

SEMESTER III

S.No.	Category	Course Code	Course Title	L	T	P	C
Theory							
1	BS	MA20302	Linear algebra and Partial Differential equations	3	1	0	4
2	PC	MD20301	Analog Electronics	3	0	0	3
3	PC	MD20302	Signals and Systems	3	1	0	4
4	PC	MD20303	Sensors and Measurements	3	0	0	3
5	PC	MD20304	Digital Design and HDL	3	0	0	3
6	MC	MC20301	Value Education	2	0	0	0
Practicals							
7	PC	MD20305	Analog Electronic Circuits Laboratory	0	0	4	2
8	PC	MD20306	Sensors and Measurements Laboratory	0	0	4	2
9	PC	MD20307	Digital Electronic Circuits Laboratory	0	0	4	2
Total				18	2	12	23
Cumulative Total							64

SEMESTER IV

S.No.	Category	Course Code	Course Title	L	T	P	C
Theory							
1	HS	BA20151	Entrepreneurship Development	3	0	0	3
2	BS	MA20403	Probability and Statistics	3	1	0	4
3	ES	IT20404	Object Oriented Programming with C++	3	0	0	3
4	PC	MD20401	Linear Integrated Circuits	3	0	0	3
5	PC	MD20402	Biomedical Instrumentation	3	0	0	3
6	PC	MD20403	Anatomy and Physiology	3	0	0	3
Practicals							
7	ES	IT20407	Object Oriented Programming with C++ Laboratory	0	0	4	2
8	PC	MD20404	Biomedical Instrumentation Laboratory	0	0	4	2
9	EE	EN20401	English Proficiency Course Laboratory	0	0	2	1
Total				18	1	10	24
Cumulative Total							88

COURSE OBJECTIVES

To enable the Students to

- apply the dependent and independent relations of vector spaces.
- learn and apply the concepts of linear transformation and diagonalisation.
- solve Fourier series and analyze the representation of periodic functions
- formulate and solve partial differential equations.
- use mathematical tools for the solution of PDEs that model several physical processes

UNIT I VECTOR SPACES 12

Vector spaces - Subspaces - Linear combinations and Linear system of equations - Linear dependence and linear independence - Bases and Dimensions.

UNIT II LINEAR TRANSFORMATION AND INNER PRODUCT SPACES 12

Linear Transformation - Null spaces and ranges – Dimension theorem - Matrix representation of a linear transformations - Review of Eigen values and Eigen vectors - Diagonalizability. Inner product, norms - Gram Schmidt orthogonalization process - Adjoint of linear operations - Least square approximation.

UNIT III FOURIER SERIES 12

Dirichlet's conditions - General Fourier series - Odd and even functions - Half range series - Complex form of Fourier Series - Parseval's identity - Harmonic Analysis.

UNIT IV PARTIAL DIFFERENTIAL EQUATIONS 12

Formation of partial differential equations - Lagrange's linear equation - Solutions of four standard types of first order partial differential equations - Linear partial differential equations of second order with constant coefficients.

UNIT V FOURIER SERIES SOLUTION TO PARTIAL DIFFERENTIAL EQUATIONS 12

Solutions of one-dimensional wave equation - One dimensional equation of heat conduction - Steady state solution of two-dimensional equation of heat conduction.

TOTAL PERIODS: 60

COURSE OUTCOMES

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

- employ the dependent and independent relations of vector spaces.
- demonstrate the knowledge of linear transformation and diagonalisation.
- derive Fourier series, their possible forms of representations of periodic functions

- formulate and solve partial differential equations
- solve certain boundary value problems and apply the methods and results in engineering applications.

TEXT BOOKS

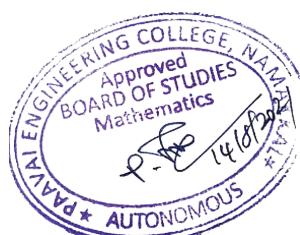
1. Veerarajan T., “Transforms and Partial Differential Equations”, Tata McGraw Hill Education Pvt. Ltd., New Delhi, Second reprint, 2012.
2. Friedberg, A.H., Insel, A.J. and Spence, L., Linear Algebra, Prentice - Hall of India, New Delhi, 2004.
3. Narayanan S., Manickavasagam Pillai.T.K and Ramanaiah.G “Advanced Mathematics for Engineering Students” ,Vol. II & III, S.Viswanathan Publishers Pvt Ltd. 1998.

REFERENCE BOOKS

1. Kumaresan, S., Linear Algebra – A geometric approach I, Prentice – Hall of India, New Delhi, Reprint, 2010.
2. Strang, G., Linear Algebra and its applications, Thomson (Brooks/Cole), New Delhi, 2005.
3. Larry C. Andrews, Bhimsen K. Shivamoggi, “Integral Transforms for Engineers”, SPIE Optical Engineering press, Washington USA (1999).
4. Ramana.B.V., “Higher Engineering Mathematics”, Tata Mc-GrawHill Publishing Company limited, New Delhi (2010).
5. Erwin Kreyszig., “Advanced Engineering Mathematics” 10th Edition, Wiley Publications.

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)													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO1 1	PO1 2	PSO 1	PSO 2
CO1	3	3	3	3	-	-	-	-	-	-	-	-	3	3
CO2	3	3	3	3	-	-	-	-	-	-	-	-	3	3
CO3	3	3	3	-	-	-	-	-	-	-	-	-	3	3
CO4	3	3	3	3	-	-	-	-	-	-	-	-	3	3
CO5	3	3	3	-	-	-	-	-	-	-	-	-	3	3



COURSE OBJECTIVES

To enable the students to

- understand the basics of BJT and MOSFET biasing
- learn the design of various amplifier circuits
- study the feedback amplifiers and oscillators circuits
- explore the basics of tuned amplifiers and power amplifiers
- acquire the concepts of rectifiers, filters and Power supply.

UNIT I BJT AND MOSFET BIASING 9

Transistor Biasing – DC, AC load line, Operating point; The Classical Discrete circuit bias (Voltage divider bias); Biasing using a collector to base feedback resistor - Bias compensation Techniques, Thermal stability; Biasing in MOS amplifier circuits - Fixing VGS, Fixing VG, Drain to Gate feedback resistor;

UNIT II BJT AND MOSFET AMPLIFIERS 9

BJT amplifier design - Hybrid equivalent circuits, Analysis of CE, CC and CB Configuration using BJT, Miller's theorem; MOSFET Amplifier configuration - Basic configurations, characterizing amplifiers, CS amplifier with and without source resistance RS, Source follower.

