits using VHDL systems

UNIT I - Sequential Logic Circuits

Introduction to Sequential Logic Circuits - Mealy Machine- Moore Machine - State Diagrams - State Table Minimization - Incompletely Specified Sequential Machines - State Assignments - Design of Synchronous and Asynchronous Sequential Logic Circuits - Working in Fundamental and Pulse Mode.

UNIT II - Synchronous Sequential Circuit Design

Introduction of Clocked Synchronous Sequential Networks (CSSN) - Modeling of CSSN - State Table Assignment and Reduction – Design of CSSN - ASM Chart - ASM Realization.

UNIT III - Asynchronous Sequential Circuit Design

Introduction of Asynchronous Sequential Circuits (ASC) - Flow Table Reduction - Races in ASC - State Assignment - Problem and the Transition Table - Design of ASC - Static and Dynamic Hazards - Mixed Operating Mode Asynchronous Circuits.

UNIT IV - Programmable Logic Devices

Basic Concepts - Programming Technologies - Programmable Logic Element(PLE), Programmable Logic Array(PLA) - Programmable Array Logic(PAL) - Complex PLD's(CPLD) -System Design using PLD's - Design of Combinational and Sequential Circuits using PLD's.

UNIT V - Study of FPGA and XILINX

Introduction to Field Programmable Gate Arrays - Types of FPGA – Xilinx XC3000 Series - Logic Cell Array (LCA) - Configurable Logic Blocks (CLB) - Input/Output Block (IOB) -Programmable Interconnect Point (PIP).

Suggested Readings:

Text Books

1. Givone, D. D. (2003). *DigitalPrinciples and Design*. Dubuque: McGraw-Hill.
2. Floyd, T. L. (2014). *Digital Fundamentals*. Essex: Pearson Education.

Reference Book

1. Gothmann, W. H. (2009). *Digital Electronics: An Introduction to Theory and Practice*. Englewood Cliffs, NJ: Prentice-Hall.

Journals

1. International Journal of Emerging trends in Electrical and Electronics.
2. International Journal of Computer and Communication Technology

Websites

1. www.makezine.com
2. www.circuitstoday.com

17ECU411	OPERATIONAL AMPLIFIER - PRACTICAL	Semester - IV			
		L	T	P	C
		-	-	4	2

COURSE OBJECTIVES

- To Gain the practical hands-on experience on 741 Op-Amp applications
- To understand the basic concepts of operational amplifier and its various applications
- To Gain the practical hands-on experience on 555 Timer applications.
- To Gain the practical hands-on experience on Voltage Regulator and Three terminal voltage regulators
- To know about various analog switches and different A/D and D/A convertors
- To understand the concepts of switched capacitor filters, Voltage regulator and various amplifiers

COURSE OUTCOMES

- Learn about the basic concepts for the circuit configuration for the design of linear integrated circuits and develops skill to solve engineering problems
- Develop skills to design simple circuits using OP-AMP
- Able to utilize items such as decibels, Bode plots, and negative feedback for circuit analysis.
- Gain knowledge about various multiplier circuits, modulators and demodulators
- Gain knowledge about PL
- Develop skills to develop simple filter circuits and various amplifiers and can solve problems related to it.

(Any 10 Experiments)

1. Study of op-amp characteristics: CMRR and Slew rate.
2. Inverting and non-inverting configuration using an opamp.
3. Adder and subtractor circuit.
4. Integrator using op-amp for a given specification and study its frequency response.
5. Differentiator using op-amp for a given specification and study its frequency response.
6. First Order low-pass and high-pass filters using op-amp.
7. Schmitt Trigger using Op-amp
8. RC Phase Shift Oscillator using op-amp.
9. IC 555 as an astable multivibrator.
10. IC 555 as monostable multivibrator.
11. Regulated power supply using IC 78 series and 79 series.
12. VCO using IC565.

17ECU412	MICROPROCESSOR AND MICROCONTROLLER - PRACTICAL	Semester - IV			
		L	T	P	C
		-	-	4	2

COURSE OBJECTIVES

- To expose students to the operation of typical microprocessor and microcontroller.
- To prepare the students to be able to solve different problems by developing different programs
- To develop the quality of assessing and analyzing the obtained data
- To illustrate the architecture of 8085 a microprocessors.
- To understand the interfacing circuits for various applications of 8051 microcontroller
- To introduce the architecture of advanced microprocessors and microcontrollers.

COURSE OUTCOMES

- Identify relevant information to supplement to the Microprocessor and Microcontroller course
- Set up programming strategies and select proper mnemonics and run their program on the training boards
- Practice different types of programming keeping in mind technical issues Develop testing and experimental procedures on Microprocessor and Microcontroller analyze their operation under different cases
- Prepare professional quality textual and computational results, incorporating accepted data analysis and synthesis methods, simulation software, and word-processing tools
- Illustrate the organization of registers and memory in microprocessors.

(Any 10 Experiments)

8085 Assembly language programs:

1. Program to transfer a block of data.
2. Program for multibyte addition and subtraction
3. Program to multiply and divide two 8-bit numbers.
4. Ascending and Descending numbers in an array.
5. Speed control of a DC motor.
6. Traffic light controller.

PIC Microcontroller Programming

Note: Programs to be written using C programming language

1. LED blinking with a delay of 1 second.
2. Interfacing of LCD (2X16).
3. Interfacing of stepper motor and Rotating stepper motor by N steps clockwise/anticlockwise with speed control.
4. Generate sine, square, saw tooth, triangular and staircase waveform using DAC interface.
5. Analog to digital conversion using internal ADC and display the result on LCD.
6. Digital clock.

17ECU413	POWER ELECTRONICS - PRACTICAL	Semester - IV			
		L	T	P	C
		-	-	4	2

COURSE OBJECTIVES

- To provide the students a deep insight in to the working of different switching devices with respect to their characteristics
- To analyze different converters and control with their applications
- To develop an overall approach for students from construction of control rectifier , inverter, choppers, study its specification, the functionality, design and practical applications
- To become familiar with power devices and their application in various fields
- To understand various controllers , converters , inverters and choppers
- To Know the advanced converters and switching techniques implemented in recent technology

COURSE OUTCOMES

- Express the design and control of rectifiers, inverters
- Design of power electronic converters in power control applications.
- Ability to express characteristics of SCR, BJT, MOSFET and IGBT
- Ability to express communication methods
- Ability design AC voltage controller and Cyclo Converter
- Ability to design Chopper circuits

(Any 10 Experiments)

1. SCR as a half wave and full wave rectifiers with R and RL loads
2. DC motor control using SCR.
3. Buck - Boost Regulator
4. AC voltage controller using TRIAC with UJT triggering.
5. Snubber circuit
6. Single phase inverter.
7. Fan control using TRIAC and DIAC.
8. Cyclo Converters
9. Automatic Battery Charger
10. Triac Flasher.
11. Thyristor Chopper
12. Burglar Alarm

17ECU414A	ELECTRICAL CIRCUITS AND NETWORK SKILLS - PRACTICAL	Semester - IV			
		L	T	P	C
		-	-	3	1

COURSE OBJECTIVES

- To provide the students a deep insight in to the working of different switching devices with respect to their characteristics
- To get technically expertise in electrical machines and drive systems, and being able to apply the knowledge to practical industry systems and appliances.
- To understand the new technological development in the field of electrical drive, and being skillful in numerical calculation, technical writing, and presentation of electrical machine technology.
- To explain the basic concepts and laws of DC and AC electrical networks and solve them using mesh and nodal analysis techniques
- To analyze circuits in time and frequency domain
- To synthesize the network using passive elements

COURSE OUTCOMES

- Apply concepts of electric network topology, nodes, branches, loops to solve circuit problems including the use of computer simulation
- Understand the basic concepts of graph and analyze the basic electrical circuits using graph theory
- Apply time and frequency concepts of analysis
- Understand various functions of network and also the stability of network
- Able to solve numericals with series, cascade and parallel connections.
- Synthesize the network using passive elements.

(**Any 8 Experiments)**

1. Verification of KVL using Digital simulation
2. Verification of KCL using Digital simulation
3. Thevenin's Theorem using Digital simulation
4. Verification of Superposition theorem using Digital simulation
5. Verification of Reciprocity Theorem using Digital simulation
6. Maximum Power Transfer theorem using Digital simulation
7. Circuit Transients by Digital simulation
8. RLC Series Resonance by Digital simulation
9. Transient analysis of Series RL circuits
10. Transient analysis of Series RC circuits

17ECU414B	DIGITAL SYSTEM DESIGN - PRACTICAL	Semester - IV			
		L	T	P	C
		-	-	3	1

COURSE OBJECTIVES

- To acquaint the students with the fundamental principles of two-valued logic and various devices used to implement logical operations on variables
- To lay the foundation for further studies in areas such as communication, VLSI, computer, microprocessor
- To analyze logic processes and implement logical operations using combinational logic circuits
- To understand concepts of sequential circuits and to analyze sequential systems in terms of state machines
- To understand concept of Programmable Devices, PLA, PAL, CPLD and FPGA and implement digital system using VHDL
- To implement combinational and sequential circuits using VHDL

COURSE OUTCOMES

- Analyze the operation of a flip-flop and examine relevant timing diagrams
- Design operate practical digital logic circuits
- Develop a digital logic and apply it to solve circuit problems
- Analyze, design and implement combinational logic circuits
- Classify different semiconductor memories
- Analyze, design and implement sequential logic circuits

(Any 8 Experiments)

Note: EDA Tools/VHDL/Verilog/Mentor Graphics/Cadence

1. To convert a Boolean expression into logic gate circuit and assemble it using logic gate IC's.
2. Design of parity generator and checker circuit.
3. Barrel shifter
4. Design a seven segment display driver.
5. Image capturing
6. Counters and Shift registers
7. IIR filters
8. FIR filters
9. Design and simulation of a 4 bit Adder.
10. Frequency synthesizer

17ECU501A	PROGRAMMABLE LOGIC CONTROLLER	Semester-VI			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

- To identify logical process control in automation
- To connect PLC peripherals with PLC for logical functioning.
- To get strong knowledge in the developing of basic PLC programs
- To understand the components of a PLC system To understand how PLCs are used
- To understand the H&S requirements of a PLC- controlled system
- To understand different methods of interfacing with a PLC

COURSE OUTCOMES

- Identify the main parts of programmable logic controller
- Develop logic gate circuits for Boolean expressions
- Able to state basic PLC Terminology
- Identify logical process control, in automation.
- Describe how a programmable logic controller is programmed.
- Describe switching elements on input/output modules

UNIT I - Introduction

Introduction - Programmable Logic structures - Programmable Logic Arrays (PLAs) - Programmable Array Logic (PALs) - Programmable Gate Arrays (PGAs) - Field Programmable Gate Arrays (FPGAs) - Sequential network design with Programmable Logic Devices (PLDs) - Design of sequential networks using ROMs and PLAs - Traffic light controller using PAL.

