

COURSE OBJECTIVES

To enable the students to

- be exposed to the fundamental principles of mechanics
- learn the effect of force on bodies
- understand the properties of different surface areas and solids
- learn basics of fluid mechanics and relate it to bio-fluids
- understand the action of friction and motion

UNIT I BASICS AND STATICS OF PARTICLES 9

Introduction – Units and Dimensions – Laws of Mechanics – Lami's theorem, Parallelogram and triangular Law of forces — Vectorial representation of forces – Vector operations of forces -additions, subtraction, dot product, cross product – Coplanar Forces – rectangular components – Equilibrium of a particle – Forces in space – Equivalent systems of forces – Principle of transmissibility.

UNIT II EQUILIBRIUM OF RIGID BODIES 9

Free body diagram – Types of supports –Action and reaction forces – Moments and Couples – Moment of a force about a point and about an axis - Varignon's theorem – Single equivalent force -Equilibrium of Rigid bodies in two dimensions – **Equilibrium of Rigid bodies in three dimensions.**

UNIT III MECHANICS OF SOLIDS 9

Rigid bodies and deformable solids – Tension, Compression and Shear Stresses – Deformation of rigid and non-rigid bodies - Centroids - Centroids of lines and areas - **Rectangular, circular, triangular areas by integration** – **Polar moments of inertia of plane areas.**

UNIT IV BASICS OF MECHANICS OF FLUIDS 9

Fluids – density – pressure – blood pressure and gravity – **buoyancy** – **moments of force and stability** – movement in water –Newton's laws of viscosity – Definitions and simple problems on Newtonian fluid, Non-Newtonian fluid, Euler equations and Navier Stoke's equations, Viscoelasticity, laminar flow and Turbulent flow.

UNIT V DYNAMICS OF PARTICLES 9

Displacements, Velocity and acceleration, their relationship – **Relative motion** – Newton's **laws of motion** **Friction force** – **Laws of sliding friction** – **equilibrium analysis of simple systems with sliding friction.**

COURSE OUTCOMES

Upon completion of this course the students will be able to

- use scalar and vector analytical techniques for analysing forces in statically determinate structures.
- understand the law of mechanics and various theorems. Apply the equilibrium concept to force systems of particle or solids in 2D and 3D
- apply the concepts of centroid or centre of gravity and moment of inertia for calculation.
- apply mathematical knowledge to predict the properties and characteristics of a fluid.
- solve problems using concepts of kinematics and kinetics of particles and analysis the results.

TEXT BOOKS

1. Kottiswaran. N, “Engineering Mechanics – Statics and Dynamics”, Sri Balaji Publications, Erode 2010.
2. Dr. R. K. Bansal, A Text Book of Fluid Mechanics, Laxmi Publications (P) Ltd., New Delhi. 2016.

REFERENCES

1. Palanichamy, M.S. and Nagan, S, “Engineering Mechanics – Statics and Dynamics”, Third Edition, Tata McGraw -Hill Publishing, New Delhi, 2004.
2. Beer, F.P and Johnston Jr. E.R., —Vector Mechanics for Engineers (In SI Units): Statics and Dynamics, 8th Edition, Tata McGraw-Hill Publishing Company, New Delhi 2004.
3. Hibbeler, R.C., “Engineering Mechanics”, Vol. 1 Statics, Vol. 2 Dynamics, Pearson Education Asia Pvt. Ltd., 2000.
4. A Textbook of Strength of Materials by R.K. Bansal, Laxmi Publications (P) Ltd., New Delhi 2018
5. Rajasekaran, S, Sankarasubramanian, G., “Fundamentals of Engineering Mechanics”, Vikas Publishing House Pvt. Ltd., (2000).

CO - PO Mapping

Mapping of Course Outcomes with Programme Outcomes (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	-	-	-	-	-	-	2	2	3
CO2	3	3	3	3	2	-	-	-	-	-	-	2	2	3
CO3	3	3	3	3	2	-	-	-	-	-	-	2	2	3
CO4	3	3	3	3	2	-	-	-	-	-	-	2	2	3
CO5	3	3	3	3	2	-	-	-	-	-	-	2	2	3



COURSE OBJECTIVES

To enable the students to

- understand the structure of basic electronic devices.
- be exposed to active and passive circuit elements.
- familiarize the operation and applications of transistor like BJT and FET.
- explore the characteristics of amplifier gain and frequency response.
- learn the required functionality of positive and negative feedback systems.

UNIT I PN JUNCTION DEVICES**9**

PN junction diode - structure, operation and V - I characteristics, diffusion and transition capacitance - Rectifiers - Half Wave and Full Wave Rectifier - **Zener diode** characteristics - Zener diode as regulator - Display devices - **LED, Laser diodes.**

UNIT II TRANSISTORS AND SCR CHARACTERISTICS**9**

BJT - structure, operation, characteristics and biasing, **JFET and MOSFET** biasing, UJT and SCR - structure and characteristics.

UNIT III BJT AND FET AMPLIFIERS**9**

BJT small signal model - analysis of CE, CB and CC amplifiers - gain and frequency response - **JFET small signal model** - analysis of CS and Source follower - gain and frequency response.

UNIT IV MULTISTAGE AMPLIFIERS AND DIFFERENTIAL AMPLIFIER**9**

Different Coupling Schemes used in Amplifiers, **Two Stage RC Coupled Amplifier**, Cascode Amplifier Differential amplifier - Configuration - Modes of operation - **Methods of improving CMRR.**

UNIT V FEEDBACK AMPLIFIERS AND OSCILLATORS**9**

Feedback amplifiers - definition, block diagram - properties of negative feedback - feedback topologies - oscillators, concept of positive feedback - condition for oscillations, RC oscillators - RC phase shift - Wien bridge. LC oscillators Hartley, Colpitts and Crystal oscillators.

TOTAL PERIODS 45**COURSE OUTCOMES**

At the end of the course, the students will be able to

- explain the structure and working operation of basic electronic devices.
- able to identify and differentiate both active and passive elements
- analyze the characteristics of different electronic devices such as diodes and transistors
- choose and adapt the required components to construct an amplifier circuit.
- employ the acquired knowledge in design and analysis of oscillators

TEXT BOOKS

1. David A.Bell, circuits, Oxford University higher education, 5th edition, 2008
2. Sedra and Smith, Microelectronic circuits, 7th Ed., Oxford University Press.

REFERENCES

1. Balbir Kumar, Shail B. Jain, Electronic devices and circuits PHI learning private limited, 2nd edition 2014.
2. Thomas L. Floyd, Electronic devices, Conventional current version, Pearson prentice hall, 10th Edition, 2017.
3. Donald A. Neamen, Electronic Circuit Analysis and Design Tata McGraw Hill, 3rd Edition, 2003.
4. Robert L. Boylestad, Electronic Devices and Circuit Theory, 2002.
5. Robert B. Northrop, Analysis and Application of Analog Electronic Circuits to Biomedical Instrumentation, CRC Press, 2004.