UNIT III FEEDBACK AMPLIFIERS AND OSCILLATORS 9

Basic concepts of feedback - Block diagram; General characteristics of negative feedback – Transfer gain, Cut off frequency with feedback; Effect of negative feedback on input and output resistances - Steps and Design of Feedback Amplifier circuits; Oscillator – classification, Barkhausen criterion; Analysis of RC oscillators - RC Phase shift oscillators, Wein bridge oscillators, LC oscillator, Hartley and Colpitts Oscillator.

UNIT IV TUNED AMPLIFIERS AND POWER AMPLIFIERS 9

Tuned amplifiers - Classification of tuned amplifiers, Effect of cascading of single tuned and Double tuned amplifier on Bandwidth; Power amplifiers – Direct Coupled Class A, Complementary, Symmetry Class B and Class C Power Amplifier and its Parameters, Conversion efficiency.

UNIT V RECTIFIERS, FILTER CIRCUITS AND POWER SUPPLY 9

Rectifiers - Half wave and Full wave Rectifiers and its parameters; Filters - L, C, LC and CLC or π filters; Regulators- Discrete transistor Voltage regulator, Series and Shunt Voltage Regulators; Switched mode power supply (SMPS).

TOTAL PERIODS 45

COURSE OUTCOMES

At the end this course, students will be able to

- apply the basics of BJT and MOSFET biasing in real time applications.
- design the various amplifier circuits based on requirements.

- analyze the feedback amplifiers and oscillators circuits
- explicate the working of tuned amplifiers and power amplifiers
- elucidate rectifiers, filters and Power supply.

TEXT BOOKS

1. Robert L Boylestad and Louis Nashelsky, “Electronic Devices and Circuit Theory” 13th Edition, Pearson Education, 2017.
2. Salivahanan.S, and Suresh kumar.N, “Electronic Devices and Circuits”, 4th edition, McGraw Hill, 2016.

REFERENCES

1. David A Bell., “Electronic Devices and Circuits”, Prentice Hall of India, New Delhi, 2010.
2. Behzad Razavi, “Fundamentals of Microelectronics”, 2nd Edition, John Wiley, 2015.
3. J.Millman and C.C.Halkias, “Integrated Electronics”, 2nd edition, TMH, 2017.
4. K. A. Navas, “Electronics Lab Manual”, Volume I, PHI, 7th Edition, 2018.

CO-PO Mapping

Mapping of course objectives with PO's and PSO's (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes (Pos)													
	PO 1	PO 2	PO 3	PO 4	PO5	PO 6	PO 7	PO8	PO 9	PO 10	PO1 1	PO1 2	PSO 1	PS O 2
CO1	2	1	3	1				2					3	
CO2	2	1	3	1									3	
CO3	2	1	3	1									3	
CO4	2	1	3	1									2	
CO5	2	1	3	1				2					2	



COURSE OBJECTIVES

To enable the students to

- learn the basics in the classification of signals and systems
- acquire the knowledge on the properties and functions of continuous time signals
- acquire the basic knowledge in Sampling and Z transform
- understand the insight of LTI - Continuous Time systems
- understand the realization of LTI - Discrete Time systems

UNIT I CLASSIFICATION OF SIGNALS AND SYSTEMS 12

Classification of Signals - 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 12

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 12

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 CONTINUOUS TIME SYSTEMS 12

Continuous Time Systems - 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 12

Discrete Time Systems - 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 60

COURSE OUTCOMES

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

- explain the classification of continuous and discrete time signals and systems
- evaluate the different transforms in continuous time signals
- apply the knowledge in Sampling and Z transform for real time applications
- analyze differential equations for various responses.
- Apply the knowledge of LTI - discrete time systems in solving problems.

TEXT BOOK

1. Allan V.Oppenheim, S.Wilsky and S.H.Nawab, “Signals and Systems”, Pearson, Indian Reprint, 2017.
2. Simon Haykin and Barry Van Veen, “Signals and Systems”, John Wiley, 2nd edition 2002.

REFERENCES

1. John G.Proakis and Dimitris G.Manolakis, “Digital Signal Processing, Principles, Algorithms and Applications”, PHI, 5rd Edition. 2015.
2. M.J.Roberts, “Signals and Systems Analysis using Transform method and MATLAB”, TMH, 2017
3. Hwei Hsu “Schaums outline of Signals and Systems”, McGraw Hill International, 2013.
4. Oktay Alkin, “Signals and Systems: A MATLAB® Integrated Approach”, McGraw - Hill., 2014

CO-PO Mapping

Mapping of course objectives with PO's and PSO's														
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes (Pos)													
	PO 1	PO 2	PO 3	PO 4	PO5	PO 6	PO 7	PO8	PO 9	PO 10	PO1 1	PO1 2	PSO 1	PS O 2
CO1	2	1		3									3	
CO2	2	1		2									3	
CO3	2	1		3									3	
CO4	2	1		3									2	
CO5	2	1		2									2	

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COURSE OBJECTIVES

To enable the students to

- explain the purpose of measurement, the methods of measurements, errors associated with measurements.
- conclude the principle of transduction, classifications of different transducers.
- analyze the characteristics of different transducers and study its biomedical applications.
- describe the need and function of various signal conditioning circuits.
- explain the different display and recording devices.

UNIT I INTRODUCTION TO MEASUREMENT 9

Measurement System – Instrumentation, Classification and Characteristics of Transducers; Static and Dynamic, Errors in Measurements, Calibration, Primary and secondary standards.

UNIT II DISPLACEMENT, PRESSURE, TEMPERATURE SENSORS 9

Resistive Transducers - Strain Gauge: Gauge factor, sensing elements, configuration, biomedical applications, strain gauge displacement & pressure transducers, RTD materials & range, Characteristics - Thermistor characteristics; Biomedical applications of Temperature sensors, Capacitive transducer, Inductive transducer, LVDT, Active type; Thermocouple –characteristics. Hall effect Sensors.