UNIT II - PLC Structure

Programmable Logic Controllers (PLCs) - Introduction - Parts of PLC - Principles of operation - PLC sizes - PLC hardware components - I/O section - Analog I/O section - Analog I/O modules - Digital I/O modules - CPU Processor - Memory module - Programming devices - Diagnostics of PLCs with Computers.

UNIT III - PLC programming

Simple instructions - Programming EXAMINE ON and EXAMINE OFF instructions - Electromagnetic control relays - Motor starters - Manually operated switches - Mechanically operated and Proximity switches - Output control devices - Latching relays - PLC ladder diagram - Converting simple relay ladder diagram into PLC relay ladder diagram.

UNIT IV - Timer instructions

Introduction to timer - ON DELAY timer - OFF DELAY timer - Counter instructions - Up/Down counters - Timer and Counter applications - Program control instructions - Data manipulating instructions - Math instructions.

UNIT V - Applications of PLC

Simple materials handling applications - Automatic control of warehouse door - Automatic lubricating oil supplier - Conveyor belt motor control - Automatic car washing machine - Bottle PRACTICALel detection - Process control application.

Suggested Readings:

Text Books

1. Webb, J. W., & Reis, R. A. (2009). *Programmable Logic Controllers: Principles and Applications*. Upper Saddle River: Prentice Hall.
2. Dunning, G. (2007). *Introduction to Programmable Logic Controllers*. Albany, NY: Delmar.

Journals

1. International Journal of Electrical and Electronic Engineers
2. International Journal of Engineering and Technology

Websites

1. www.nptel.ac.in
2. www.quora.com

17ECU501B	NANO ELECTRONICS	Semester - V			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

- To discuss about the latest technology on nano systems based Nanoelectronics.
- To know the various methods to fabricate and measure Nanoscale features.
- To identify the critical parameters that one must evaluate when considering any new Nanoelectronics device.
- Know the types of nanotechnology, atomic structure, molecular technology and• preparation of nano materials
- Understand the fundamentals of nano electronics and its properties.
- Know the Silicon MOSFET's, QTD and carbon nano tubes

COURSE OUTCOMES

- Understand the fundamentals of Nano Electronics and its properties.
- Gain the concepts of quantum theory.
- Understand the latest technology on nano systems based Nano electronics
- Identify the various methods to fabricate and measure Nanoscale features.
- Evaluate the critical parameters when considering any new Nano electronics device.
- Understand the applications of Nano Electronics.

UNIT I - Introduction

Definition of Nano-Science and Nano Technology - Applications of Nano - Technology. Introduction to Physics of Solid State: Size dependence of properties - Bonding in atoms and giant molecular solids - Electronic conduction - Systems confined to one, two or three dimension and their effect on property.

UNIT II - Quantum Theory for Nano Science

Time dependent and time independent Schrodinger wave equations - Particle in a box - Potential step: Reflection and tunneling (Quantum leak) - Penetration of Barrier - Electron trapped in 2D plane (Nano sheet) - Quantum confinement effect in nano materials - Quantum Wells, Wires and Dots: Preparation of Quantum Nanostructure - Size and Dimensionality effect - Fermi gas - Potential wells - Partial confinement –Excitons - Single electron Tunneling - Infrared detectors - Quantum dot laser Superconductivity.

UNIT III - Growth Techniques of Nanomaterials

Synthetic aspects: bottom up and top down approaches - Lithograpahic and Nonlithograpahic techniques - Sputtering and film deposition in glow discharge - DC sputtering technique (p-CuAlO2 deposition) - Thermal evaporation technique - E-beam evaporation - Chemical Vapour deposition(CVD) - Synthesis of carbon nano-fibres - Multi-walled carbon nanotubes - Pulsed Laser Deposition - Molecular beam Epitaxy - Sol-Gel Technique (No chemistry required) - Synthesis of nanowires/rods - Electro deposition - Chemical bath deposition - Ion beam deposition system – Vapor Liquid –Solid (VLS) method of nanowire.

UNIT IV - Methods of Measuring Properties and Characterization techniques

Microscopy: Scanning Probe Microscopy (SPM) - Atomic Force Microscopy (AFM)

- Field Ion Microscopy - Scanning Electron Microscopy (SEM) - Transmission Electron Microscopy(TEM) including energy dispersive X-ray (EDX) analysis - Low energy electron diffraction (LEED) - Reflection high energy electron diffraction (RHEED) - Spectroscopy: Infra-red and Raman Spectroscopy - X-ray Spectroscopy - Magnetic resonance - Optical and Vibrational Spectroscopy Characterization.

UNIT V - Applications

Carbon nanotubes - Nano cuboids - Graphene - Carbon quantum dots: Fabrication - Structure - Electrical - Mechanical - Vibrational properties – Applications - Use of nano particles for biological application - Drug delivery and bio-imaging - Impact of nanotechnology on the environment.

Suggested Readings:

Text Books

1. Singh, G. P. (2011). *Basics of Nano Electronics*, (1st ed.). Animol Publications Pvt. Ltd.
2. Goser, .K (2005). *Nanoelectronics and Nanosystems: From Transistors to Molecular and Quantum devices.* (1st ed.). Springer.

Reference Books

1. Pradeep, T. (2008). *Nano: The Essentials: Understanding Nanoscience and*
2. *Nanotecnology.* New Delhi.: Tata McGraw Hill.
3. Kelsall, R. W., Ian W. Hamley, I.W., & Geoghegan, M. (2005). *Nanoscale Science and Technology*. John Wiley & Sons, Ltd.

Journals

1. International Journal of Nanofluids and Nanoparticles
2. International Journal of New Technology and Research

Websites

1. www.tutorialspoint.com
2. www.allaboutcircuits.com

17ECU502A	ADVANCED COMMUNICATION SYSTEMS	Semester - V			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

- Provides knowledge in understanding the characteristics of different multiple access techniques in mobile/wireless communication.
- To understand the need of coding, Channel models, Diversity, Equalization and Channel estimation techniques. Able to apply analytical and empirical models in the design of wireless links.
- To understand the Wireless communication systems and standards.
- Students can design an optimum Single and multi-carrier communication system under given power, spectral and error performance constraints
- Analyze the error performance of digital modulation techniques
- Explore M ary signaling

COURSE OUTCOMES

- Understand the need of coding, Channel models, Diversity, Equalization and Channel estimation techniques.
- Understand the Wireless communication systems and its standards
- Apply analytical and empirical models in the design of wireless links.
- Evaluate the characteristics of speech signals and their frequency limitations.
- Describe and evaluate the design and performance of digital and analog circuits.
- Ability to analyze and evaluate digital communication systems.

UNIT I -Wave Propagation

EM Waves – Free Space Propagation – Surface Wave Propagation – Sky Wave Propagation – Space Wave Propagation – Trophospheric Scatter Propagation – Structure of Atmosphere – Characteristics of Ionized Regions – Virtual Height – Maximum Usable Frequency - Lowest Usable Frequency – Skip Distance – Optimum Working Frequency – Ionospheric Abnormalities – Duct Propagation.

UNIT II -Antenna Theory

Electro Magnetic radiations – Elementary doublet – Current and Voltage Distribution – Resonant antennas, Radiation patterns and Length calculations – Non resonant antennas – Antenna gain and Effective radiated power – Antenna resistance – Bandwidth, Beam width and Polarization – Grounded and Ungrounded antennas – Impedance matching – Dipole Arrays - Yagi Uda antenna – Parabolic antenna – Horn and Lens antenna .

UNIT III - Satellite Communication

System Description – Telemetry, Tracking and Command – Communication Space Craft – Satellite Orbit – GEO – LEO – MEO – Satellite Position – Linkage – Frequencies – Inside the Satellite: Transponder – Antenna Systems – Power Packages – Station Keeping – Ground Station – Aligning the Satellite Dish.

UNIT IV - Optical Fiber Communication

Basic Fiber Optic System – Frequencies – Fiber Optic Cables – Refraction – Numerical Aperture – Graded Index Cables – Single Mode – Multimode – Cable Constructions – Cable Losses – Connecter – Light Sources – Light Detector - System

Components – Advantages And Disadvantages.