Co – Po Mapping:

Course Outcomes (CO's)	Mapping of course objectives with PO's and PSO's (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak													
	Programme Outcomes (PO's)												Programme Specific Outcomes (PSO's)	
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CO 3		3	3	3	3			2		3		3	3	3
CO 4		3	3	3	3		2			3		3	3	3
CO 5	3	3			3		2			3	3	3	3	3



COURSE OBJECTIVES

To enable the students to

- ✦ introduce the basic concepts of continuous time and discrete time signals and systems
- ✦ analyze signals and systems using different transforms
- ✦ acquire the basic knowledge in Sampling and Z transform
- ✦ know about the analysis and realization of LTI - Continuous Time systems
- ✦ know about the analysis and realization of LTI - Discrete Time systems

UNIT I CLASSIFICATION OF SIGNALS AND SYSTEMS 15

Continuous time signals (CT signals) - Discrete time signals (DT signals) - Step, Ramp, Pulse, Impulse, Exponential, basic operation on signals, classification of CT and DT signals - periodic and aperiodic signals, Energy and Power signals - CT systems and DT systems - Properties - LTI system - Properties, Discrete time - Convolution sum, Continuous time - convolution integral.

UNIT II ANALYSIS OF CONTINUOUS TIME SIGNALS 15

Fourier series - definition, properties and analysis - Fourier transform - definition, properties and analysis - Laplace Transform - definition, ROC, properties and signal Analysis - Unilateral Laplace Transform.

UNIT III SAMPLING THEOREM AND Z - TRANSFORM 15

Sampling Theorem - Reconstruction - Aliasing - DTFT and properties - Z - transform - Region of Convergence - Properties of ROC - Properties of z - transform - Inverse Z - transform using Partial fraction expansion.

UNIT IV LINEAR TIME INVARIANT - CONTINUOUS TIME SYSTEMS 15

Differential Equation - impulse response, Step response and output response - Fourier and Laplace transforms in analysis of continuous time (CT) systems - Block diagram representation for causal LTI System.

UNIT V DISCRETE TIME SYSTEMS 15

Difference Equations using Z transform - Impulse response - Analysis of Discrete time systems using DTFT and z - Transform - Direct Form I - Direct Form II - Cascade and Parallel Realization.

TOTAL PERIODS 75

COURSE OUTCOMES

After the completion of the course, the students will be able to

- ✦ analyze the basic concepts of solving problems in signals and systems.
- ✦ demonstrate critical thinking and problem solving capabilities
- ✦ solve problems and solutions relating to LTI - continuous time systems
- ✦ demonstrate the basic knowledge and competence in the analysis of continuous time systems
- ✦ have an in - depth knowledge about LTI - discrete time systems

TEXT BOOK

1. Allan V.Oppenheim, S.Wilsky and S.H.Nawab, "Signals and Systems", Pearson, Indian Reprint, 2007.
2. Simon Haykin and Barry Van Veen, —Signals and Systems, John Wiley, 1999.

REFERENCES

1. John G.Proakis and Dimitris G.Manolakis, - Digital Signal Processing, Principles, Algorithms and Applications, PHI, 3rd Edition. 2000.
2. M.J.Roberts, - Signals and Systems Analysis using Transform method and MATLAB, TMH, 2003
3. K.Lindner, - Signals and Systems, McGraw Hill International, 1999.
4. Moman H. Hays, - Digital Signal Processing, Schaum's outlines, Tata McGraw - Hill., 2004.

Co– Po Mapping:

Course Outcomes (CO's)	Mapping of course objectives with PO's and PSO's (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak													
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CO 4									2	2	2	3	3	3
CO 5	3	3	3	3	3	3	3		3	2	3		3	3



COURSE OBJECTIVES

To enable the students to

- understand the fundamentals and simplification of digital logic
- design the various combinational circuits
- study and design synchronous sequential circuits
- design and implement asynchronous sequential circuits
- acquire basic knowledge about memory devices and HDL programming

UNIT I BOOLEAN ALGEBRA AND LOGIC GATES**9**

Boolean postulates and laws - De - Morgan's Theorem - Principle of Duality - Boolean functions - Minimization of Boolean functions - Karnaugh map Minimization - Tabulation Method - Don't care Conditions. Logic Gates - Implementations of Logic Functions using gates - NAND - NOR implementations - TTL - CMOS - NAND, NOR, NOT - Tristate gates

UNIT II COMBINATIONAL CIRCUITS**9**

Design procedure of Combinational circuits: Adders - Subtractors - Parallel and serial adder/ Subtractor - Carry look ahead adder - BCD adder - 2 bit Magnitude Comparator - Multiplexer, Demultiplexer - Encoder, Decoder - Parity generator and checker - Code converters.

UNIT III SEQUENTIAL CIRCUITS**9**

Flip flops - Triggering - Realization of flip flop using other flip flops - Asynchronous and Synchronous counters - Classification of sequential circuits - Moore and Mealy - Design of Synchronous counters - Modulo - n counter - Ring counters - Shift registers.

UNIT IV ASYNCHRONOUS SEQUENTIAL CIRCUITS**9**

Design of fundamental mode and pulse mode circuits - primitive state / flow table - Minimization of primitive state table - state assignment - Excitation table - cycles - Race Free State assignment - ASM Chart - Hazards: Static - Dynamic - Essential - Hazards elimination.

UNIT V MEMORY DEVICES AND INTRODUCTION TO HDL**9**

Classification of memories - ROM - ROM organization - PROM - EPROM - EEPROM - EAPROM, RAM - RAM organization - Write operation - Read operation - Memory decoding - memory expansion - Static RAM Cell - Bipolar RAM cell - Dynamic RAM cell. Programmable Logic Devices - PLA - PAL - FPGA - Introduction to HDL - Simple programs Using Verilog HDL.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon completion of the course, the students will be able to

- understand the realization of Boolean functions using various techniques
- design and implement combinational circuits
- design and implement synchronous sequential circuits
- design and study the effect of hazards in asynchronous sequential circuits
- know the concept of Memories and HDL.

TEXT BOOKS

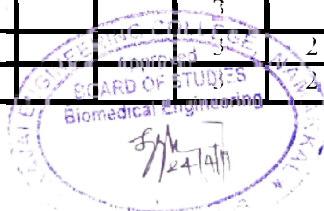
1. M. Morris Mano, "Digital Design", 3.ed., Prentice Hall of India Pvt. Ltd., New Delhi, 2003/Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2003.
2. H. Charles Roth Jr, "Digital System Design using VHDL", Thomson/ Brookscole, 2005.(Unit V)

REFERENCES

1. S. Salivahanan and S. Arivazhagan, "Digital Circuits and Design", 3rd Edition, Vikas Publishing House Pvt.Ltd, New Delhi, 2007.
2. John .M Yarbrough, "Digital Logic Applications and Design", Thomson Publications, New Delhi, 2007.
3. Charles H.Roth, "Fundamentals of Logic Design", Thomson Publication Company, 2003.
4. Donald P.Leach and Albert Paul Malvino, "Digital Principles and Applications", 5th edition, Tata Mc - Graw Hill Publishing Company Limited, New Delhi, 2003.

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CO 5	3	3	3	3	3	2	2			3	2	3	3	3



COURSE OBJECTIVES

To enable the students to

- identify all the organelles of an animal cell and their function.
- understand structure and functions of the various types of systems of human body.
- provide the knowledge of structure and functioning of nervous system, cardiovascular system, respiratory system, digestive system and musculoskeletal system
- provide the knowledge of physiological parameters of normal health and factors affecting various physiological processes in the body.
- Locate and have idea while dealing with images.

UNIT I CELL AND TISSUE STRUCTURE**9**

Structure of cell - structure and functions of sub organelles - Cell membrane - Transport of across Cell Membrane - Action potential - Cell to Cell Signaling - Cell Division. Types of Specialized tissues - **Functions Terms and terminologies, Tissues:** Epithelial tissue - definition, Function classification with examples, modifications: **Skin, Connective tissue definition**, components, function classification with examples. Lymphoid tissue, Cartilage - Hyaline cartilage, Fibro cartilage, Elastic cartilage.