UNIT III PHOTOELECTRIC AND PIEZOELECTRIC SENSORS 9

Photoelectric - Phototube, scintillation counter, Photo Multiplier Tube (PMT), photovoltaic, Photo conductive cells, photo diodes, phototransistor, comparison of photoelectric transducers, spectrophotometric applications of photo electric transducers; Piezo electric sensors - Piezoelectric active transducer and biomedical applications as pressure & Ultrasound transducer.

UNIT IV 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 V DISPLAY AND RECORDING DEVICES 9

Display - Digital voltmeter, Multi meter, CRO, block diagram; CRT – vertical & horizontal deflection system, DSO, LCD monitor, LED, LDR, Interferometer.

Recording Devices - PMMC writing systems, MI, and dynamometer type instruments, servo recorders, photographic recorder, magnetic tape recorder, Inkjet recorder, thermal recorder. Digital Recorders.

TOTAL PERIODS**45**

COURSE OUTCOMES

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

- describe the purpose and methods of measurements.
- explain the principle of different sensors and its applications.
- analyze the characteristics of different transducers.
- describe the need and function of various signal conditioning circuits.
- explain different display and recording devices for various applications.

TEXT BOOKS

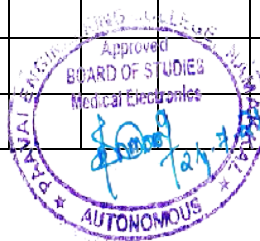
1. Doebelin E.O. and Manik D.N., “Measurement Systems”, Tata McGraw-Hill Education Pvt. Ltd., 6th Edition, 2011.
2. L.A Geddes and L.E.Baker , “Principles of Applied Biomedical Instrumentation”, – John Wiley and sons, 3rd Edition, Reprint 2015

REFERENCES

1. Leslie Cromwell, Fred J. Weibell, Erich A. Pfeiffer, “Biomedical Instrumentation and Measurement”, Prentice Hall India Pvt. Ltd, New Delhi, 2nd Edition, Reprint, 2013
2. Khandpur R.S, “Handbook of Biomedical Instrumentation”, Tata McGraw Hill, New Delhi, 3rd Edition, 2014.
3. A.K.Sawhney, “Electrical & Electronics Measurement and Instrumentation”, Dhanpat Rai & Co, New Delhi, 17th Edition, 2004.
4. Albert D.Helfrick and William D.Cooper, “Modern Electronic Instrumentation and Measurement Techniques”, Prentice Hall of India, 2007.

CO-PO Mapping

Mapping of course objectives with PO's and PSO's														
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes (Pos)													
	PO 1	PO 2	PO 3	PO 4	PO5	PO 6	PO 7	PO8	PO 9	PO 10	PO1 1	PO1 2	PSO 1	PS O 2
CO1	2			1			2	2					3	
CO2	2			1			2	2					3	
CO3	2			1			2	2					3	
CO4	2			1			2	2					2	
CO5	2			1			2	2					2	



COURSE OBJECTIVES

To enable the students to

- learn the basic principles of combinational Logic
- design and construct the combinational logic circuits
- implement and construct the sequential logic circuits
- study the applications of synchronous sequential circuits
- acquire the knowledge on Verilog HDL

UNIT I DIGITAL FUNDAMENTALS 9

Digital Basic Fundamentals –Number systems, Definition of combinational logic, Canonical forms, Generation of switching equations from truth tables, Karnaugh maps upto 4 variables, Quine McCluskey Minimization Technique, Quine McCluskey using Don't Care Terms.

UNIT II COMBINATIONAL LOGIC CIRCUITS 9

Combinational Logic: Binary Adders and Subtractors, Comparators, Decoders, Encoders, Multiplexers; Programmable Logic Devices (PLDs) – Programmable Array Logic (PAL), Programmable Logic Array (PLA) Programmable Read only Memories (PROMS).

UNIT III SEQUENTIAL LOGIC CIRCUITS 9

Basic Bistable Elements - Latches, Timing Considerations; The Master Slave Flip-flops (Pulse-Triggered flip-flops): SR flip-flops, JK flip-flops, Edge Triggered Flip-flops, T-flipflop Characteristic equation

UNIT IV SYNCHRONOUS SEQUENTIAL CIRCUITS 9

Flip flops – SR, JK, T, D, Master/Slave FF – operation and excitation tables, Triggering of FF, Analysis and design of clocked sequential circuits – Design – Moore/Mealy models, state minimization, state assignment, circuit implementation – Design of Counters- Ripple Counters, Ring Counters, Shift registers, Universal Shift Register.

UNIT V VERILOG HDL PROGRAMMING 9

Verilog Programming - Structure of Verilog module, Operators, Data Types; Styles of Description- Data flow description, Behavioural description. Implementation of half adder and full adder using Verilog data flow description; Verilog Behavioural description - Structure, Variable Assignment Statement, Sequential Statements, Loop Statements, Verilog Behavioural Description of Multiplexers

COURSE OUTCOMES

At the end this course, students will be able to

- understand the basic concepts of digital fundamentals
- apply the functions in the combinational logic circuits
- learn the concepts of sequential logic circuits using flip-flops
- analyse the knowledge of sequential logic circuits.
- develop the applications of Combinational and sequential logic circuit using Verilog HDL

TEXT BOOKS

1. Salivahanan, “Digital Circuits and Design”, 4th edition 2015
2. Nazeih M. Botros, “HDL Programming VHDL and Verilog”, Dreamtech press,,2015 reprint,

REFERENCES

1. Charles H Roth Jr, “Fundamentals of logic design”, Cengage Learning,2015
2. Donald D Givone, “Digital Principles and Design”,14th reprint, TMH,2012
3. Sudhakar Samuel, ”Logic Design”, Pearson/ Saguine, 2015
4. Cyril P R ,“Fundamentals of HDL”, Pearson/Sanguin 2016

CO-PO Mapping

Mapping of course objectives with PO's and PSO's (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes (Pos)													
	PO 1	PO 2	PO 3	PO 4	PO5	PO 6	PO 7	PO8	PO 9	PO 10	PO1 1	PO1 2	PSO 1	PS O 2
CO1	2	1	3	1				2					3	2
CO2	2	1	3	1				2					3	2
CO3	2	1	3	1				2					3	2
CO4	2	1	3	1				2					2	1
CO5	2	1	3	1				2					2	3

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COURSE OBJECTIVES

To enable the students to

- develop the individual multi-dimensionally in physical, intellectual, emotional and spiritual dimensions.
- facilitate individuals think about and reflect on different values.
- understand their responsibility in making choices and the practical implications of expressing them.
- instigate to choose their personal, social, moral and spiritual values.
- design and chisel the overall personality of an individual

UNIT I PERSONAL VALUES**6**

Value Education – Definition, Types of values; Human values - Respect, Acceptance, Consideration, Appreciation, Listening, Openness, Affection, Patience, Honesty, Forgiveness, Sacrifice, Authenticity, Self Control, Altruism, Tolerance and Understanding, Wisdom, Decision making, Self – actualization, Character formation towards positive Personality, Contentment; -Religious Values - Humility, Sympathy and Compassion, Gratitude. Peace, Justice, Freedom, Equality.