UNIT V – Microwave Communication

Introduction – Maxwell's equation – Amperes law – Faradays law – Gauss law – Wave equation – Types of wave guides –Microwave tubes: - Two cavity Klystron – Multi cavity Klystron – Reflex Klystron – Traveling wave tube (TWT) – Radar – Classification- Applications.

Suggested Readings:

Text Books

1. Kennedy, G., & Davis, B. (2012). *Electronic Communication Systems*. Lake Forest, IL: Glencoe.
2. Schoenbeck, R. J. (2011). *Electronic Communications: Modulation and Transmission*. New York: Merrill.

Reference Books

1. Lathi, B. P., & Ding, Z. (2010). *Modern Digital and Analog Communication Systems*. New York: Oxford University Press.
2. Taub, H., & Schilling, D. L. (2012). *Principles of Communication Systems*. New York: McGraw Hill.
3. Roddy, D., & Coolen, J. (1984). *Electronic Communications*. Reston, VA: Reston Pub.

Journals

1. International Journal of Information and Communication Technology.
2. International Journal of Computer and Communication Technology.

Websites

1. www.allaboutcircuits.com
2. www.hackaday.io

17ECU502B	CONTROL SYSTEMS	Semester - V			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

- To know the fundamental concept of signals and production for controlling equipment or machines.
- To learn the various closed loop control systems current output is taken into consideration and corrections are made based on feedback
- To introduce different types of system and identify a set of algebraic equations to represent and model a complicated system into a more simplified form to interpret different physical and mechanical systems in terms of electrical system to construct equivalent electrical models for analysis
- To employ time domain analysis to predict and diagnose transient performance parameters of the system for standard input functions
- Identify the needs of different types of controllers and compensator to ascertain the required dynamic response from the system
- Formulate different types of analysis in frequency domain to explain the nature of stability of the system

COURSE OUTCOMES

- Understand the concept of time response and frequency response of the system.
- Analyze feedback characteristics of linear control systems to reduced the disturbance.
- Analyze time response of first and second order control systems for different standard test signals.
- Perform frequency domain analysis of linear control system using nyquist stability criterion.
- Identify the needs of different types of controllers and compensator to ascertain the required dynamic response from the system.
- Employ time domain analysis to predict and diagnose transient performance parameters of the system for standard input functions.

UNIT I - Introduction to Control Systems

Open loop and Closed loop control systems - Mathematical modeling of physical systems (Electrical - Mechanical and Thermal) - Derivation of transfer function - Armature controlled and field controlled DC servomotors - AC servomotors - Block diagram representation and signal flow graph - Reduction Technique - Mason's Gain Formula - Effect of feedback on control systems.

UNIT II - Time Domain Analysis

Time domain performance criteria - Transient response of first, second and higher order systems - Steady state errors and static error constants - Performance indices. Concept of Stability: Asymptotic stability and conditional stability - Routh-Hurwitz criterion - Relative stability analysis - Root Locus plots and their applications.

UNIT III - Frequency Domain Analysis

Correlation between time and frequency response - Polar and inverse polar plots - Frequency domain specifications - Logarithmic plots (Bode Plots) - Gain and phase margins - Nyquist stability criterion - Relative stability using Nyquist criterion - Constant M and N

circles.

UNIT IV - State Space Analysis

Definitions of state - State variables - State space - Representation of systems - Solution of time invariant - Homogeneous state equation - State transition matrix and its properties - Controllers and Compensation Techniques: Response with P, PI and PID Controllers - Concept of compensation - Lag - Lead and Lag-Lead networks.

UNIT V - Design of Digital Control System

Z Plane Specifications of Control System Design – Digital Compensator Design – Frequency Response Method - State Feedback – Pole Placement Design – State Observers – Digital Filter Properties – Frequency Response – Kalman's Filter.

Suggested Readings:

Text Books

1. Jairath, A. K. (2013). *Control systems: The State Variable Approach (Conventional and MATLAB*. Boca Raton: CRC Press.
2. Nagrath, I. J., & Gopal, M. (1982). *Control Systems Engineering*. New York: Wiley.

Reference Books

1. Kuo, B. C. (2011). *Automatic Control Systems*. Englewood Cliffs, NJ: Prentice-Hall.
2. Ananadanatrajan, R., & Babu, P.R. (2012). *Control Systems Engineering*. (4th ed.). Scitech Publications (India).
3. Ogata, K. (2009). *Modern Control Engineering*. Englewood Cliffs, NJ: Prentice-Hall.

Journal

1. International Journal of Electrical, Electronics and Mechanical Controls.

Websites

1. www.edx.org
2. www.coursera.org

17ECU503A	BIOMEDICAL INSTRUMENTATION	Semester - V			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

- To know the fundamental concept of origin of Bio-electric signals and recording it with highly precision equipment.
- To learn the various medical equipment used for diagnosis and therapeutic purpose.
- To provide a large number of quality trained Medical Electronics professionals for preventive and maintenance work needed to maintain hi-tech medical equipments in hospitals to ensure good health care.
- To explore the human body parameter measurements setups
- To give basic ideas about how multimedia evidences are useful in crime investigation.
- Understanding basic principles and phenomena in the area of medical diagnostic instrumentation, theoretical and practical preparation enabling students to maintain medical instrumentation.

COURSE OUTCOMES

- Understand the fundamental concept of origin of Bio-electric signals and recording it with highly precision equipment.
- Differentiate and analyze the biomedical signal sources.
- Identify common biomedical signals and distinguish characteristic features.
- Ability to study various transducers
- Identify common signal artifacts, their sources and formulate strategies for their suppression.
- Familiarize with patient safety issues related to biomedical instrumentation.

UNIT I - Biomedical signals & Physiological transducers

Source of biomedical signal - Origin of bioelectric signals - Recording electrodes - Electrodes for ECG - EMG & EEG - Physiological transducers Pressure - Temperature - Photoelectric & ultrasound Transducers - breathing mechanics Spiro meter - Respiratory therapy equipments Inhalators ventilators & Respirators - Humidifiers - Nebulizers Aspirators - Biomedical recorders ECG - EEG & EMG. MEMS based biosensors

UNIT II - Patient Monitoring systems and Audiometers

Cardiac monitor - Bedside patient monitor - Measurement of heart rate - Blood pressure - Temperature - Respiration rate - Arrhythmia monitor - Methods of monitoring fatal heart rate - Monitoring PRACTICALor activity - Audiometers Audiometers - Blood cell counters - Oximeter - Blood flow meter - Cardiac output measurement - Blood gas analyzers.

UNIT III - Modern Imaging systems

Introduction - Basic principle & Block diagram of x-ray machine - x-ray Computed Tomography (CT) - Magnetic resonance imaging system (NMR) - Ultrasonic imaging system - Eco-Cardiograph - Eco Encephalography - Ophthalmic scans - MRI - Therapeutic Equipments Cardiac pacemakers - Cardiac defibrillators - Hemodialysis machine - Surgical diathermy machine.

UNIT IV - Patients safety & Computer Applications in Biomedical field

Precaution - Safety codes for electro medical equipment - Electric safety analyzer -

Testing of biomedical equipment - Use of microprocessors in medical instruments.

UNIT V - PC based medical instruments

Computerized Critical care units - Planning & designing a computerized critical care unit - Physiotherapy Software Diathermy - Microwave diathermy - Ultrasound therapy unit. Electrotherapy Equipments - Ventilators.

Suggested Readings:

Text Books

1. Chatterjee, S., & Miller, A. (2010). *Biomedical Instrumentation Systems*. Clifton Park, NY: Delmar Cengage Learning.
2. Cromwell, L. (2014). *Biomedical Instrumentation and Measurements*. Englewood Cliffs, NJ: Prentice-Hall.

Reference Books

1. Jog, N. K. (2006). *Electronics in Medicine and Biomedical Instrumentation*. New Delhi: Prentice- Hall of India.
2. Webster, J. G., & Clark, J. W. (2012). *Medical Instrumentation: Application and Design*. Boston: Houghton Mifflin.
3. Singh, M. (2010). *Introduction to Biomedical Instrumentation*. New Delhi: PHI Learning.
4. Jacobson, B., & Webster, J. G. (2012). *Medicine and Clinical Engineering*. Englewood Cliffs, NJ: Prentice-Hall.

Journals

1. International Journal of Recent Scientific Research.
2. International Journal of New Technology and Research

Websites

1. www.circuitstoday.com
2. www.coursera.org

17ECU503B	SIGNALS AND SYSTEMS	Semester-V			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

- To understand the process of convolution between signals and able to solve differential equation using Laplace transform techniques.
- To understand the intuitive meaning of frequency domain and the importance of analyzing and processing signals in the frequency domain.
- Able to compute the Fourier series or Fourier transform Z-transform
- To introduce students the concept and theory of signals and systems needed in electronics and telecommunication engineering fields
- Knowledge about basic signal and system modeling concept and definitions
- Knowledge about the application and use of mathematical transforms and state-variables in order to solve electrical engineering problems

COURSE OUTCOMES

- Understand about various types of signals and systems, classify them, analyze them and perform various operations.
- Understand the use of transform to analysis of signals and systems in continuous and discrete time domain
- Implement the concept and theory of signals and systems in electronics and communication field.
- Ability to have idea of signal and system analysis and its characterization in time and frequency domain.
- Students can perform mathematical and graphical convolution of signals and systems.
- Compute the Fourier series or Fourier transform Z-transform

UNIT I - Signals and Systems

Continuous and discrete time signals - Transformation of the independent variable - Exponential and sinusoidal signals - Impulse and UNIT step functions - Continuous-Time and Discrete -Time Systems - Basic System Properties.