UNIT II SKELETAL, MUSCULAR AND RESPIRATORY SYSTEMS**9**

Skeletal::Types of Bone and function - Physiology of Bone formation - Division of Skeleton - Types of joints and function - Types of cartilage and function. Vertebral column - parts, function, curvatures, vertebrae. **Thoracic cage - ribs, sternum. Muscular: Parts of Muscle - Movements. Respiratory: Parts of Respiratory Systems - Types of respiration - Mechanisms of Breathing - Regulation of Respiration**

UNIT III CARDIOVASCULAR AND LYMPHATIC SYSTEMS**9**

Cardiovascular: Components of Blood and functions - Blood Groups and importance - Structure of heart - Conducting system of heart - Properties of cardiac muscle - Cardiac cycle - Heart beat - Types of Blood vessel - **Regulation of heart rate and blood pressure. Cardiac action potential, Principles of ECG measurement.** Lymphatic: Parts and functions of Lymphatic systems - Types of Lymphatic organs and vessels

UNIT IV NERVOUS AND ENDOCRINE SYSTEMS AND SENSE ORGANS**9**

Nervous: Functional components of nervous system - Cells of nervous systems - Types of neuron and synapses - Mechanisms of nerve impulse - Brain: Parts of brain - Spinal cord - Tract and pathways of spines - Reflex mechanism - Classification of nerves - **Autonomic nervous systems and its functions.** Endocrine - Pituitary and thyroid gland, Sense organs: Eye and Ear.

UNIT V DIGESTIVE AND URINARY SYSTEMS**9**

Digestive: Introduction - organs of Digestive system - Digestion and absorption. Electrogastrogram, Bilirubin measurement - Pancreas and Liver. Urinary: Structure of kidney and nephron - Mechanisms of urine formation - Regulation of blood pressure by urinary system - Urinary reflex - Dialysis .

TOTAL PERIODS**45****COURSE OUTCOMES**

Upon completion of the course, the students will be able to

- students would be able to explain basic structure and functions of cell
- students would be learnt about anatomy and physiology of various systems of human body
- students would be able to locate and have idea while dealing with images
- to analyze and interpret physiological data to design of medical instruments used for diagnosis
- students would be able to explain interconnect of various systems

TEXT BOOKS:

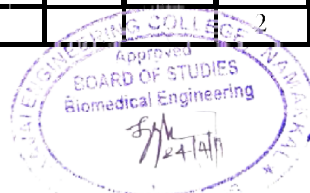
1. PrabhjotKaur, "Anatomy and Physiology", Lotus Publishers. 2014
2. Elaine.N. Marieb , —Essential of Human Anatomy and Physiology, Eight Edition, Pearson Education, New Delhi, 2007
3. Ross andWilson's, "Anatomy and Physiology in Health and Illness", Anne Waugh and Allison Grant, 9thEdition, Churchill Livingstone Publications.2006

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1. Frederic H. Martini, Judi L. Nath, Edwin F. Bartholomew, Fundamentals of Anatomy and Physiology. Pearson Publishers, 2014
2. Gillian Pocock, Christopher D. Richards, The Human Body - An introduction for Biomedical and Health Sciences, Oxford University Press, USA, 2013
3. William F.Ganong, —Review of Medical Physiology, 22nd Edition, McGraw Hill, New Delhi, 2010
4. Guyton and Hall, —Medical Physiology, 13th Edition, Elsevier Saunders, 2015
5. Eldra Pearl Solomon, —Introduction to Human Anatomy and Physiology, W.B. Saunders Company, 2015

Co – Po Mapping:

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CO 3	3	3	3	3		3	3			2	2	3	3	2
CO 4	3	3	3	3								3		
CO 5	3	3	3	3							2	3	2	2



COURSE OBJECTIVES

To enable the students to

- get the basic idea of measurements and the errors associated with measurement.
- know about the various types of transducers.
- understand the function of signal generators and analyzers.
- gain knowledge on functioning of the various measuring instruments, display devices and application on the biomedical devices.
- gain knowledge in biosensor and its application

UNIT I MEASUREMENT SYSTEM AND BASICS OF TRANSDUCER 9

Measurements and generalized measurement system: Static characteristics, accuracy, precision, linearity, hysteresis, threshold, **Dynamic Characteristics** - calibration, standards and errors in measurement, Transducer: **Basics, Classification**, Characteristics and Choice.

UNIT II TRANSDUCERS FOR BIO - MEDICAL INSTRUMENTATION 9

LVDT, Strain gauges, Transducer: Resistance, RTD, Capacitive, Inductive, Electrochemical, Piezo - electric, Hall effect, Opto - electronic Digital encoding/digital, Thermistor, Thermocouple, photo optic transducers, POT.

UNIT III SIGNAL GENERATORS AND SIGNAL ANALYZER 9

Signal generator: AF, Pulse, AM, FM, Function, and Sweep frequency generator, Signal analyzer Wave, Spectrum, Logic, and Distortion analyzer, Heterodyne wave analyzer.

UNIT IV DIGITAL DATA DISPLAY AND RECORDING SYSTEM 9

DVM and Multimeter, Frequency, Period measurement, Time interval and pulse width measurement, Graphic recorders - strip chart, X - Y recorder, Magnetic tape recorder, **CRO basics**: CRT, General purpose oscilloscope, Dual trace, Dual beam, Sampling oscilloscope, Digital storage oscilloscope, LCD monitor.

UNIT V BIOSENSORS AND ITS APPLICATIONS 9

Gas sensor, Microbial sensor, electro analytical sensor, **Enzyme based sensor - Glucose sensor**, electronic nose - halitosis, **Advances in sensor technology: Lab - on - a - chip, Smart sensor, MEMS and Nano sensor.**

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of the course, the students will be able to

- get the basic idea of measurements and the errors associated with measurement.
- known about the various types of transducers.
- understand the function of signal generators and analyzers.
- have knowledge in biosensors and its application.
- have knowledge on functioning of various measuring instruments, display devices etc.

TEXT BOOKS

1. Sawhney A.K, "A course in electrical and electronic measurements and instrumentation", Dhanpat Rai and Co (P) Ltd, Educational and Technical Publishers, 1996.
2. Cooper, "Electronic Instrumentation and Measurement techniques" Prentice Hall of India, 1998

REFERENCES

1. Renganathan S, "Transducer engineering", Allied Publishers Limited, 2003
2. Murty DVS, "Transducer and instrumentation", PHI, second edition, 2008.
3. Manoj Kumar Ram, Venkat R. Bhethanabotla, "Sensors for chemical and biological applications", CRC press, 2010
4. Patranabis D, "Sensors and transducers", PHI, Second Edition, 2004.
5. Jacob Fraden, "Handbook of Modern Sensors: Physics, Designs and applications", Third edition, Springer International, 2010.
6. Doebelin, "Measurements Systems: Application and Design", Tata McGraw - Hill, 2003
7. Neubert HKP, "Instrument Transducers", Oxford University Press, 1999
8. Bakshi U.A, Bakshi A.V, "Measurement and Instrumentation" Technical Publication, 2nd Edition 2011.