UNIT II SOCIAL VALUES**6**

Social Values - Pity and probity - Self control - Respect to - Age, Experience, Maturity, Family members, Neighbors - Universal Brotherhood - Flexibility -Peer pressure - Sensitization towards Gender Equality, Physically challenged, Intellectually challenged - Reliability - Unity - Modern Challenges of Adolescent Emotions and behavior - Comparison and Competition- Positive and Negative thoughts- Arrogance, Anger and Selfishness.

UNIT III ENGINEERING ETHICS**6**

Professional Values -.Knowledge thirst - Sincerity in profession- Regularity, Responsibility, Job satisfaction, Punctuality and Faith - Perseverance - Courage - Competence - Co-operation- Curbing unethical practices - Integrity, Social Consciousness and Responsibility. Global Values – Ethical values of earth centric - Computer Ethics – Moral Leadership - Code of Conduct - Corporate Social Responsibility

UNIT IV SPIRITUAL VALUES**6**

Developing Spirituality - Thinking process, Moralization of Desires – Reduction of wants and freedom from greed; -Health benefits- Physical exercises - Mental peace - Meditation - Objectives, Types, Effects on body, mind and soul- Yoga - Objectives, Types, Asanas. Family values -family's structure, function, roles, beliefs, attitudes and ideals, Family Work Ethic, Family Time, Family Traditions.

UNIT V HUMAN RIGHTS**6**

Classification of Human Rights - Right to Life, Liberty and Dignity- Right to Equality - Right against Exploitation - Cultural and Educational Rights- Physical assault and Sexual harassment - Domestic violence.

TOTAL PERIODS 30**COURSE OUTCOMES**

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

- cultivate the values needed for peaceful living in the existing society.
- comprehend humanistic values to develop peace in the world.
- foster ethics in profession and usage of Technology.
- orient with the importance of value education towards personal, group and spiritual attributes.
- nurture physical, mental, spiritual growth to face the competitive world.

REFERENCES

1. Little, William, An introduction of Ethics. Allied publisher, Indian Reprint 1955.
2. Sharma, S.P. Moral and Value Education; Principles and Practices, Kanishka publishers, 2013.
3. “Values (Collection of Essays)”. Sri Ramakrishna Math. Chennai. 1996.

CO-PO MAPPING

CO/PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programmes Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	2	2	-	-	2	-	2
CO2	-	-	-	2	-	2	-	1	3	2	1	3	-	2
CO3	-	-	3	2	2	3	2	3	3	1	3	3	2	3
CO4	-	-	3	1	-	2	-	-	1	-	-	3	2	-
CO5	-	-	-	-	-	1	-	-	-	-	-	3	-	-



PRACTICAL

MD20305

ANALOG ELECTRONIC CIRCUITS LABORATORY

0 0 4 2

COURSE OBJECTIVES

To enable the students to

- learn the implementation of CE, CB,CC and CS Amplifiers
- understand the implementation of differential amplifier
- learn the implementation of single stage and multistage amplifiers
- understand the P-SPICE simulation of Electronic Circuits

LIST OF EXPERIMENTS

1. Design of Regulated Power supplies
2. Frequency Response of CE, CB, CC and CS amplifiers
3. Darlington Amplifier
4. Differential Amplifiers - Transfer characteristics, CMRR Measurement
5. Cascode and Cascade amplifiers
6. Determination of bandwidth of single stage and multistage amplifiers
7. Analysis of BJT with Fixed bias and Voltage divider bias using P-SPICE
8. Analysis of FET, MOSFET with fixed bias, self-bias and voltage divider bias using P SPICE
9. Analysis of Cascode and Cascade amplifiers using P-SPICE
10. Analysis of Frequency Response of BJT and FET using P-SPICE

TOTAL PERIODS 60

COURSE OUTCOMES

At the end this course, students will be able to

- evaluate the execution of CE, CB and CC amplifiers.
- demonstrate the differential amplifiers
- evaluate the single stage and multistage amplifiers using Analog ICs
- analyze amplifier circuits using P-SPICE simulation

CO-PO Mapping

Mapping of course objectives with PO's and PSO's														
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes (Pos)													
	PO 1	PO 2	PO 3	PO 4	PO5	PO 6	PO 7	PO8	PO 9	PO 10	PO1 1	PO1 2	PSO 1	PS O 2
CO1	2	1	3	1	2	2	2	2					3	
CO2	2	1	3	1	2	2	2	2					3	
CO3	2	1	3	1	2	2	2	2					3	
CO4	2	1	3	1	2	2	2	2					2	



COURSE OBJECTIVES

To enable the students to

- describe the characteristics of various transducers
- develop bridge circuits to find unknown variables
- compare filter characteristics
- demonstrate various read out and display devices

LIST OF EXPERIMENTS

1. Characteristics of strain gauges.
2. Displacement measurement using LVDT.
3. Characteristics of temperature sensor-thermistor
4. Characteristics of temperature sensor-RTD.
5. Characteristics of thermocouple
6. Characteristics of Light sensors-LDR, Photo Diode, Photo Transistor.
7. Characteristics of Piezoelectric Transducer.
8. Study of Multimeter and Medical Oscilloscope.
9. Study of Input / Output characteristics using X – Y oscilloscope.
10. Force measurement using force sensor and calibration.

TOTAL PERIODS 60

COURSE OUTCOMES

At the end this course, students will be able to

- design and understand characteristics and calibration of various transducers.
- design and develop bridge circuits to find unknown variables.
- design and analyze filter characteristics.
- explain various read out and display devices.