UNIT II - Linear Time -Invariant Systems (LTI)

Discrete time LTI systems - Convolution Sum - Continuous time LTI systems - Convolution integral - Properties of LTI systems - Commutative - Distributive - Associative - LTI systems with and without memory - Invariability - Causality - Stability - UNIT Step response - Differential and Difference equation formulation - Block diagram representation of first order systems.

UNIT III - Fourier Series Representation of Periodic Signals

Continuous - Time periodic signals - Convergence of the Fourier series - Properties of continuous - Time Fourier series - Discrete-Time periodic signals - Properties of Discrete - Time Fourier series - Frequency-Selective filters - Simple RC highpass and lowpass filters.

UNIT IV - Fourier Transform

Periodic signals - Properties of Continuous time Fourier transform - Convolution and Multiplication Properties - Properties of Fourier transform - Basic Fourier transform Pairs.

UNIT V - Laplace Transform

Laplace Transform - Inverse Laplace Transform - Properties of the Laplace Transform - Laplace Transform Pairs - Laplace Transform for signals - Laplace Transform Methods and Circuit Analysis - Impulse and Step response of RL - RC and RLC circuits

Suggested Readings:

Text Books

1. Oppenheim, A. V., Willsky, A. S., & Young, I. T. (2013). *Signals and systems* (4th ed.). Englewood Cliffs, NJ: Prentice-Hall.
2. Nagrath, I. J. (2009). *Signals and Systems* (2nd ed.). New Delhi: Tata McGraw-Hill.

Reference Books

1. Haykin, S. (2016). *Signals and Systems* (5th ed.). S.l.: John Wiley.
2. Rao, P. R. (2008). *Signals and Systems* (1st ed.). New Delhi: Tata McGrawiHill.

Journals

1. International Journal of Signal Processing Systems.
2. International Journal of New Technology and Research

Websites

1. www.allaboutcircuits.com
2. www.coursera.org

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17ECU504A	ROBOTICS	Semester - V			
		L	T	P	C
		3	-	-	3

COURSE OBJECTIVES

- To learn the basic configuration of Robotics
- To understand the various types of Robots.
- To get an exposure in Robot control systems
- To acquire the knowledge on advanced algebraic tools for the description of motion
- To develop the ability to analyze and design the motion for articulated systems.
- To develop an ability to use software tools for analysis and design of robotic systems

COURSE OUTCOMES

- Understand the relationship between mechanical structures of industrial robots and their operational workspace characteristics.
- Illustrate the kinematics and dynamics of robotics.
- Implementation of related instrumentation and control in robotics
- Ability to solve inverse kinematics of simple robot manipulators
- Able to do the path planning for a robotic system
- Identify a Robot for a specific application.

UNIT I - Programming Environments

Integrated Development Environment (IDE) for AVR microcontrollers - Free IDEs like AVR Studio - WIN AVR - Installing and configuring for Robot programming - In System Programmer (ISP) - Loading programmes on Robot.

UNIT II - Actuators

DC Motors - Gearing and Efficiency - Servo Motors - Stepper motors - Motor Control - Implementations and techniques.

UNIT III - Sensors

White line sensors - IR range sensor of different range - Analog IR proximity sensors - Analog directional light intensity sensors - Position encoders - Servo mounted sensor pod/Camera Pod - Wireless colour camera - Ultrasound scanner - Gyroscope and Accelerometer – Magnetometer - GPS receiver - Battery voltage sensing - Current Sensing

UNIT IV – Interfacing Concepts

LCD interfacing with robot (2 x 16 Characters LCD) - Other indicators: Indicator LEDs - Buzzer - Timer / Counter operations - PWM generation - Motor velocity control - Servo control - Velocity calculation - Motor position Control - Event scheduling.

UNIT V - Communication

Wired RS232 (serial) Communication - Wireless ZigBee Communication - USB Communication - Simplex infrared Communication (IR remote to robot).

Suggested Readings:

Text Book

1. Saha, S.K. (2014). *Introduction to Robotics*. (2nd ed.). New Delhi: Tata McGraw-Hill

Reference Books

1. Groover, M. P. (1986). *Industrial Robotics: Technology, Programming, and Applications*. New York, NY: McGraw-Hill.
2. Craig, J. J. (1989). *Introduction to Robotics: Mechanics and Control*. Reading, MA: Addison-Wesley.
3. Niku, S. B. (2011). *Introduction to Robotics: Analysis, Control, Applications*. Hoboken, N.J: Wiley.

Journals

1. International Journal of Research in Science and Technology
2. International Journal of New Technology and Research

Websites

1. www.robotroom.com
2. www.letsmakerobot.com

17ECU504B	MOBILE APPLICATIONS DEVELOPMENT	Semester - V			
		L	T	P	C
		3	-	-	3

COURSE OBJECTIVES

- To understand system requirements for mobile applications.
- To generate suitable design using specific mobile development framework.
- To apply analytical and empirical models in the design of wireless links
- Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces,
- Program mobile applications for the Android operating system that use basic and advanced phone features, and
- Deploy applications to the Android marketplace for distribution

COURSE OUTCOMES

- Understand system requirements for mobile applications.
- Generate suitable design using specific mobile development framework.
- Apply analytical and empirical models in the design of wireless links.
- Develop user interfaces for the android platform.
- Identify the interaction between user interface and underlying application infrastructure.
- Configure android application development tools

UNIT I - Introduction

Mobile Application Programming - Different Platforms - Architecture and working of Android - iOS and Windows phone 8operating system - Comparison of Android - iOS - Windows phone 8.

Android Development Environment: Android - Advantages and Future of Android - Tools and about Android SDK - Installing Java – Eclipse – Android - Android Software Development Kit for Eclipse - Android Development Tool: Android Tools for Eclipse - AVDs: Smartphone Emulators - Image Editing

UNIT II - Android Software Development Platform

Understanding Java SE and the Dalvik Virtual Machine - Directory Structure of an Android Project - Common Default Resources Folders - The Values Folder - Leveraging Android XML - Screen Sizes - Launching Your Application: The Android Manifest.xml File - Creating Your First Android Application.

UNIT III - Android Framework Overview

The Foundation of OOP - The APK File - Android Application Components - Android Activities: Defining the User Interface - Android Services: Processing in the Background - Broadcast Receivers: Announcements and Notifications - Content Providers: Data Management - Android Intent Objects: Messaging for Components - Android Manifest XML: Declaring Your Components.

UNIT IV - Views and Layouts in Android

Buttons – Menus – Dialogs - Graphics Resources: Introducing the Drawables - Implementing Images - Core Drawable Subclasses - Using Bitmap – PNG - JPEG - GIF Images in Android - Creating Animation in Android Handling User Interface(UI) Events: An Overview of UI Events in Android - Listening for and Handling Events - Handling UI Events via the View Class - Event Callback Methods - Handling Click Events - Touchscreen Events - Keyboard Events - Context Menus - Controlling the Focus.

UNIT V - Content Providers

An Overview of Android Content Providers - Defining a Content Provider - Working with a Database - Intents and Intent Filters: Intent - Implicit Intents - Explicit Intents - Intents with Activities - Intents with Broadcast Receivers - Advanced Android: New Features in Android 4.4 - iOS Development Environment: Overview of iOS - iOS Layers - Introduction to iOS application development - Windows phone Environment: Overview of windows phone and its platform - Building windows phone application.

Suggested Readings:

Text Books

1. Novák, I., Arvai, Z., Balássy, G., & Fulop, D., (2012). *Beginning Windows 8 Application Development*. IN: John Wiley & Sons.
2. Mark, D., Nutting, J., & LaMarche, J. (2013). *Beginning iOS 6 development: Exploring the iOS SDK*. Berkeley, CA: Apress.

Journals

1. International Journal of Information and Communication Technology.
2. International Journal of Computer and Communication Technology.

Websites

1. www.allaboutcircuits.com
2. www.hackaday.io

17ECU511A	PROGRAMMABLE LOGIC CONTROLLER - PRACTICAL	Semester-VI			
		L	T	P	C
		-	-	4	2

COURSE OBJECTIVES

- To acquaint the students with the fundamental principles of two-valued logic and various devices used
- To connect PLC peripherals with PLC for logical functioning
- To get strong knowledge in the developing of basic PLC programs
- To understand the components of a PLC system To understand how PLCs are used
- To understand the H&S requirements of a PLC- controlled system
- To understand different methods of interfacing with a PLC

COURSE OUTCOMES

- Able to describe typical components of a Programmable Logic Controller
- apply the concept of electrical ladder logic, its history, and its relationship to programmed PLC instruction
- Able to use timer, counter, and other intermediate programming functions
- Able to design and program a small, automated industrial production line.
- Develop ladder logics for a particular design
- Simplify designs with Boolean algebra

(Any 10 Experiments)

1. Different applications of Push buttons.
2. Working of different types of Timers.
3. Working of different types of Counters.
4. Sequential operation of ON/OFF of a set of lights.
5. Latching and Unlatching of a Motor.
6. Automatic indication of water tank level.
7. Traffic lights indication.
8. Logic Gates
9. Latching and Unlatching
10. Interlocking
11. Sequential operation of ON/OFF of a set of lights
12. Counters

17ECU511B	NANO ELECTRONICS - PRACTICAL	Semester -V			
		L	T	P	C
		-	-	4	2

COURSE OBJECTIVES

- Make them understand various advanced concepts in nanoelectronics
- Explore the fundamentals on QED, SED, Molecular electronics and spintronics
- Train the students on state-of-the-art computational tools for modeling and simulation of nanoelectronics devices
- To identify the critical parameters that one must evaluate when considering any new Nanoelectronics device
- Know the types of nanotechnology, atomic structure, molecular technology and• preparation of nano materials
- Understand the fundamentals of nano electronics and its properties.