Co – Po Mapping:

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CO 4	3	3	3	3	3	3	2				3	3	3	3
CO 5	3	3	3	3	3		3	3		3	2	3	2	2



COURSE OBJECTIVES

To provide practice to

- study and analyze the theory and practical characteristics of the various transducers for the measurement of the vital physiological signals.
- get familiar with the various types of transducers and to study the compatibility for any clinical measurements
- study the characteristics of optical transducer
- study the amperometric sensor for blood glucose measurement

LIST OF EXPERIMENTS

1. Characteristics of pressure transducer
2. Measurement of displacement capacitive transducer, LVDT and Inductive transducer
3. Characteristics of optical transducer for SpO₂ measurement
4. Measurement of skin temperature by both contact and non - contact method
5. Study of the characteristics of capacitor level sensor for saline level measurement in a I - V set.
6. Data acquisition of physiological signals
7. Study of hot - wire anemometry
8. Study of amperometric sensor for blood glucose measurement
9. Electronic weighing machine for the measurement of chemical compounds
10. Non - invasive gas analyzer as an electronic nose

TOTAL PERIODS: 60

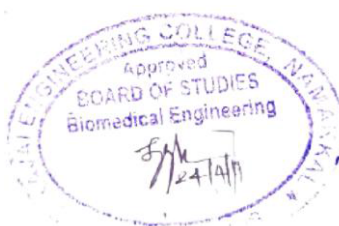
COURSE OUTCOMES

At the end of this course, the students will be able to

- analyze the characteristics of transducers
- understand the physiological signals
- measure the chemical compounds and non - invasive method of gas analyser
- study the characteristics of optical transducer

CO-PO Mapping

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COURSE OBJECTIVES

To enable the students to

- design and implement Adders and Subtractors and
- implement code converters and combinational logic circuit
- know about the design and implementation of counters and shift registers
- acquire the knowledge about simulation of digital circuits with Verilog HDL

List of Experiments

1. Design and implementation of Full and Half Adders and Full and Half Subtractors using logic gates.
2. Design and implementation of code converters using logic gates
 - i. BCD to excess - 3 code convertors and vice versa.
 - ii. Binary to gray code convertors and vice - versa.
3. Design and implementation of 4 bit binary Adder/ Subtractor and BCD adder using IC 7483.
4. Design and implementation of 2 Bit Magnitude Comparator using logic gates
5. Design and implementation of 16 bit odd/even parity checker generator using IC74180.
6. Design and implementation of Multiplexer and De - multiplexer using basic logic gates and study of IC 74160 and IC 74164.
7. Design and implementation of encoder and decoder using logic gates and study of IC7445 and IC74147.
8. Construction and verification of 4 bit ripple counter and Mod - n Ripple counters.
9. Design and implementation of 3 - bit synchronous up (or) down counter.
10. Implementation of 3 - bit shift registers using Flip flops
11. Design and Simulation of Full and Half Adders, Full and Half Subtractors, Multiplexer and De - multiplexer, Encoder and Decoder, 4 bit Ripple Counter using Verilog HDL.

TOTAL PERIODS 60

COURSE OUTCOMES

Upon the completion of the course, the students will be able to

- design Adders and Subtractors using basic logic gates and karnaugh map
- create code converters using basic logic gates combinational logic circuits like MUX, DEMUX, Encoder, Decoder etc.
- know about the design and implementation of counters and shift registers
- acquire the knowledge about simulation of digital circuits with Verilog HDL

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COURSE OBJECTIVES

To provide practice on:

- learn the characteristics of basic electronic devices such as Diode.
- understand the working of Transistors.
- analyze the concept of feedback amplifiers and oscillators.
- understand the character of UJT and SCR

LIST OF EXPERIMENTS

1. Characteristics of PN Junction Diode
2. Characteristics of Zener diode
3. Calculate the efficiency and ripple factor for HWR & FWR
4. Common Emitter input - output Characteristics
5. Common Source input - output Characteristics
6. Characteristics of UJT
7. Characteristics of SCR
8. Differential Amplifiers - CMRR Measurement
9. Series and Shunt feedback amplifiers - Frequency response
10. RC Phase shift oscillator / Wien Bridge oscillator
11. Hartley Oscillator / Colpitts Oscillator

TOTAL PERIODS: 60

COURSE OUTCOMES

At the end of this course, the students will be able to

- analyze the characteristics of PN diodes and Zener diodes
- understand the characteristics of Transistors and SCR
- design the feedback amplifiers and Oscillators
- understand the character of UJT and SCR

CO-PO Mapping:

Course Outcomes (CO's)	Mapping of course objectives with PO's and PSO's (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak													
	Programme Outcomes (PO's)												Programme Specific Outcomes (PSO's)	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	3	3	3	3				3			3		2
CO 2	3		3		3						3	3	2	
CO 3	3	3			3						2	3	3	3
CO 4	3	3	3	3	3				3		3	3	3	2



COURSE OBJECTIVES

To enable the students to

- introduce the basic of operational amplifier
- learn linear and nonlinear applications of operational amplifier
- study the applications of analog multiplier and PLL
- introduce theory of analog and digital conversion
- acquire the basic knowledge of special function IC's

UNIT I INTEGRATED CIRCUIT FABRICATION AND BASICS OF OPERATIONAL AMPLIFIER 9

Integrated Circuit classification, Fundamentals of Monolithic IC Technology, Basic Fabrication process
Fabrication of a typical circuit - Active and passive components of ICs - Operational amplifier - Basic information of Op - Amps - Ideal Op - Amp - operational amplifier Internal circuit - Examples of IC Op - Amps - DC, AC Characteristics of Op - Amp - virtual ground, frequency compensation techniques - slew rate.

UNIT II APPLICATIONS OF OPERATIONAL AMPLIFIERS 9

Basic Op - Amp applications (sign changer, scale changer, voltage follower, adder and subtractor) - Instrumentation amplifier - Voltage - to - Current and Current - to - Voltage converter - Logarithmic amplifier - Anti - logarithmic amplifiers - Differentiator - Integrator - Comparator - Schmitt trigger - Active filters - Design of Low pass, high pass and band pass filters - Precision rectifiers.

UNIT III ANALOG MULTIPLIER AND PLL 9

Analog multiplier IC - applications - Analysis of four quadrant and variable Trans - conductance multipliers - PLL: Basic principles - Phase Detector/Comparator - Voltage controlled Oscillator - Monolithic PLL - PLL applications - Frequency multiplier - AM, FM and FSK demodulators - Frequency synthesizers - Frequency translation.

UNIT IV ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTORS 9

Introduction - basic DAC techniques: Binary weighted resistor type - R - 2R ladder type - sample and hold circuits - Analog - to - Digital converters: Flash type ADC - Counter type ADC - Successive approximation register type ADC - Dual slope ADC - DAC / ADC Specifications.

UNIT V SPECIAL FUNCTION ICS 9

Waveform generators - Basic principles of sine wave oscillators - Astable and monostable multivibrators using Op - Amp - ICL8038 Function Generator - 555 timer: description of functional diagram - Astable, monostable operation - IC 723 general purpose voltage regulator - switching regulator - Switched capacitor filter - LM380 audio amplifier - Opto - couplers and fiber optic ICs.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of the course, the students will be able to

- learn the Basic Concepts of operational amplifier
- understand the working and applications of operational amplifier
- learn about PLL applications in modulator circuits
- study about working of analog and digital communication circuits
- know the basic function of special function IC's

TEXT BOOKS

1. D.RoyChoudhry, Shail Jain, "Linear Integrated Circuits", New Age International Pvt. Ltd., Fourth edition 2010.
2. Sergio Franco, "Design with operational amplifiers and analog integrated circuits", McGraw Hill, 3rd edition 2007.