CO-PO Mapping

Mapping of course objectives with PO's and PSO's														
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes (Pos)													
	PO 1	PO 2	PO 3	PO 4	PO5	PO 6	PO 7	PO8	PO 9	PO 10	PO1 1	PO1 2	PSO 1	PS O 2
CO1	2	1	3	1	2	2	2	2					3	
CO2	2	1	3	1	2	2	2	2					3	
CO3	2	1	3	1	2	2	2	2					3	
CO4	2	1	3	1	2	2	2	2					2	



COURSE OBJECTIVES

To enable the students to

- learn the implementation and simulation using Verilog HDL of Basic combinational circuits
- understand the implementation and simulation using Verilog HDL of error checking using parity generator and checking
- learn the implementation and simulation of multiplexer and demultiplexer using logic gates
- analyze the design of synchronous and asynchronous sequential circuits using logic gates

LIST OF EXPERIMENTS**Digital Circuits**

1. Implementation of Adder and Subtractor circuits using logic gates.
2. Code converters: Excess-3 to BCD and Binary to Gray code converter and vice-versa using logic gates
3. Design and implementation of Parity generator and parity checking using logic gates
4. Design and implementation of multiplexer and demultiplexer using logic gates
5. Counters: Design and implementation of 3-bit modulo counters as synchronous and Asynchronous types using FF IC's and specific counter IC
6. Shift Registers: Design and implementation of 4-bit shift registers in SISO, SIPO, PISO, PIPO modes using suitable IC's.

Simulation

7. Implementation of Adder and Subtractor circuits using Verilog HDL
8. Code converters: Excess-3 to BCD and Binary to Gray code converter and vice-versa using Verilog HDL
9. Design and implementation of Parity generator and parity checking using Verilog HDL
10. Design and implementation of multiplexer and demultiplexer using Verilog HDL
11. Counters: Design and implementation of 3-bit modulo counters as synchronous and Asynchronous types using FF IC's and specific counter IC via Verilog HDL
12. Shift Registers: Design and implementation of 4-bit shift registers in SISO, SIPO, PISO, PIPO modes using suitable IC's. via Verilog HDL

TOTAL PERIODS 60

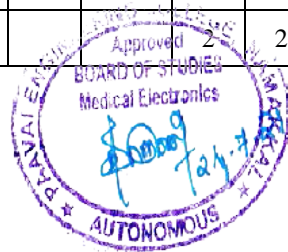
COURSE OUTCOMES

At the end this course, students will be able to

- evaluate the implementation and simulation using Verilog HDL of Basic combinational circuits
- analyze the implementation and simulation using Verilog HDL of error checking using parity generator and checking
- analyze the implementation and simulation using Verilog HDL of multiplexer and demultiplexer using logic gates
- analyze the design of synchronous and asynchronous sequential circuits using logic gates and simulation using Verilog HDL

CO-PO Mapping

Mapping of course objectives with PO's and PSO's														
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes (Pos)													
	PO 1	PO 2	PO 3	PO 4	PO5	PO 6	PO 7	PO8	PO 9	PO 10	PO1 1	PO1 2	PSO 1	PS O 2
CO1	2	1	3			2	2	2					3	2
CO2	2	1	3			2	2	2					3	2
CO3	2	1	3			2	2	2					3	2
CO4	2	1	3			2	2	2					2	2



SEMESTER IV

BA20151

ENTREPRENEURSHIP DEVELOPMENT

3 0 0 3

COURSE OBJECTIVES

To enable students to

- understand the Management principles.
- build the entrepreneurial competencies & analyse the support rendered by government and other agencies in entrepreneurship development.
- understand the business opportunities & to prepare a Feasibility Report.
- propose a business plan.
- appraise & comprehend the various factors to be considered for launching a small business.

UNIT I BASICS OF MANAGEMENT: 9

Management : Meaning, Definition, Nature & Importance ; Roles of management - Functions of Management - Levels of Management - Functional areas of Management : Marketing, Finance, Production, HRM, IT, R & D.

The Evolution & Development of Management Thought : Classical, Neo -classical, System and Contingency Approaches - An Overview.

UNIT II ENTREPRENEURIAL COMPETENCE & ENVIRONMENT 9

Entrepreneurial Competence: Entrepreneurship – Definition, Role and expectations – Entrepreneurial styles and types – Characteristics of the Entrepreneur - Entrepreneurial Competencies – Functions of an Entrepreneur.

Entrepreneurial Environment: Role of Socio-Cultural, Economic and Political Environment – Institutional Support for small entrepreneurs, Assistance Programme for Small Scale Units – Institutional Framework, Central and State Government Industrial Policies and Regulations.

UNIT III ENTREPRENEURIAL DEVELOPMENT 9

Ownership Structures – Proprietorship, Partnership, Company, Co-operative, Franchise.

Identification of Business Opportunity – Preparation of Feasibility Report – Financial and Technical Evaluation – Project Formulation – Common Errors in Project Formulation – Specimen Project Report

Entrepreneurial Development Programs — Role of SSI Sector in the Economy – IAS Units – Failure, Causes and Preventive Measures – Turnaround Strategies.

UNIT IV BUSINESS PLAN PREPARATION, FINANCING VENTURES 9

Business Plan : Business opportunities-SWOT, Business plan process, Feasibility Study, Functional plan- Marketing plan, Operational plan, Organizational plan, financial plan, Evaluation Criteria.

Financing ventures : sources of raising capital, seed funding, venture capital funding, funding opportunities for startups in India.

UNIT V WOMEN ENTREPRENEURSHIP & ENTREPRENEURSHIP IN VARIOUS SECTORS 9

Women Entrepreneurship: Growth of women Entrepreneurship – Problems faced by Women Entrepreneurs – Development of women Entrepreneurship.

Entrepreneurship in Informal Sector: Rural Entrepreneurship – Entrepreneurship in Sectors like Agriculture, Tourism, Health care, Transport and allied services.

TOTAL PERIODS: 45

COURSE OUTCOMES

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

- implement the necessary managerial skills to become an entrepreneur.
- take up self-employment having been exposed to entrepreneurial environment.
- select a best business idea by using appropriate methods to assess its viability.
- formulate a business plan & deploy the resources for sustainable growth.
- analyse channels and means of launching a small business in any sector.