COURSE OUTCOMES

- Able to describe typical components of a Programmable Logic Controller
- Gain the concepts of nanoelectronics such as ballistic transport and quantum confinement.
- Identify the various methods to fabricate and measure Nanoscale features.
- Evaluate the critical parameters when considering any new Nano electronics device.
- Understand the latest technology on nano systems based Nano electronics
- Design and simulate various advanced nanoelectronic devices

(Any 10 Experiments)

1. Synthesis of at least two different sizes of Nickel Oxide Nano Particles Using Sol-Gel Method.
2. Synthesis of at least two different sizes of Copper Oxide Nano Particles Using Sol-Gel Method.
3. Synthesis of at least two different sizes of Zinc Oxide Nano Particles Using Sol-Gel Method.
4. Polymer synthesis by suspension method / emulsion method B-H loop of nanomaterials.
5. Magnetoresistance of thin films and nanocomposite, I-V characteristics and transient response.
6. Particle size determination by X-ray diffraction (XRD) and XRD analysis of the given XRD spectra.
7. Determination of the particle size of the given materials using He-Ne LASER.
8. Selective area electron diffraction: Software based structural analysis based on TEM based experimental data from published literature.

9. Surface area and pore volume measurements of nanoparticles.
10. Spectroscopic characterization of metallic, semiconducting and insulating Nano-particles.
11. Developing a lead free solder using copper nanoparticles.
12. Deposition of Nano crystals on plastic sheets.

17ECU512A	ADVANCED COMMUNICATION SYSTEMS - PRACTICAL	Semester - V			
		L	T	P	C
		-	-	4	2

COURSE OBJECTIVES

- Understand radio-frequency systems and their applications
- Analyze the performance parameters of radio frequency circuits
- Analyze the performance parameters of radio frequency circuits
- Identify design trade-off of radio frequency communication systems.
- To analyze error performance of a digital communication system in presence of noise and other interference
- To understand various source coding and channel coding techniques

COURSE OUTCOMES

- To focuses the fundamental concepts on TDM, Pulse modulations, digital modulation techniques
- To enhance the knowledge of source coding techniquesand Error-control coding techniques.
- To understand the basic concept of digital commutation system
- To understand Multiple Access and Spread Spectrum Techniques for mobile and cellular communication system.
- Estimate various losses in optical fiber
- Design fiber optic communication link

(Any 10 Experiments)

1. Performance analysis of Half wave dipole antenna
2. Performance analysis of Loop antenna
3. Performance analysis of Yagi Uda antenna
4. Performance analysis of Log periodic antenna
5. Radio wave propagation path loss calculations
6. Tunnel Diode Oscillator and Gunn Diode Oscillator
7. Analog fiber optic transmitter & receiver
8. Digital fiber optic transmitter & receiver
9. Radiation Pattern by Horn antenna
10. Reflex Klystron characteristics using microwave bench
11. Gunn Diode oscillator
12. Impedance and power measurement by Smith chart

17ECU512B	CONTROL SYSTEMS - PRACTICAL	Semester-V			
		L	T	P	C
		-	-	4	2

COURSE OBJECTIVES

- To know the concept of time response and frequency response of the system
- To introduce different types of system and identify a set of algebraic equations to represent and model a complicated system into a more simplified form
- To interpret different physical and mechanical systems in terms of electrical system to construct equivalent electrical models for analysis
- To employ time domain analysis to predict and diagnose transient performance parameters of the system for standard input functions
- Identify the needs of different types of controllers and compensator to ascertain the required dynamic response from the system
- Formulate different types of analysis in frequency domain to explain the nature of stability of the system

COURSE OUTCOMES

- Represent the mathematical model of a system
- Determine the response of different order systems for various step inputs 3. Analyze the stability of the system
- Ability to formulate transfer function for the given control system problem
- Ability to find time response of the given control system model
- Ability to design Lead, Lag, Lead-Lag system in control system.
- Ability to design PID controllers for the given control system model.

(Any 10 Experiments)

1. Characteristics of synchro transmitter receiver
2. Characteristics of synchro as an error detector
3. Position control of DC motor
4. Speed control of DC motor
5. Characteristics of AC servo motor
6. Time response of type 0,1 and 2 systems
7. Frequency response of first and second order systems
8. Time response characteristics of a second order system.
9. Effect of damping factor on performance of second order system
10. Frequency response of Lead networks.
11. Frequency response of Lag networks.
12. Study of P, PI and PID controller.

17ECU513A	BIOMEDICAL INSTRUMENTATION - PRACTICAL	Semester-V			
		L	T	P	C
		-	-	4	2

COURSE OBJECTIVES

- To introduce an fundamentals of transducers as applicable to physiology ● To explore the human body parameter measurements setups
- To make the students understand the basic concepts of forensic techniques. With widespread use and requirements of medical instruments
- Gives knowledge of the principle of operation and design of biomedical instruments
- To provide a large number of quality trained Medical Electronics professionals for preventive and maintenance work needed to maintain hi-tech medical equipments in hospitals to ensure good health care.
- To explore the human body parameter measurements setups
- To give basic ideas about how multimedia evidences are useful in crime investigation.

COURSE OUTCOMES

- Understand the physiology of biomedical system
- Measure biomedical and physiological information
- Discuss the application of Electronics in diagnostics and therapeutic area
- Develop a thorough understanding on basics of biomedical amplifiers
- Develop a thorough understanding on principles of medical instrumentations
- Develop a thorough understanding on clinical applications of medical instrumentation systems

(Any 10 Experiments)

1. Characterization of bio potential amplifier for ECG signals.
2. Study on ECG simulator
3. Measurement of heart sound using electronic stethoscope. Study on ECG heart rate monitor /simulator
4. Study of pulse rate monitor with alarm system
5. Determination pulmonary function using spirometer.
6. Measurement of respiration rate using thermister /other electrodes.
7. Respiration Rate monitor/ apnea monitor
8. Ultrasound transducers based on medical system
9. Study of a Pacemaker.
10. Measurement of pulse rate using photoelectric transducer & pulse counting for known period.
11. To study fingertip oximeter and analysis of various parameters.
12. Display the frequency spectrum of a signal using MatPRACTICAL/PRACTICALview.

17ECU513B	SIGNALS AND SYSTEMS - PRACTICAL	SEMESTER-V			
		L	T	P	C
		-	-	4	2

COURSE OBJECTIVES

- To introduce an fundamentals of transducers as applicable to physiology
- Understanding signals and systems in terms of both the time and transform domains, taking advantage of the complementary insights and tools that these different perspectives provide
- Able to compute the Fourier series or Fourier transform Z-transform
- Knowledge about basic signal and system modeling concept and definitions
- Knowledge about the application and use of mathematical transforms and state-variables
- Development of the mathematical skills to solve problems involving convolution, filtering, modulation and sampling.

COURSE OUTCOMES

- Apply the knowledge of linear algebra topics like vector space, basis, dimension, inner product, norm and orthogonal basis to signals.
- Analyse the spectral characteristics of continuous-time periodic and a periodic signals using Fourier analysis.
- Classify systems based on their properties and determine the response of LSI system using convolution.
- Analyze system properties based on impulse response and Fourier analysis.

Apply the Laplace transform and Z- transform for analyze of continuous-time and discrete-time signals and systems

(Any 10 Experiments)

1. Generation of Signals: continuous time
2. Generation of Signals: discrete time
3. Time shifting of signals.
4. Time scaling of signals.
5. Convolution of Signals
6. Solution of Difference equations.
7. Fourier series representation of continuous time signals.
8. Fourier transform of continuous time signals.
9. Laplace transform of continuous time signals.
10. Introduction to Xcos/similar function and calculation of output of systems represented by block diagrams
11. Sampling and signal reconstruction and Spectral Analysis using DFT.
12. Correlation of signals.

17ECU514A	ROBOTICS - PRACTICAL	Semester - V			
		L	T	P	C
		-	-	3	1

COURSE OBJECTIVES

- To learn the basic configuration of Robotics
- To understand the various types of Robots.
- To get an exposure in Robot control systems
- To acquire the knowledge on advanced algebraic tools for the description of motion
- To develop the ability to analyze and design the motion for articulated systems.
- To develop an ability to use software tools for analysis and design of robotic systems

COURSE OUTCOMES

- Understand the relationship between mechanical structures of industrial robots and their operational workspace characteristics.
- Illustrate the kinematics and dynamics of robotics.
- Implementation of related instrumentation and control in robotics
- Ability to solve inverse kinematics of simple robot manipulators
- Able to do the path planning for a robotic system
- Identify a Robot for a specific application.

(Any 8 Experiments)

1. Study of different types of Robots based on configuration and application
2. Study of different types of links and joints used in Robots
3. Study of components of Robots with drive system and end effectors
4. Determination of maximum and minimum position of links
5. Verification of transformation (position and orientation) with respect to gripper and world coordinate system
6. Estimation of accuracy, repeatability and resolution
7. Robot programming exercises
8. Design, modeling and analysis of two different types of grippers.
9. Study of sensor integration.
10. Study of robotic system design.