REFERENCES

1. William D.Stanely, "Operational Amplifiers with Linear Integrated Circuits", Pearson Education, 2004.
2. David L.Terrell, "Op Amps - Design, Application, and Troubleshooting", Elsevier publications 2005.
3. Ramakant A. Gayakwad, "OP - AMP and Linear IC's", Prentice Hall, 1994.
4. Botkar K.R., "Integrated Circuits", Khanna Publishers, 1996.
5. Taub and Schilling, "Digital Integrated Electronics", McGraw Hill, 1977.
6. Caughlier and Driscoll, "Operational amplifiers and Linear Integrated circuits", PHI, 1989.
7. Michael Jacob J., "Applications and Design with Analog Integrated Circuits", PHI, 1996.

CO-PO Mapping:

Course Outcomes (CO's)	Mapping of course objectives with PO's and PSO's (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak													
	Programme Outcomes (PO's)												Programme Specific Outcomes (PSO's)	
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CO 1	3	3	3	3	2					3	2	3	3	3
CO 2	3	3	3	3		2	2			3	3	3	3	3
CO 3	3	3	3	3		2				3		3	2	3
CO 4	3	3	3	3	3		2			3	2	3	3	3
CO 5	3	3	3	3	3	2	2			3	2	3	3	3



COURSE OBJECTIVES

At the end of this course the student is expected to

- know the constituents of the environment and the precious resources in the environment.
- conserve all biological resources.
- understand the role of human being in maintaining a clean environment and useful environment for the future generations
- maintain the ecological balance and preserve bio - diversity.
- the role of government and non - government organizations in environment management.

UNIT I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES 9

Environment: Definition - scope - importance - need for public awareness. Forest resources: Use - over exploitation - deforestation - case studies - mining - effects on forests and tribal people. Water resources: Use - over utilization of surface and ground water - floods - drought - conflicts over water. Mineral resources Use - exploitation - environmental effects of extracting and using mineral resources - case studies. Food resources: World food problems - changes caused by agriculture and overgrazing - effects of modern agriculture - fertilizer - pesticide problems - water logging - salinity - case studies. Energy resources Growing energy needs - renewable and non renewable energy sources. Land resources: Land as resource - land degradation - soil erosion. Role of an individual in conservation of natural resources.

UNIT II ECOSYSTEMS AND BIODIVERSITY 9

Concept of an ecosystem: Structure and function of an ecosystem - producers - consumers - decomposers - energy flow in the ecosystem - ecological succession - food chains - food webs and ecological pyramids. Types of ecosystem: Introduction - characteristic features - forest ecosystem - grassland ecosystem - desert ecosystem - aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries). Biodiversity: Introduction - definition (genetic - species - ecosystem) diversity. Value of biodiversity: Consumptive use - productive use - social values - ethical values - aesthetic values. Biodiversity level: Global - national - local levels - India as a mega diversity nation - hotspots 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 - field study.

UNIT III POLLUTION 9

Pollution: Definition - air pollution - water pollution - soil pollution - marine pollution - noise pollution - thermal pollution - nuclear hazards. Solid waste management: Causes - effects - control measures of urban and industrial wastes. Role of an individual in prevention of pollution - pollution case studies. Disaster management: Floods - earthquake - cyclone - landslides. Electronic waste - Sources - Causes and

UNIT IV SOCIAL ISSUES AND ENVIRONMENT 9

UNIT V HUMAN POPULATION AND ENVIRONMENT 9

TOTAL PERIODS 45

Upon the completion of the course, the students will be able to

- know the relationship between the human population and environment.
- understand the basic concepts of environment studies and natural resources.
- gaining the knowledge about ecosystem and biodiversity.
- have knowledge about causes, effects and control measures of various types of pollution.
- understand the social issues and various environmental acts.

1. Raman Sivakumar, Introduction to Environmental Science and Engineering, 2ndEdn, TataMcGraw Hill Education Private Limited, New Delhi,(2010).
2. Benny Joseph, “Environmental Science and Engineering”, Tata McGraw Hill, (2010).

1. BharuchaErach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad India,2010.
2. S. Divan, Environmental Law and Policy in India, Oxford University Press, New Delhi, 2001.
3. K.D. Wager, Environmental Management, W.B. Saunders Co., Philadelphia, USA, 1998.
4. W.P. Cunningham, Environmental Encyclopedia, JaicoPublishing House, Mumbai, 2004.

Course Outcomes (CO's)	Mapping of course objectives with PO's and PSO's (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak													
	Programme Outcomes (PO's)												Programme Specific Outcomes (PSO's)	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	2	3	2	2	-	-	-	-	-	-	2	2	2
CO 2	3	2	1	2	3	-	-	-	-	-	-	2	-	2
CO 3	2	2	3	2	3	-	-	-	-		2	3	3	2
CO 4	2	2	3	2	2	-	-	2	-	-	-	3	-	2
CO 5	3	1	2	3	2	-	-	1	-	-	-	3	2	1



COURSE OBJECTIVES

To enable the students to

- understand origin of bio - potential.
- study different types of electrodes used in bio - potential recording.
- understand the characteristics of bio - amplifiers and different types of recorders.
- understand how to measure various physiological parameters and helps to design simple biomedical sensors
- study the instrumentation concerned with measuring various parameters and the principle of working and gain knowledge on usage of instruments in hospitals and servicing.

UNIT I BIOELECTRODES AND BIOCHEMICAL SENSORS**10**

Components of Medical Instrumentation - System Origin of Bio potential: Action Potential, Nernst Equation, Goldman equation, Hodgkin - Huxley model - Electrode electrolyte interface, Half - cell potential, Polarisable and Non - polarisable electrodes - Skin electrode interface - Bio - electrodes: Surface - , Micro - . Needle - electrodes - Equivalent circuits of electrodes - Biochemical - , and Transcutaneous - electrodes: pH, pO₂, pCO₂ - Ion sensitive Field effect Transistors.

UNIT II BIOPOTENTIAL MEASUREMENTS**8**

Bioamplifiers - Carrier Amplifier, - Isolation Amplifier - Differential amplifier - Chopper Amplifier - Instrumentation Amplifier - Bioelectric signals (ECG, EMG, EEG, EOG and ERG) and their characteristics - Electrodes for ECG, EEG and EMG - Einthoven triangle, Standard 12 - lead configurations - ECG Machine - EMG machine - 10 - 20 electrodes placement system for EEG - EEG machine - Heart sound and characteristics, PCG

UNIT III PATIENT MONITORING SYSTEMS AND BIOTELEMETRY**8**

Measurement of Blood pressure - Direct Methods and Indirect Methods - Temperature - Respiration rate - Heart rate measurement - Oximetry - Pulse oximeter, Ear oximeter - Computerized patient monitoring system - Bedside, Central Monitoring system - Biotelemetry: Basics components, and its different types.

UNIT IV CARDIAC MEASUREMENTS AND ASSIST DEVICES**10**

Cardiac output Measuring techniques - Dye Dilution method, Thermo dilution method, BP method - Blood Flow measuring Techniques: Electromagnetic Type - Ultrasound Blood Flow meter, Laser Doppler Blood Flow meter - Cardiac Arrhythmias - Plethysmography - Cardiac Pacemakers - Defibrillator: AC - , and DC - types - Heart - Lung Machine (HLM) - Oxygenators

UNIT V CLINICAL INSTRUMENTATION

9

Chemical Fibro sensors, Fluorescence sensors - Blood cell counters - Coulter counter, Electrical Impedance Method, Optical Method - Colorimeter, Spectro photometer, Flame photometer - Chromatography - Mass Spectrometer - Biochemical and Bioanalytical equipments Electrical hazard - Micro - and Macroshock - Patient safety procedures

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of the course, the students will be able to

- examine the various concepts of biochemical sensors.
- evaluate the different models in biomedical systems.
- synthesize the behavior of assist devices.
- compare different patient monitoring and application of biotelemetry systems.
- understand the analytical equipment of bioengineering systems.