TEXT BOOKS

1. Khanka S.S, “Entrepreneurial Development”, S. Chand & Company Limited, New Delhi, 2016.
2. Saravanavel. P, “Entrepreneurial Development”, Ess Pee Kay Publishing House, Chennai, 2013.

REFERENCES

1. Donald L. Sexton & Raymond W.Smilor, “The Art and Science of Entrepreneurship”, Ballinger Publishing Company, 2008.
2. Clifford M.Baumbaack & Joseph R.Mancuso, “Entrepreneurship and Venture Management”, Prentice Hall, 1975.
3. Gifford Pinchot, “Intrapreneuring” Harper & Row Publishers, New York, 2005.
4. Mathew Manimala, “Entrepreneurship Theory at the Crossroads”, Paradigms & Praxis, Biztrantra, 2nd Edition, 2015.

CO-PO Mapping

Mapping of course objectives with PO's and PSO's														
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes (Pos)													
	PO 1	PO 2	PO 3	PO 4	PO5	PO 6	PO 7	PO8	PO 9	PO 10	PO1 1	PO1 2	PSO 1	PS O 2
CO1	3			3	1		2	2	2		2	3	2	3
CO2		2	2		2	1					1	1	1	3
CO3		1	1		1	1	1		1	1	1	3		3
CO4	1	1					1		3	1	1	3	1	2
CO5	1	1	1		1	1	2		2	1		3		1



COURSE OUTCOMES

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

- demonstrate the fundamental concepts of probability and probability distributions of random variables in designing process
- identify the differences in two dimensional random variables
- implement the statistical techniques to hypotheses testing of engineering and management problems
- be aware of the principles to be adopted for designing the experiments.
- compare statistical data using control chart in quality control

TEXT BOOKS

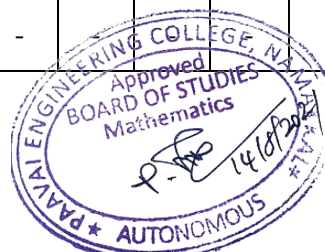
1. Milton. J. S. and Arnold. J.C., "Introduction to Probability and Statistics", Tata McGraw Hill, 4thEdition, 2007.
2. Johnson. R.A. and Gupta. C.B., Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 7thEdition, 2007.
3. Papoulis. A and Unnikrishnapillai. S., "Probability, Random Variables and Stochastic Processes" McGraw Hill Education India, 4thEdition, New Delhi, 2010.

REFERENCE BOOKS

1. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8thEdition, 2012.
2. Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", Pearson Education, Asia , 8thEdition, 2007.
3. Ross, S.M., "Introduction to Probability and Statistics for Engineers and Scientists", 3rd Edition, Elsevier, 2004.
4. Spiegel. M.R., Schiller. J. and Srinivasan. R.A., "Schaum's Outline of Theory and Problems of Probability and Statistics", Tata McGraw Hill Edition, 2004.

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)													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO1 1	PO1 2	PSO 1	PSO 2
CO1	3	3	3	3	-	-	-	-	-	-	-	3	3	3
CO2	3	2	3	3	-	-	-	-	-	-	-	2	3	3
CO3	3	3	3	2	-	-	-	-	-	-	-	3	3	3
CO4	3	3	3	2	-	-	-	-	-	-	-	2	3	3
CO5	3	3	3	3	-	-	-	-	-	-	-	3	3	3



COURSE OBJECTIVES

To enable students to

- introduction to C++ and its variables, data type, operators.
- acquire the knowledge about Object Oriented Programming(OOP)
- study about operator overloading and inheritance in C++.
- understand the concepts of polymorphism and templates.
- familiarize the students with templates and generic programming.

UNIT I INTRODUCTION TO C++ 9

Object oriented programming concepts - Introduction to C++, Tokens, Keywords, Identifiers and constants; Basic data types - User defined data types, Derived datatypes Symbolic constants; Declaration of variables - Dynamic initialization of variables, Reference variables; Operators in C++ - Scope resolution operator - Manipulators - Expressions and their types - Control structures - The main function – Function prototyping -Call by value - Call by reference - Inline functions -Default arguments - Function overloading.

UNIT II CLASSES AND OBJECTS 9

Specifying a class – Defining member functions, Private member functions, Arrays within a class, Memory allocation for objects, Static data members, Static member functions, Arrays of objects, Objects as function arguments, Friend functions, Returning objects; Constructors - Parameterized constructors, Multiple constructors in a class, Constructors with default arguments, Dynamic initialization of objects, Copy constructor, Dynamic constructors, Destructors.

UNIT III OPERATOR OVERLOADING AND INHERITANCE 9

Defining operator overloading - Overloading unary, binary operators; Manipulation of strings using operators–Rules for overloading operators– Type Conversions– Inheritance - Defining derived classes, Single inheritance, Multilevel Inheritance, Multiple inheritance, Hierarchical inheritance, Hybrid inheritance; Virtual base classes – Abstract classes.

UNIT IV POLYMORPHISM AND TEMPLATES 9

Introduction to pointers to objects - This pointer, Pointers to derived classes, Virtual functions, Pure virtual functions; Templates - Function templates, user defined template arguments, class templates.

UNIT V EXCEPTION HANDLING AND GENERIC PROGRAMMING 9

Exception Handling - Exception handling mechanism, multiple catch, nested try, rethrowing the exception – Namespaces – std namespace- Standard Template Library.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end this course, students will be able to

- summarize the basic concepts of object oriented programming with C++.
- analyze a problem and identify classes, objects and the relationships among them
- make use of overloading and inheritance concepts to solve real world problems
- develop application using polymorphism and templates.
- apply the features of exception handling and generic programming.

TEXT BOOKS

1. E.Balagurusamy, “Object Oriented Programming with C++”, Tata McGraw Hill, Sixth Edition, 2013.
2. Herbert Schildt “C++: The Complete Reference”, Tata McGraw Hill, 4th Edition, 2003.

REFERENCES

1. Ira Pohl, “Object Oriented Programming using C++”, Pearson Education, Second Edition Reprint 2004.
2. S. B. Lippman, Josee Lajoie, Barbara E. Moo, “C++ Primer”, Fourth Edition, Pearson Education, 2005.
3. B. Stroustrup, “The C++ Programming language”, Third edition, Pearson Education, 2004.
4. Paul Deitel, Harvey Deitel, “C++ How to Program”, Tenth Edition, Pearson Education, 2017.