17ECU514B	MOBILE APPLICATIONS DEVELOPMENT - PRACTICAL	Semester - V			
		L	T	P	C
		-	-	3	1

COURSE OBJECTIVES

- Understand aspects of mobile programming that make it unique from programming for other platforms,
- Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces,
- Program mobile applications for the Android operating system that use basic and advanced phone features, and
- Deploy applications to the Android marketplace for distribution
- Program mobile applications for the Android operating system that use basic and advanced phone features, and
- Deploy applications to the Android marketplace for distribution

COURSE OUTCOMES

- Understand system requirements for mobile applications.
- Generate suitable design using specific mobile development framework.
- Apply analytical and empirical models in the design of wireless links.
- Develop user interfaces for the android platform.
- Identify the interaction between user interface and underlying application infrastructure.
- Configure android application development tools

(Any 8 Experiments)

1. Develop an application that uses GUI components, Font and Colours.
2. Develop an application that uses Layout Managers and event listeners.
3. Develop a native calculator application.
4. Write an application that draws basic graphical primitives on the screen.
5. Develop an application that makes use of database.
6. Develop an application that makes use of RSS Feed.
7. Implement an application that implements Multi threading:
8. Develop a native application that uses GPS location information.
9. Implement an application that writes data to the SD card.
10. Implement an application that creates an alert upon receiving a message.

17ECU601A	EMBEDDED SYSTEMS	Semester-VI			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

- Ability to design an Embedded System, component or process to meet desired needs within realistic constraints.
- To develop the next generation technologies, methods and tools for modeling, design, implementation and operation of hardware/software systems embedded in intelligent devices
- To provide a broad overview of both theoretical and practical aspects of a design flow for To understand the need and applications of Microcontrollers n embedded system.
- To understand architecture and features of typical Microcontroller.
- Learn interfacing of real world input and output devices
- To study various hardware and software tools for developing applications embedded systems

COURSE OUTCOMES

- Understand hardware and software design requirements of embedded systems.
- Acquire knowledge about embedded processors and their applications
- Analyze the embedded systems specification and develop software programs.
- Ability to design an Embedded System, component or process to meet desired needs within realistic constraint
- Evaluate the requirements of programming embedded systems and tool chain for embedded systems.
- Explore the features of the microcontroller and provide solutions for embedded applications

UNIT I - Introduction to Embedded Systems

Overview of Embedded Systems - Features - Requirements and Applications - Recent Trends in the Embedded System Design - Common architectures for the Embedded System Design - Embedded Software design issues.

UNIT II - Embedded Design Process

Embedded Design Life Cycle – Product Specification – Hardware / Software Partitioning – Detailed Hardware and Software Design – Integration – Product Testing – Selection Processes – Microprocessor Vs Micro Controller – Performance Tools – Bench Marking – RTOS Micro Controller Tool Chain AvaiPRACTICALility – Other Issues in Selection Processes.

UNIT III - Introduction to microcontrollers

Overview of Harvard architecture and Von Neumann architecture - RISC and CISC microcontrollers - AVR RISC Microcontrollers: Introduction to AVR RISC Microcontrollers - Architecture overview - Status register - General purpose register file.

UNIT IV - Interrupts and Timer

Memories - Instruction set - Data Transfer Instructions - Arithmetic and Logic Instructions Branch Instructions - Bit and Bit-test Instructions - MCU Control Instructions - Simple programs in Assembly Language / C Language - Introduction to System Clock -

Reset sources.

UNIT V – Peripherals

Introduction to interrupts - External interrupts - IO Ports - 8-bit and 16-bit Timers - Introduction to different modes - Input Capture and Compare Match Analog Comparator - Analog-to-Digital Converter - Serial Peripheral Interface (SPI) - The Universal Synchronous and Asynchronous serial Receiver and Transmitter (USART) - Two Wire Interface (TWI) / I2C bus.

Suggested Readings:

Text Books

1. Andrew, N., Sloss, Dominic Symes, & Chris Wright, (2011). *ARM System Developer's Guide – Designing and Optimizing System Software*, (1st ed.). Morgan.: Kaufmann Publishers.

Reference Books

1. Predko, M. (2007). *Programming and Customizing the PIC Microcontroller*. New York: Tab.
2. Smith, W. A. (2010). *ARM Microcontroller Interfacing hardware and software*. Susteren: Elektor

Journals

1. International Journal of Research in Electronics and Communication Technology
2. International Journal of Engineering and Technology

Websites

1. www.embeddedrelated.com
2. www.nptel.ac.in

17ECU601B	BASIC VLSI DESIGN	Semester-VI			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

- To enable the students to model, simulate and test the Electronics and Instrumentation based design.
- To provide a design flexibility using graphical programming language
- To provide a platform for the students to do multidisciplinary projects
- To facilitate the conduct of short term and continuous learning programmes
- To provide knowledge on design of process control by using virtual instrumentation techniques To provide knowledge in process analysis by VI tools
- To develop basic VI programs using loops, case structures etc. including its applications in image, signal processing and motion control.

COURSE OUTCOMES

- Understand basics of acquisition techniques and its interface.
- Recognize the components of virtual instrumentations and measurement.
- Get adequate knowledge in VI Tool sets.
- Use Lab view software for instrument control, measurement and data acquisition.
- Understand VI Programming techniques.
- Ability to use state machines to solve complex problems.

UNIT I - Metal Oxide Semiconductor (MOS)

Introduction to basic principle of MOS transistor - Large signal MOS models (long channel) for digital design - SPICE model - MOS device layout.

UNIT II - MOS Inverter

Transistor layout - Inverter layout - CMOS digital circuit layout - Inverter principle - Depletion and enhancement load inverters - Basic CMOS inverter - Transfer characteristics - Logic threshold - Noise margins - Dynamic behavior.

UNIT III - Combinational MOS Logic Design

Propagation Delay and Power Consumption - Static MOS design - Pass Transistor logic - Complex logic circuits - Sequential MOS Logic Design - Static latches - Flip flops & Registers.

UNIT IV - Memory Design

Dynamic Latches & Registers - CMOS Schmitt trigger - Monostable sequential Circuits - Astable Circuits - ROM & RAM cells design - Dynamic MOS design - Dynamic logic families and performances - Interconnect & Clock Distribution - Interconnect delays - Cross Talks - Clock Distribution.

UNIT V – Power Estimation

Power Estimation Techniques – Logic level Power Estimation – Simulation Power Analysis – Probabilistic Power Analysis.

Suggested Readings:

Text Book

1. Pucknell, D. A. & Eshraghian, K. (2009). *Basic VLSI design*. Sydney u.a.: Prentice Hall.

Reference Books

1. Sumathi, S. (2011). *Principles of vlsi design,*. S.l.: Scitech Publications (Ind.).
2. Kang, & Leblebigi, (2014). *CMOS Digital IC Circuit Analysis & Design.* McGraw Hill.

Journals

1. International Journal of Information and Communication Technology.
2. International Journal of Computer and Communication Technology.

Websites

1. www.allaboutcircuits.com
2. www.hackaday.io

17ECU602A	DIGITAL SIGNAL PROCESSING	Semester-VI			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

- To understand the fundamental concepts and theory of Discrete Fourier Series and Discrete Fourier Transform.
- To get an exposure on Discrete Fourier Transforms (DFT), its applications and implementation by FFT techniques.
- To apply design technique for FIR type digital filters
- Understand fundamentals of Digital Signal Processing
- Analyze & compare different signal processing strategies.
- Become aware of some applications of DSP.

COURSE OUTCOMES

- Understand the fundamental concepts and theory of Discrete Fourier Series and Discrete Fourier Transform
- Ability to compute various transform analysis of Linear Time Invariant Systems.
- Implement problem solving strategies to DSP Problems.
- Able to test signal processing algorithms for various applications
- Ability to understand Various applications of DSP such as signal processing and telecommunication.
- Apply design techniques for FIR type digital filters

UNIT I - Discrete Time systems

Discrete sequences - Linear coefficient difference equation - Representation of DTS - LSI Systems - Stability and causality - Frequency domain - Representations and Fourier transform of DT sequences.

UNIT II - Z-Transform

Definition – Properties - Inverse Z Transform and stability - Parsevals Theorem - Applications - System Function: Signal flow graph - Representation and analysis of Discrete Time Systems -Techniques of representations - Matrix generation - Solution for DTS evaluations.

UNIT III - Discrete Fourier Transform

DFT assumptions - Inverse DFT - Matrix relations - Relationship with FT and its inverse - Circular convolution - DFT theorems – DCT – Computation of DFT - FFT Algorithms and processing gain – Discrimination - Interpolation and extrapolation - Gibbs Phenomena - FFT of real functions - Interleaving - Resolution improvement - Word length effects.

UNIT IV - Digital Filters

Analog filter review - System function for IIR and FIR filters - Network representation -Canonical and decomposition networks - IIR filter realization methods – Limitations - FIR filter realization techniques - Discrete correlation and convolution - Properties - Limitations.

UNIT V - TMS 320 C 6713

Introduction – TMS320C6713 Overview – Key Features – Architectural Overview – Functional Block Diagram - Internal Memory Organization – CALU – System Control – PLU – Interrupts – Addressing Modes – Instruction Set.

Suggested Readings:

Text Book

1. Oppenheim, A.V., Schaffer, R.W., & Buck, C. (2013). *Discrete Time Signal Processing.* (2^{nd} ed.). Prentice Hall India.

Reference Books

1. Mitra, S.K. (2013). *Digital Signal Processing – A computer Based Approach*. (4^{th} ed.). McGraw Hill.
2. Nagoor Kani, A. (2012). *Digital Signal Processing*. (2^{nd} ed.). Tata McGraw Hill Pvt Ltd.