TEXT BOOKS

1. Geddes L.A and Baker L.E, "Principles of Applied Biomedical Instrumentation", John Wiley, 3rd Edition, 1975, Reprint 1989.
2. Khandpur R.S, "Hand - book of Biomedical Instrumentation", Tata McGraw Hill, 2nd Edition, 2003.
3. Leslie Cromwell, Fred J. Weibell, Erich A. Pfeiffer, "Biomedical Instrumentation and Measurements", Prentice - Hall India, 2nd Edition, 1997

REFERENCES

1. R. Stuart MacKay, "Bio - Medical Telemetry: Sensing and Transmitting Biological Information from Animals and Man", Wiley - IEEE Press, 2nd Edition, 1968.
2. John G. Webster, "Medical Instrumentation application and design", John Wiley, 3rd Edition, 1997.
3. Carr, Joseph J, Brown, John M., "Introduction to Biomedical equipment technology", JohnWiley and sons, New York, 4th Edition, 1997.
4. Geddes L.A and Baker L.E, "Principles of Applied Biomedical Instrumentation", John Wiley - Inter Science, 3rd Edition, 1989.
5. C.Rajarao and S.K. Guha, "Principles of Medical Electronics and Bio - medical Instrumentation", Universities press (India) Ltd, First Edition, Orient Longman Ltd, 2001.

Course Outcomes (CO's)	Mapping of course objectives with PO's and PSO's (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak													
	Programme Outcomes (PO's)												Programme Specific Outcomes (PSO's)	
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CO 1	3			3	2			2				2	2	
CO 2			2										2	2
CO 3	2			3						3			3	3
CO 4		2			3		2						3	
CO 5		3	2							3			1	



COURSE OBJECTIVES

To enable the students to

- gain a knowledge on the structural and functional aspects of living organisms.
- know the etiology and remedy in treating the pathological diseases.
- empower the importance of public health.
- understand the structure and function of organs and its synthesise.
- understand the structure and function of human body

UNIT I CELL DEGENERATION, REPAIR AND NEOPLASIA 9

Cell injury - Reversible cell injury and Irreversible cell injury and Necrosis, Apoptosis, Intracellular accumulations, Pathological calcification - Dystrophic and Metastatic .cellular adaptations of growth and differentiation, Inflammation and Repair including fracture healing, Neoplasia, Classification, Benign and Malignant tumours, carcinogenesis, spread of tumours Autopsy and biopsy.

UNIT II FLUID AND HEMODYNAMIC DERANGEMENTS 9

Edema, Hyperemia/Ischemia, normal hemostasis, thrombosis, disseminated intravascular coagulation, embolism, infarction, shock, Chronic venous congestion, Hematological disorders - Bleeding disorders, Leukaemias, Lymphomas Haemorrhage.

UNIT III MICROBIOLOGY 9

Structure of Bacteria and Virus. Routes of infection and spread; endogenous and exogenous infections, Morphological features and structural organization of bacteria and virus, growth curve, identification of bacteria , culture media and its types , culture techniques and observation of culture. Disease caused by bacteria, fungi, protozoal, virus and helminthes.

UNIT IV MICROSCOPES 9

Light microscope - bright field, dark field, phase contrast, fluorescence, Electron microscope (TEM and SEM). Preparation of samples for electron microscope. Staining methods - simple, gram staining and AFB staining.

UNIT V IMMUNOPATHOLOGY 9

Natural and artificial immunity, types of Hypersensitivity, antibody and cell mediated tissue injury: opsonization, phagocytosis, inflammation, Secondary immunodeficiency including HIV infection. Auto - immune disorders: Basic concepts and classification, SLE.Antibodies and its types, antigen and antibody reactions, immunological techniques: immune diffusion, immunoelectrophoresis, RIA and ELISA, monoclonal antibodies.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of the course, the students will be able to

- analyze structural and functional aspects of living organisms.
- explain the function of microscope
- discuss the importance of public health.
- describe methods involved in treating the pathological diseases.
- understand the analytical equipment of bioengineering systems.

TEXT BOOKS

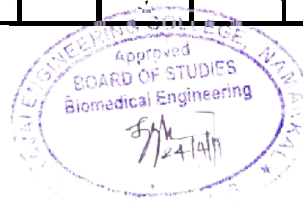
1. Ramzi SCotran, VinayKumar and Stanley LRobbins, -Pathologic Basis of Diseases, 7th edition, WB Saunders Co. 2005 (Units I and II).
2. Ananthanarayanan and Panicker, -Microbiology Orient blackswan, 2017 10th edition. (Units III, IV and V).

REFERENCES

1. Underwood JCE: General and Systematic Pathology Churchill Livingstone, 3rd edition, 2000.
2. Dubey RC and Maheswari DK. -A Text Book of Microbiology| Chand and Company Ltd, 2007
3. Prescott, Harley and Klein, -Microbiology|, 10th edition, McGraw Hill, 2017

CO-PO Mapping:

COs	Programme Outcomes (PO's)												Programme Specific Outcomes (PSO's)	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3			3	2			2				2	2	
CO 2			2										2	2
CO 3	2			3						3			3	3
CO 4		2			3		2						3	
CO 5		3	2							3			1	



COURSE OBJECTIVES

To enable the students to

- study the application of operational amplifier
- know the design of multivibrators using operational amplifier and 555 timer
- design oscillators and active filters in various applications.
- simulate the Op - Amp application circuits using PSPICE software

LIST OF EXPERIMENTS**Design and testing of**

1. Inverting, Non inverting amplifier and differential amplifier
2. Instrumentation amplifier
3. Integrator and Differentiator
4. Active low pass, High pass and band pass filters.
5. Astable, Monostable Multivibrators and Schmitt trigger (using IC 741)
6. Phase shift Oscillator and Wien bridge oscillators (using IC 741)
7. Astable and monostable Multivibrators using NE555 Timer
8. Frequency multiplier using PLL IC
9. Voltage regulation using LM317 and LM723

Simulation Experiments

10. Simulation of (i) Instrumentation amplifier,(ii) Integrator and Differentiator,(iii) Active low pass, High pass and band pass filters, (iv) Astable, Monostable Multivibrators and Schmitt trigger (using IC 741), (v) Phase shift Oscillator and Wien bridge oscillators (using IC 741).

TOTAL PERIODS 60

COURSE OUTCOMES

Upon the completion of the course, the students will be able to

- design and test the Op - amp applications
- understand the working and applications of filters
- design oscillators and multivibrators for various applications
- analyse the working of power supply

CO-PO Mapping:

COs	Programme Outcomes												Programme Specific Outcomes (PSO's)	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3			3	2			2				2	2	
CO 2			2										2	2
CO 3	2			3						3			3	3
CO 4		2			3		2						3	



COURSE OBJECTIVES

To enable the students to

- ◆ study the parts of compound microscope.
- ◆ demonstrate the manual tissue processing.
- ◆ know the simple, gram and AFB stain.
- ◆ study the bleeding and clotting time.

LIST OF EXPERIMENTS

1. **Urine physical and chemical examination** (protein, reducing substances, ketones, bilirubin and blood)
2. Hematoxylin and eosin staining.
3. Study of parts of compound microscope
4. Histopathological slides of benign and malignant tumours.
5. Manual tissue processing and section cutting (demonstration)
6. **Simple stain.**
7. **Gram stain.**
8. **AFB stain.**
9. **Slides of malarial parasites, micro filarial and leishmania donovani.**
10. **Haematology slides of anemia and leukemia.**
11. **Bleeding time and clotting time.**
12. Study of bone marrow charts.