CO-PO MAPPING:

CO/PO MAPPING (3/2/1 indicates the strength of correlation) 3 – Strong, 2 – Medium, 1 – Weak														
COs	Programme Outcomes (POs)												Programme Specific Outcomes (PSO)	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	2	2	-	-	-	-	-	-	2	2	2
CO2	3	2	1	2	3	-	-	-	-	-	-	2	-	2
CO3	2	2	3	2	3	-	-	-	-	-	2	3	3	2
CO4	2	2	3	2	2	-	-	2	-	-	-	3	-	2
CO5	3	1	2	3	2	-	-	1	-	-	-	3	2	1



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 BASICS OF OPERATIONAL AMPLIFIER 9

Basics of Op amp - 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 AMPLIFIER 9

Basic Op Amp applications - sign changer, scale changer, voltage follower, adder and subtractor; Instrumentation amplifier ; Converters Circuits – 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, Phase Locked Loop - 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 ADC AND DAC 9

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; Multivibrators - 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

- summarize the basics of operational amplifier
- apply the knowledge about applications of linear and nonlinear operational amplifier
- elucidate the applications of analog multiplier and PLL
- apply the concepts of analog and digital conversion
- develop applications based on special function ICs

TEXT BOOKS

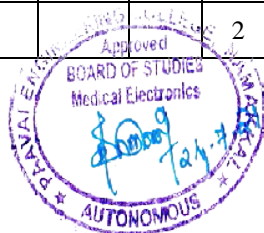
1. D. Roy Choudhry, Shail Jain, "Linear Integrated Circuits", New Age International Pvt. Ltd., Fifth edition 2018
2. Sergio Franco, "Design with operational amplifiers and analog integrated circuits", McGraw Hill, 4th edition 2015.

REFERENCES

1. William D.Stanely, "Operational Amplifiers with Linear Integrated Circuits", Pearson Education, 3rd edition, 2014
2. B.Visveswara Rao, "Linear Integrated Circuits", Pearson Reprint, 2018
3. S.Sivanagaraju, "Linear Integrated Circuits", Prentice Hall India, Reprint, 2018
4. A.P.Godse, U.A.Bakshi., "Linear Integrated Circuits", 3rd edition Technical Publication, 2015

CO-PO Mapping

Mapping of course objectives with PO's and PSO's														
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes (Pos)													
	PO 1	PO 2	PO 3	PO 4	PO5	PO 6	PO 7	PO8	PO 9	PO 10	PO1 1	PO1 2	PSO 1	PS O 2
CO1	2	1	3				2	2					3	
CO2	2	1	3				2	2					3	
CO3	2	1	3				2	2					3	
CO4	2	1	3				2	2					2	
CO5	2	1	3				2	2					2	



COURSE OBJECTIVES

At the end of this course the student is expected to

- explain the basics theory of bio electrodes
- illustrate the concept of Bio potential measurement
- design Biopotential amplifiers for acquisition of bio signals.
- study the various non-electrical physiological parameter measurement
- outline the types of biochemical measurement

UNIT I BIOPOTENTIAL ELECTRODES 9

Introduction to Electrodes - Origin of bio potential and its propagation; Electrode - electrolyte interface, electrode, skin interface, half cell potential, impedance, polarization effects of electrode, non polarizable electrodes; Types of electrodes - surface, needle and micro electrodes and their equivalent circuits, Measurement with two electrodes.

UNIT II BIOPOTENTIAL MEASUREMENT 9

Biopotential Measurement - Bio signal characteristics, frequency and amplitude ranges; ECG – Einthoven's triangle, standard 12 lead system, block diagram; Measurements of heart sounds – PCG; EEG – 10-20 electrode system, unipolar, bipolar and average mode, Functional block diagram; EMG – unipolar and bipolar mode, block diagram; EOG; ERG.

UNIT III BIOPOTENTIAL AMPLIFIER 9

Need for bio-amplifier - single ended bio-amplifier, differential bio-amplifier, right leg driven ECG amplifier; Filtering and Isolation - Band pass filtering, isolation amplifiers, transformer and optical isolation, isolated DC amplifier and AC carrier amplifier; Artifacts and removal.

UNIT IV NON ELECTRICAL PHYSIOLOGICAL PARAMETER MEASUREMENT 9

Parameter Measurement - Temperature, respiration rate and pulse rate measurements; Plethysmography; Pulse oximetry; Blood Pressure - direct methods, Pressure amplifiers, systolic, diastolic, mean detector circuit; Indirect methods - auscultatory method, oscillometric method, ultrasonic method; Blood flow – Electromagnetic, ultrasound blood flow measurement; Cardiac output measurement- Indicator dilution, dye dilution and thermo dilution method.

UNIT V BIOCHEMICAL MEASUREMENT 9

Biochemical sensors - pH, pO₂ and pCO₂, Ion selective Field Effect Transistor (ISFET); immunologically sensitive FET (IMFET); Blood glucose sensors - Blood gas analyzers, colorimeter, flame photometer, spectrophotometer, blood cell counter, auto analyzer.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- describe the electrode behavior and circuit models.
- describe the fundamentals of Bio potential recording.
- design various bio amplifiers.
- measure various nonelectrical physiological parameters.
- measure various biochemical parameters.

TEXT BOOKS

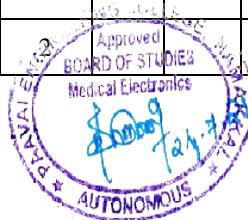
1. Joseph J. Carr and John M. Brown, "Introduction to Biomedical equipment technology", Pearson Education, 4th Edition, 2016.
2. John G. Webster, "Medical Instrumentation Application and Design", John Wiley and Sons, New York, 5th Edition, 2013.

REFERENCES

1. Khandpur R.S, "Handbook of Biomedical Instrumentation", Tata McGraw Hill, New Delhi, 3rd Edition, 2014.
2. L.A Geddes and L.E. Baker, "Principles of Applied Biomedical Instrumentation", John Wiley and sons, 3rd Edition, Reprint 2015
3. Leslie Cromwell, Fred J. Weibell, Erich A. Pfeiffer, Biomedical Instrumentation and Measurements, Pearson Education India, 2nd Edition, 2015.
4. Myer Kutz, "Standard Handbook of Biomedical Engineering & Design", McGraw-Hill Publisher, 2003.