Journals

1. International Journal of Signal Processing Systems.
2. International Journal of New Technology and Research

Websites

1. www.allaboutcircuits.com
2. www.coursera.org

17ECU602B	VIRTUAL INSTRUMENTATION	Semester-VI			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

- To enable the students to model, simulate and test the Electronics and Instrumentation based design.
- To provide a design flexibility using graphical programming language
- To provide a platform for the students to do multidisciplinary projects
- To facilitate the conduct of short term and continuous learning programmes
- To provide knowledge on design of process control by using virtual instrumentation techniques To provide knowledge in process analysis by VI tools
- To develop basic VI programs using loops, case structures etc. including its applications in image, signal processing and motion control.

COURSE OUTCOMES

- Understand basics of acquisition techniques and its interface.
- Recognize the components of virtual instrumentations and measurement.
- Get adequate knowledge in VI Tool sets.
- Use Lab view software for instrument control, measurement and data acquisition.
- Understand VI Programming techniques.
- Ability to use state machines to solve complex problems.

UNIT I - Introduction

General functional description of a digital instrument - Block diagram of a Virtual Instrument - Physical quantities and Analog interfaces - Hardware and Software - User interfaces - Advantages of Virtual instruments over conventional instruments - Architecture of a Virtual instrument and its relation to the operating system.

UNIT II - Software Overview

LABVIEW - Graphical user interfaces - Controls and Indicators - 'G' programming - labels and Text - Shape, Size and Color - Owned and free labels - Data type, Format, Precision and representation - Data types - Data flow programming - Editing - Debugging and Running a Virtual instrument - Graphical programming palettes and tools - Front panel objects - Functions and Libraries.

UNIT III - Programming Structure

FOR loops - WHILE loops - CASE structure - Formula nodes - Sequence structures - Arrays and Clusters - Array operations - Bundle - Bundle/Unbundle by name - Graphs and charts - String and file I/O - High level and Low level file I/O's - Attribute modes Local and Global variables. Operating System and Hardware Overview: PC architecture - Current trends - Operating system requirements - Drivers – Interface Buses – PCI Bus – Interface cards – Specification – Analog and Digital interfaces – Power - Speed and timing considerations.

UNIT IV - Hardware Aspects

Installing hardware - Installing drivers - Configuring the hardware - Addressing the hardware in LabVIEW - Digital and Analog I/O function - Data Acquisition - Buffered I/O - Real time Data Acquisition.

UNIT V - LabView Applications

IMAQ - Motion Control: General Applications - Feedback devices - Motor Drives - Instrument Connectivity – GPIB - Serial Communication – General - GPIB Hardware & Software specifications - PX1 / PC1: Controller and Chassis Configuration and Installation.

Suggested Readings:

Text Books

1. Lisa K Wells, (2010). *LabView for Everyone.* New Delhi.: Prentice Hall of India.
2. Garry M Johnson, (2005). *LabView Graphical Programming.* New Delhi.: Tata McGraw Hill.

Journals

1. International Journal of Signal Processing Systems.
2. International Journal of New Technology and Research

Websites

1. www.allaboutcircuits.com
2. www.eetimes.com

17ECU603A	PROGRAMMING WITH LABVIEW	Semester-VI			
		L	T	P	C
		3	-	-	3

COURSE OBJECTIVES

- To learn and to navigate LABVIEW and use the block diagram, front panel, and Functions and Controls palettes.
- To explore use of graphs and charts and build a user interface.
- To gain knowledge on the different data types and methods to organize and group data, controls, and indicators in LABVIEW.
- Understand basics of acquisition techniques and its interface.
- Recognize the components of virtual instrumentations and measurement
- To develop basic applications in the LabVIEW graphical programming environment

COURSE OUTCOMES

- Gain knowledge on the different data types and methods to organize and group data, controls, and indicators in LABVIEW
- Understand various functions available in Lab View for instrumentation applications.
- Ability to model complex system using Lab view.
- Ability to improve lab view programming skills
- Able to use graphical programming language.
- Ability to simulate and test behavior of system.

UNIT I - Introduction to Virtual Instrumentation

Computers in Instrumentation - Concept of Virtual Instrumentation (VI) - History of VI - LABVIEW and VI - Conventional and Graphical Programming - Distributed Systems.

UNIT II - Basics of LABVIEW

Components of LABVIEW - Owned and Free Labels - Tools and Other Palettes Arranging Objects - Pop-Up Menus -Colour Coding - Code Debugging - Creating Sub-VIs - For Loop - While Loop - Loop Behaviour and Interloop Communication - Local Variables - Global Variables - Shift Registers.

UNIT III - Programming Fundamentals

Feedback – Auto indexing - Loop Timing - Timed Loops Sequence Structures - Case Structure - Formula Node - Event Structure - Arrays - Clusters - Inter-Conversion of Arrays and Clusters - Waveform Chart - Resetting Plots - Waveform Graph – Use of Cursors - X-Y Graph - Introduction to a State Machine - Event Structures - Full State Machine - File Formats - File I/O Functions - Path Functions.

UNIT IV - Basics of Data Acquisition

Classification of Signals – Real World Signals - Analog Interfacing - Connecting the Signal to the Board - Practical vs Ideal Interfacing - Bridge Signal Sources.

UNIT V - Data Acquisition with LABVIEW

Measurement and Automation Explorer - Waveform DataType - Working in DAQmx -Working in NI-DAQ - Use of Simple analog and digital VIs -Continuous data acquisition - Acquisition of data in bursts - DAQ Assistant - Analysis Assistant - Instrument Assistant -

Instrument Interfacing and LABVIEW - Data Sockets.

Suggested Readings:

Text Book

1. Sanjay Gupta, & Joseph John, (2005). *Virtual Instrumentation using LABVIEW.* (2nd ed.). TMH Pvt. Ltd.

Reference Books

1. Travis, J., King, J. (2006). *LABView for Everyone*, (3rd ed.). Prentice Hall.
2. Johnson, G.W., & Jeninngs, R. (2006). *LABView Graphical Programming*, (4th ed.). McGraw Hill.

Journals

1. International Journal of Scientific and Engineering Research.
2. International Journal of Electronics and Communication Technology.

Websites

1. www.allaboutcircuits.com
2. www.eetimes.com

17ECU603B	VERILOG AND FPGA BASED SYSTEM DESIGN	Semester-VI			
		L	T	P	C
		3	-	-	3

COURSE OBJECTIVES

- To understand the fundamentals of Verilog and FPGA based system design.
- To appreciate the design process in FPGA through an application on the design of a system design
- Describe general FPGA architecture, internals and use cases
- Understanding of building blocks that are available to digital designers
- Apply design flow methodology for a given problem
- Implement and debug various digital designs

COURSE OUTCOMES

- Understand the fundamentals of Verilog and FPGA based system design.
- Design and optimize complex combinational and sequential digital circuits
- Apply design flow methodology for a given problem
- Solve time related problems
- Implement and debug various digital designs.
- Analyze a given design based on synthesis, implementation and timing reports

UNIT I - Digital logic design flow

Combinational circuits - Combinational building blocks: Multiplexors – Demultiplexers - Decoders - Encoders - Adder circuits - Sequential circuit elements: Flip-Flop - Latch – Register- Finite state machines: Mealy and Moore - Other sequential circuits: Shift registers – Counters - FSMD (Finite State Machine with Datapath): Design and analysis. Microprogrammed control - Memory basics and timing - Programmable Logic devices.

UNIT II - Evolution of Programmable logic devices

PAL - PLA – GAL - CPLD - FPGA architectures - Placement and routing - Logic cell structure - Programmable interconnects - Logic blocks - I/O Ports - Clock distribution in FPGA - Timing issues in FPGA design - Boundary scan.

UNIT III - Verilog HDL

Introduction to HDL - Verilog primitive operators - Structural Verilog - Behavioral Verilog - Design verification - Modeling of combinational and sequential circuits (including FSM and FSMD) with Verilog Design - Examples in Verilog.

UNIT IV – Basics of FPGA

Introduction - FPGA basics - FPGA Design - FPGA schematic connectivity - Wiring the design - schematic components - Processor cores - Peripheral Components - Generic components - Vendor macro and primitive libraries - Create a PWM.

UNIT V - Targeting and Running the design

Constraint files– Configurations - NanoBoard constraint files - Configuration Manager -Auto Configuring an FPGA project - Defining constraints manually - Editing a constraint file - Configuring MyPWM - Controlling the build process -

Understanding the build process - Button regions - Accessing stage reports / outputs - Build stages - Configuring a build stage.

Suggested Readings:

Text Book

1. Bhasker, J. (2010). *A VHDL Primer*. (3rd ed.). Pearson Education.

Reference Books

1. Nazeih M. Botros, (2012). *HDL Programming VHDL and Verilog.* (1st ed.).Wiley India Pvt. Ltd.
2. Douglas. P. Perry, (2014). *VHDL: Programming by Examples.* (4th ed.). Mc Graw Hill Publications.

Journals

1. International Journal of Information and Communication Technology.
2. International Journal of Computer and Communication Technology.

Websites

1. www.allaboutcircuits.com
2. www.hackaday.io

17ECU611A	EMBEDDED SYSTEMS - PRACTICAL	Semester-VI			
		L	T	P	C
		-	-	4	2

COURSE OBJECTIVES

- Demonstrate the sensing of different physical parameters
- Explain the calibration of parameters measured and displayed
- Evaluate the data transfer
- To understand the need and applications of Microcontrollers and ARM Processors in embedded system.
- To understand architecture and features of typical Microcontroller
- To learn interfacing of real world input and output devices

COURSE OUTCOMES

- Define the arithmetical and logical assembly language for microcontroller
- Know the downloading procedure on hardware into flash ROM and show the testing data on defined port wish board
- Competent to evaluate the data transfer response
- Able to describe the microcontroller and ARM Processor Architecture and its Features
- Learn importance of microcontroller and ARM Processor in designing embedded applications
- Learn use of hardware and software tools. 4. Develop interfacing to real world devices.