TOTAL PERIODS 60

COURSE OUTCOMES

Upon the completion of the course, the students will be able to

- design and test the urine physical and chemical examination.
- know the parts of compound microscope.
- understand the manual tissue processing
- analyze the haematology slides of anemia and leukemia.

CO-PO Mapping:

Course Outcomes (CO's)	Mapping of course objectives with PO's and PSO's (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak													
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CO 1	3			3	2			2				2	2	
CO 2			2										2	2
CO 3	2			3						3			3	3
CO 4		2			3		2						3	



COURSE OBJECTIVES

To enable the students to

- ◆ develop the reading skills of the students and to familiarize them in skimming and scanning.
- ◆ instill the communication concepts and enhance the students' conversational skills through various practice sessions.
- ◆ familiarize them with a variety of business correspondence.
- ◆ develop the receptive skills such as listening and reading and to make the students well versed in the productive skills (writing and speaking)

UNIT I	READING AND VOCABULARY	8
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Understanding short, notices, messages - detailed comprehension of factual material - skimming and scanning skills - interpreting visual information - reading for gist and specific information - reading for grammatical accuracy and understanding of text structure - **reading and information transfer.**

UNIT II	WRITING	7
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Fixing appointments - asking for permission - giving instructions - apologizing and offering compensation - making or altering reservations - dealing with requests - **giving information about a product.**

UNIT III	LISTENING	8
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Listening to short telephonic conversation - Listening to short conversation or monologue - Listening to specific information - **Listening to recorded interview, discussion.**

UNIT IV	SPEAKING	7
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Conversation between the interlocutor and the candidate - general interaction and social language - **A mini presentation by each candidate on a business theme - organising a larger unit of discourse** - giving information and expressing opinions - to way conversation between candidates followed by further prompting from the interlocutor Expressing opinions - agreeing and disagreeing.

TOTAL PERIODS	30
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LIST OF EXPERIMENTS

1. Reading
2. Writing
3. Listening
4. Speaking

COURSE OUTCOMES

Upon the completion of the course, the students will be able to

- enrich the business vocabulary through reading.
- develop their pronunciation skills.
- speak effectively in English in various occasions.
- speak and write in English effectively.

TEXT BOOKS

1. Cambridge BEC Preliminary, Self Study Edition, Cambridge University Press, New York, 2012
2. Whitby, Norman. Business Benchmark, Pre - intermediate to intermediate, Business Preliminary, Shree Maitrey Printech Pvt. Ltd., Noida, 2014.

REFERENCES

1. Raman, Meenakshi and Sangeetha Sharma. Technical Communication: Principles and Practice Oxford University Press, New Delhi. 2011.
2. Rizvi, Ashraf. M. Effective Technical Communication. Tata McGraw - Hill, New Delhi. 2005.
3. Rutherford, Andrea. J Basic Communication Skills for Technology. Pearson, New Delhi.

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Course Outcomes (CO's)	Mapping of course objectives with PO's and PSO's (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak													
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CO 1	2	1	3	1				2					3	
CO 2	2	1	3	1									3	
CO 3	2	1	3	1									3	
CO 4	2	1	3	1									2	



SYLLABI

BM16951

EMBEDDED PROGRAMMING USING ARDUINO

0 0 2 1

COURSE OBJECTIVES

To enable the students to

- learn the basic of arduino and the programming language
- acquire knowledge on arduino function libraries
- understand the real time projects using arduino and the interfacing modules
- acquire knowledge on real time projects

UNIT I ARDUINO BASICS

6

Basics of Arduino –Overview, Board Description, Installation, Program Structure, Data types, Variables & Constants, operators, Control Statements, Loops, Functions, Strings, String Object, Time, Arrays

UNIT II ARDUINO FUNCTION LIBRARIES

6

Function Libraries- I/O Functions, Advanced I/O Functions, Character Functions, Math Library, Trigonometric Functions, Due & Zero, Pulse width Modulation, Random Numbers, Interrupts, Communication, Inter Integrated Circuits, Serial Peripheral Interface, Arduino UART,

UNIT III ARDUINO SENSORS AND INTERFACING

9

Sensors – Humidity Sensor, Temperature Sensor, Water Detector/Sensor, PIR Sensor, Ultrasonic Sensor; Connecting switches (Magnetic Relay Switches- Types of Relay, Controlling electrical appliances with electromagnetic relays, working as a matrix keypad,

UNIT IV ARDUINO INTERFACING AND REAL TIME PROJECTS

9

Arduino Interfacing - Using the keypad library to interface with Arduino, Interfacing servo motors with Arduino, Using a buzzer as an alarm unit, GSM/GPRS arduino interfacing, Intelligent home locking system, intelligent water level management system, home automation using RFID, Automatic hand sanitizer

TOTAL PERIODS 30

COURSE OUTCOMES

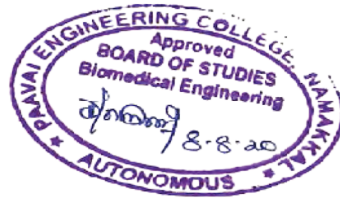
Upon the completion of the course, students will be able to

- learn the basic of arduino and the programming language
- acquire knowledge on arduino function libraries

- understand the real time projects using arduino and the interfacing modules
- acquire knowledge on real time projects

TEXT BOOKS

1. Simon Monk, “Programming Arduino Getting Started with Sketches” , January 2012



TOTALPERIODS 30

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- apply the knowledge on PC hardwares and troubleshooting
- apply the knowledge on system architectures and PC buses
- apply the knowledge on semiconductor memory device and its interfaces
- illustrate the understanding on hard disk drives and displays
- apply the knowledge on windows error messages and circuitry

TEXT BOOKS

1. Newnes, PC Troubleshooting Pocket book, Howard Anderson & Mike tooley, second edition



BM16953

**BASIC ELECTRONIC CIRCUIT DESIGN USING
MULTISIM**

0 0 1 1

COURSE OBJECTIVES

To enable the students to

- learn the basics on Multisim
- analyze the basic electronic circuit using multisim
- analyze the opamp circuit and multivibrator circuit using multisim
- acquire the knowledge on digital circuits

UNIT I BASICS

4

Basic of Multisim -Introduction to Multisim, Placing Components, Wiring Components, Placing simulation source, place measurement instruments, simulation

UNIT II BASICS ELECTRONIC CIRCUITS

4

Clipper, Clamper, Voltage, Regulator, CE amplifier, Emitter follower

UNIT III CIRCUIT USING OPAMP AND MULTIVIBRATOR

4

Comparator, Schmitt trigger circuit, Diode waveshaping circuit, peak detector, Integrator, Differentiator, logarithmic Amplifier, A.C. Amplifier, Multivibrator, 555 timer, PLL circuit

UNIT IV DIGITAL CIRCUITS

3

Flipflop, Registers, Counter, MUX, DEMUX, A/D and D/A Converter

TOTAL PERIODS 15

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- acquire the basics on Multisim
- apply the knowledge on basic electronic circuit using multisim
- apply the opamp circuit and multivibrator circuit using multisim
- apply the knowledge on digital circuits