(Any 10 Experiments)

1. Flash LED at an observable rate.
2. Hello LED – Flash LED at a rate such that the LED appears always on. Estimate the onset of the rate when the LED appears to stay on
3. Controlling ON/OFF of an LED using switch.
4. Toggle the LED every second using Timer interrupt.
5. Read the ADC value of the voltage divider involving the LDR. Print the value on the serial monitor.
6. Use the thermistor to estimate the temperature and print the raw value on the serial monitor.
7. Connect the LCD I/O Board and print ‘Hello World’ on the LCD. Scroll display from left to right.
8. Speed control of stepper motor.
9. Serial Communication Interface
10. I2C Interface
11. Programming using Interrupts.
12. Generation of Pulse Width Modulation

17ECU611B	BASIC VLSI DESIGN - PRACTICAL	Semester-VI			
		L	T	P	C
		-	-	4	2

COURSE OBJECTIVES

- Introduced digital integrated circuits
- Introduce CMOS devices and manufacturing technology.
- Introduce CMOS logic gates and their layout.
- Ability to find Propagation delay, noise margins, and power dissipation in the digital VLSI circuits.
- Ability to design Combinational (e.g., arithmetic) and sequential circuit.
- Ability to design Memory in VLSI circuits.

COURSE OUTCOMES

- Analyze the CMOS layout levels, how the design layers are used in the process sequence, and resulting device structures (i.e. cross-sectional views).
- Implement digital logic designs of various types (i.e. combinational logic, multiplexers).
- Analyze performance issues and the inherent trade-offs involved in system design (i.e. power vs. speed).
- Complete a moderately complex design project involved with data path operators, data registers, serial/parallel conversion, clocking/timing details and feedback.
- Identify the interactions between process parameters, device structures, circuit performance, and system design.

(Any 10 Experiments)

1. Design and implementation of logic gates
2. Design and simulation of Real Time Clock
3. Design and implementation of Encoder and Decoder
4. To plot the (i) output characteristics & (ii) transfer characteristics of an n-channel MOSFET.
5. To plot the (i) output characteristics & (ii) transfer characteristics of an p-channel MOSFET.
6. To design and plot the static (VTC) and dynamic characteristics of a digital CMOS inverter.
7. To design and plot the output characteristics of a 3-inverter ring oscillator.
8. To design and plot the dynamic characteristics of 2-input NAND, NOR logic gates using CMOS technology.
9. To design and plot the dynamic characteristics of 2-input XOR and XNOR logic gates using CMOS technology.
10. To design and plot the characteristics of a 4x1 digital multiplexer using pass transistor logic.

11. To design and plot the characteristics of a positive and negative latch based on multiplexers.
12. To design and plot the characteristics of a master-slave positive and negative edge triggered registers based on multiplexers.

17ECU612A	DIGITAL SIGNAL PROCESSING - PRACTICAL	Semester-VI			
		L	T	P	C
		-	-	4	2

COURSE OBJECTIVES

- To implement Linear and Circular Convolution
- To implement FIR and IIR filters
- Familiar with the most important methods in DSP, including digital filter design, transform-domain processing and importance of Signal Processors.
- Aware about implications of the properties of systems and signals
- To design FIR filters and IIR Filters
- Analyze discrete-time filter banks and multi-rate signal processing system

COURSE OUTCOMES

- Analyze the CMOS layout levels, how the design layers are used in the process sequence, and
- Understand the handling of discrete/digital signals using MATLAB
- Understand the basic operations of Signal processing
- Analyze the spectral parameter of window functions
- Design IIR, and FIR filters for band pass, band stop, low pass and high pass filters
- Design the signal processing algorithm using MATLAB & VLAB.

(Any 10 Experiments)

USING TMS320C5X/TMS320C54XX/TMS320C67XX/MATLAB

1. Study of addressing Modes of DSP using simple examples
2. Arithmetic operations
3. Generation of unit sample sequence, unit step, ramp function, discrete time sequence, real sinusoidal sequence.
4. Generate and plot sequences over an interval.
5. Given x[n], write program to find X[z].
6. Fourier Transform, Discrete Fourier Transform and Fast Fourier Transform
7. Design of a Butterworth analog filter for low pass and high pass.
8. Design of digital filters.
9. Correlation of two discrete signals
10. Quantization noise
11. Waveform generation
12. Discrete Cosine Transform

17ECU612B	VIRTUAL INSTRUMENTATION - PRACTICAL	Semester-VI			
		L	T	P	C
		-	-	4	2

COURSE OBJECTIVES

- To enable the students to model, simulate and test the Electronics and Instrumentation based design.
- To provide a design flexibility using graphical programming language
- To provide a platform for the students to do multidisciplinary projects
- To facilitate the conduct of short term and continuous learning programmes
- To provide knowledge on design of process control by using virtual instrumentation techniques To provide knowledge in process analysis by VI tools
- To develop basic VI programs using loops, case structures etc. including its applications in image, signal processing and motion control.

COURSE OUTCOMES

- Understand basics of acquisition techniques and its interface.
- Recognize the components of virtual instrumentations and measurement.
- Get adequate knowledge in VI Tool sets.
- Use Lab view software for instrument control, measurement and data acquisition.
- Understand VI Programming techniques.
- Ability to use state machines to solve complex problems

(Any 10 Experiments)

1. Creating a simple VI to place a Digital Control.
2. Navigation and Editing.
3. VI to make a Degree C to Degree F Converter.
4. Converting VI in to Sub VI.
5. Write a program to count Modulus 32 and display the values in decimal, octal decimal and Binary.
6. Built a VI using while loop that displays random numbers in to three wave form charts. (Strip, scope & Sweep)
7. Data Acquisition using LABVIEW.
8. Development of Temperature Measurement using LABVIEW.
9. Development of Virtual Instrument for Function Generator using LABVIEW.
10. Development of Virtual Instrument for Audio Signal Spectrum Analyser using LABVIEW.
11. Design of V-F and F-V converter.
12. Instrumentation amplifier.

17ECU613A	PROGRAMMING WITH LABVIEW - PRACTICAL	Semester-VI			
		L	T	P	C
		-	-	3	1

COURSE OBJECTIVES

- Know about dataflow and Graphical Programming Language
- Describe and utilize the NI example finder.
- Describe what is meant by 'data acquisition'.
- Describe the function of the 'General Purpose Interface Bus (GPIB)'.
- Design and implement various front panel controls and indicators.
- Connect and manipulate nodes and wires in the block diagram

COURSE OUTCOMES

- Execute save and load dialogs.
- Demonstrate the use of the revert function.
- Troubleshoot broken VIs.
- Single-Step through a VI.
- Implement execution highlighting and setting break points.
- Create SubVIs

(Any 8 Experiments)

1. Set up a while loop to execute EXACTLY the predefined number of iterations.
2. Write a program to invert the state of a Boolean indicator twice a second, until the program is stopped by the user. The Boolean should initially be TRUE. Solve the problem using two different methods: Shift Register, and Local Variables.
3. Write a program to count Modulus 32 and display the values in decimal, Hexadecimal, octal and binary. Use a STOP button to stop your code programmatically. Use local variables to stop a while loop and reset the Stop button. The action of the switch should be set to Switch When Pressed or Switch When Released.
4. Set up a temperature simulator as follows. Allow for a user defined a set point (you may place it inside the while loop). In the while loop add an error amounting to a maximum of ±10°C to the set point. Set up over- and undertemperature LEDs to light up whenever the deviation is >5°C. The loop should operate once every second.
5. Build a VI using the while loop that displays random numbers (0-5) into three Waveform Charts (strip, scope, sweep). Incorporate appropriate switching and delays.
6. Set up an 8-bit Binary counter and display your results graphically. The graph should have 8-traces corresponding to bits 0-7. For this you may like to the Following: Number to Boolean Array, Boolean to (0,1).

7. Write a simple program to generate a Voltage at Analog Output 0 using a knob to select the voltage. Verify using a Multimeter.
8. Read the status of NI Instrument simulator by using its different commands.
9. Converting Voltage to Resistance.
10. Converting Resistance to Temperature.

17ECU613B	VERILOG AND FPGA BASED SYSTEM DESIGN - PRACTICAL	Semester-VI			
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COURSE OBJECTIVES

- To understand the fundamentals of Verilog and FPGA based system design.
- To appreciate the design process in FPGA through an application on the design of a system design
- Describe general FPGA architecture, internals and use cases
- Understanding of building blocks that are available to digital designers
- Apply design flow methodology for a given problem
- Implement and debug various digital designs

COURSE OUTCOMES

- Understand the fundamentals of Verilog and FPGA based system design.
- Design and optimize complex combinational and sequential digital circuits
- Apply design flow methodology for a given problem
- Solve time related problems
- Implement and debug various digital designs.
- Analyze a given design based on synthesis, implementation and timing reports

(Any 8 Experiments)

1. Write code to realize basic and derived logic gates.
2. Half adder, Full Adder using basic and derived gates.
3. Half subtractor and Full Subtractor using basic and derived gates.
4. Design and simulation of a 4 bit Adder.
5. Multiplexer (4x1) and Demultiplexer using logic gates.
6. Decoder and Encoder using logic gates.
7. Clocked D, JK and T Flip flops (with Reset inputs)
8. 3-bit Ripple counter
9. To design and study switching circuits (LED blink shift)
10. To design traffic light controller.