TEXT BOOKS

1. Multisim Tutorial, NI <http://www.ni.com/tutorial/10710/en/>

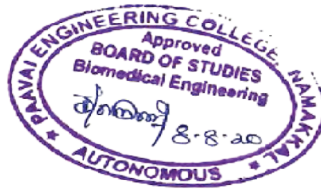


- TOTAL PERIODS 30

- analyze the biomedical signals and images using matlab programming
- implement the programming in GUI

TEXT BOOKS

1. MATLAB® Programming for Biomedical Engineers and Scientists, Andrew P.King, Paul Aljabar,
2. <https://ocw.mit.edu/courses/mathematics/18-s997-introduction-to-matlab-programming-fall-2011/index.htm>



BM16955

LABVIEW PROGRAMMING

0 0 2 1

COURSE OBJECTIVES

To enable the students to

- learn the basic of LABVIEW
- acquire the knowledge on DAQ using LABVIEW
- acquire the knowledge on embedded device using LABVIEW

UNIT I BASICS OF LABVIEW

8

Basics of LABVIEW - Numericals, Booleans and comparators, Loops, For loops, while loops, Flat sequence, Structures, Case structure, Event structure, Formula node, Local and global variable, Data handling instruction, Strings, Matrix, File IO, Clusters, Waveform and wavechart, Final Module test

UNIT II LABVIEW WITH DAQ-USB-6009

10

Theory of DAQ card; Hardware Interfaces- Acquiring and generation of Digital signals, Acquiring analog values in DE and RSE method, Generating analog output, Integration of DAQ card with embedded devices

UNIT III EMBEDDED DEVICE WITH LABVIEW

12

Standalone file and installer development, web server, Remote panel creation and testing, Webserver monitoring with LabVIEW, Hardware interfacing with LabVIEW, UART- Communication, Simplex, Half Duplex, Full Duplex, Led with switch, Lm35 sensor, RFID, Bluetooth, Zigbee, Glucose Level Monitoring, Heart beat detection

TOTAL PERIODS 30

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- learn the tools involved in the LABVIEW
- apply the knowledge on DAQ using LABVIEW
- apply the knowledge on embedded device using LABVIEW

TEXT BOOKS

1. National Instruments Inc. <http://www.ni.com/academic/students/learn-labview/>



BM16956

OPEN SOURCE PROGRAMMING USING LINUX

0 0 1 1

COURSE OBJECTIVES

To enable the students to

- learn the basic of LINUX
- learn the system components of Text editor
- understand the command details in LINUX
- understand the system administration and management

UNIT I LINUX ORIENTATION

4

Linux Orientation – Kernel vs. Operating System and Tools, History of Linux, UNIX and LINUX, Linux Distributions, GUI, KDE Desktop, GNOME and KDE, Linux Standard Base, Software Environment, sudo, workspaces,

UNIT II SYSTEM COMPONENTS

4

Introduction to Text Editors, Vi Editors, emacs Editor, Development of shells, Introduction to filesystems, using fdisk, partitioning considerations

UNIT III COMMAND DETAILS

4

File transfer Tools, Graphical Monitoring tools, System Monitoring, Kernel Modules, Device Management, using udev, using systemctl, Basic Commands and Utilities, Monitoring and Performance Utilities, Installing and Running ksysguard

UNIT IV SYSTEM ADMINISTRATION AND MANAGEMENT

3

System Installation, Using Graphical Package Management, Software management and packaging

TOTAL PERIODS 15

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- learn the basic of LINUX
- learn the system components of Text editor
- understand the command details in LINUX
- understand the system administration and management

TEXT BOOKS

1. Paul Cobbaut, “The Ultimate Linux Newbie Guide”, PHI publications, 2015



COURSE OBJECTIVES

To enable the students to

- learn the basic of PCB Design
- design the electronic projects using KICAD tool
- learn the basics of transmission lines and crosstalk
- acquire the knowledge on kicad tools
- analyze the schematics using kicad tool for PCB design

UNIT I INTRODUCTION TO PCB**6**

Introduction to PCB- Definition and Need/Relevance of PCB, Background and History of PCB, Types of PCB, Classes of PCB Design, Terminology in PCB Design, Different Electronic design automation (EDA) tools and comparison; PCB Design Flow, Placement and routing, Steps involved in layout design, Artwork generation Methods - manual and CAD, General design factor for digital and analog circuits, Layout and Artwork making for Single-side, double-side and Multilayer Boards. Design for manufacturability, Design-specification standards

UNIT II INTRODUCTION TO PCB FABRICATION & ASSEMBLY**3**

Steps involved in fabrication of PCB; PCB Fabrication techniques-single, double sided and multilayer; Etching - chemical principles and mechanisms; Post operations- stripping, black oxide coating and solder masking; PCB component assembly processes

UNIT III TRANSMISSION LINES AND CROSSTALK**3**

Transmission Line - Transmission lines and its effects, Significance of Transmission line in Board design, Types of Transmission lines; Crosstalk - The crosstalk in transmission lines Crosstalk control in PCB design parts, planes, tracks, connectors, terminations Minimization of crosstalk. Thermal issues - Thermal mapping of design

UNIT IV KICAD BASICS**9**

Workflow- Overview, Forward and Backward annotation; Shortcut Keys- Accelerate Keys, Hotkeys, Electronic schematics - using Eeschema, Bus connection in Kicad, Layout Printed Circuit Board - Using pcbnew, generate gerber files, using gerbview, Automatically route with freerouter; Make Schematic symbols - using component library editor, export, import and modify library components, using quicklib, high pin count schematic component; Make Component footprints- using footprint editor

UNIT V PCB DESIGN USING KICAD

9

Regulator circuit using 7805, Inverting Amplifier or Summing Amplifier using op-amp, Full-wave Rectifier, Astable or Monostable multivibrator using IC555, RC Phase-shift or Wein-bridge Oscillator using transistor

TOTAL PERIODS 30

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- learn the basic of PCB Design
- implement the electronic circuits using KICAD tool
- learn the basics of transmission lines and crosstalk
- apply the knowledge on kicad tools
- analyze the schematics using kicad tool for PCB design

TEXT BOOKS

1. https://docs.kicad-pcb.org/5.1/en/getting_started_in_kicad/getting_started_in_kicad.pdf
2. Peter Balman, “Kicad Like a Pro”, Tech exploration, 2nd edition, 2018



BM16958

VHDL PROGRAMMING

0 0 1 1

COURSE OBJECTIVES

To enable the students to

- learn the basic of VHDL
- understand the concept of parallel and sequential processing using VHDL
- acquire the knowledge on combinational circuit using VHDL
- acquire the knowledge on sequential circuit using VHDL

UNIT I VHDL BASICS

3

Code models; component model; gates; entity; architecture; identifier object; variables, signals, data types, operators of relationships

UNIT II PARALLEL AND SEQUENTIAL PROCESSING

3

Modeling for simulation, simulation cycle, parallel and sequential sets; instantiation of components

UNIT III CONSTRUCTION OF COMBINATORIAL LOGIC USING VHDL

4

Timing and delays in digital circuits; hazard; arithmetic units; ROM; design example

UNIT IV DESIGN OF SEQUENTIAL LOGIC USING VHDL

5

Timing of synchronous systems; synchronous processes; latches; flip-flops; initialization; Mealy and Moore machines; counters; registers; RAM

TOTAL PERIODS 15

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- learn the basic of VHDL
- analyze the concept of parallel and sequential processing using VHDL
- apply the knowledge on combinational circuit using VHDL
- apply the knowledge on sequential circuit using VHDL

TEXT BOOKS

1. <https://www.classcentral.com/course/canvas-network-digital-design-with-vhdl-2616>