CO-PO Mapping

Mapping of course objectives with PO's and PSO's														
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes (Pos)													
	PO 1	PO 2	PO 3	PO 4	PO5	PO 6	PO 7	PO8	PO 9	PO 10	PO1 1	PO1 2	PSO 1	PS O 2
CO1	2	1	3				2	2					3	
CO2	2	1	3				2	2					3	
CO3	2	1	3				2	2					3	
CO4	2	1	3				2	2					2	
CO5	2	1	3				2						2	



COURSE OBJECTIVES

To enable the students to

- acquaint with basic structural and functional elements of human body.
- comprehend 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
- impart the knowledge of physiological parameters of normal health and factors affecting various physiological processes in the body.
- Gain knowledge of organs and structures involving in system formation and functions.

UNIT I CELL AND TISSUE STRUCTURE 9

Cell - Structure and organelles, Functions of each component in the cell; Cell membrane – transport across membrane, Origin of cell membrane potential, Action potential. Homeostasis – Tissue, Types, Specialized tissues, functions; Basics of molecular biology

UNIT II RESPIRATORY SYSTEM AND NERVOUS SYSTEM 9

Components of respiratory system – Respiratory Mechanism; Types of respiration - Oxygen and carbon dioxide transport and acid base regulation; Basics of Neuron-Structure of a Neuron, Types of Neuron; Neurological Cells - Synapses and types; Brain – Divisions of brain lobes, Cross Sectional Anatomy of Brain, Cortical localizations and functions; Spinal cord – Tracts of spinal cord, Spinal Nerve; Reflex mechanism –Types of reflex. Autonomic nervous system and its functions.

UNIT III BLOOD AND CARDIOVASCULAR SYSTEM 9

Blood composition - functions of blood, functions of RBC.WBC types and their functions; Blood groups – importance of blood groups, identification of blood groups; Blood vessels - Structure of heart, Properties of Cardiac muscle, Conducting system of heart, Cardiac cycle; Heart sound - Volume and pressure changes and regulation of heart rate, Coronary Circulation, Factors regulating Blood flow.

UNIT IV SKELETAL AND SPECIAL SENSORY SYSTEM 9

Skeletal System - Bone types and functions, Axial Skeleton and Appendicular Skeleton and musculoskeletal; Joint- Types of Joint, Cartilage structure, types and functions; Special Sensory system- Eye, Ear and Skin, diseases and related surgery.

UNIT V PHYSIOLOGICAL SYSTEMS 9

Urinary system -Structure of Kidney and Nephron; Mechanism of Urine formation – Urinary reflex, Homeostasis and blood pressure regulation by urinary system; Digestive System - Basics of Digestive, Reproductive and Integumentary systems.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- reveal basic structural and functional elements of human body.
- enlighten gaseous exchange and fluid maintenance in the human body.
- enlighten organs and structures involving in system formation and functions.
- Reveal the concepts involved in the skeleton and sensory system
- elucidate special senses in the human body.

TEXT BOOKS:

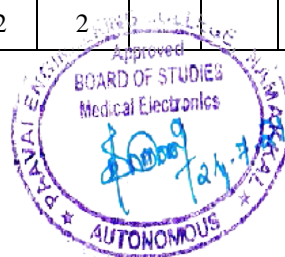
1. Elaine.N. Marieb, “Essential of Human Anatomy and Physiology”, 12th Global Edition, Pearson Education, New Delhi, 2016
2. Gillian Pocock, Christopher D. Richards, "The Human Body An introduction for Biomedical and Health Sciences", Oxford University Press, USA, 2015.

REFERENCES:

1. William F.Ganong, —Review of Medical Physiology, 24nd Edition, McGraw Hill, New Delhi, 2014
2. Arthur C. Guyton, "Text book of Medical Physiology", Elsevier Saunders, 13th Edition, 2010
3. Eldra Pearl Solomon, —Introduction to Human Anatomy and Physiology, W.B. Saunders Company, 2015
4. Openstax, “Anatomy and Physiology”, XanEdu Publishing, 2013

CO-PO Mapping

Mapping of course objectives with PO’s and PSO’s														
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes (Pos)													
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CO1	2	1	3	1	2	2	2	2					3	
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CO3	2	1	3	1	2	2	2	2					3	
CO4	2	1	3	1	2	2	2	2					2	
CO5	2	1	3	1	2	2	2	2					2	



COURSE OBJECTIVES

To enable students to

- know fundamental knowledge of object oriented programming.
- demonstrate C++ syntax and semantics
- solve simple engineering problems.
- development of solution for complex problems in the real world.

LIST OF EXPERIMENTS

1. Write C++ Programs using Classes and Objects.
2. Design C++ Classes with static members, methods with default arguments, friendfunctions.
3. Develop C++ Programs using Operator Overloading.
4. Develop C++ Programs using constructor, destructor, and copy constructor.
5. Develop C++ Programs Overload the new and delete operators.
6. Develop C++ Programs using Inheritance, Polymorphism and its types.
7. Develop C++ Programs using Arrays and Pointers.
8. Develop C++ Programs using Dynamic memory allocation.
9. Develop C++ Programs using Function Templates.
10. Develop C++ Programs using Exceptions Handling.

TOTAL PERIODS**60****COURSE OUTCOMES**

At the end this course, students will be able to

- understand object-oriented concepts and how they are supported byC++
- demonstrate the ability to analyze, use, and create functions, classes, to overload operators.
- develop a application using polymorphism and templates.
- apply the concepts of data encapsulation and inheritance to develop largescale software.

RECOMMENDED SYSTEM/SOFTWARE REQUIREMENTS

Software: Turbo C++.

Hardware: Flavor of any WINDOWS or LINUX and Standalone desktops 30 Nos.

CO-PO Mapping

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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CO3	2	2	3	2	3	-	-	-	-		2	2	3	2
CO4	2	2	3	2	2	-	-	2	-	-	-	3	2	3



COURSE OBJECTIVES

To enable the students to

- design and study about bioamplifiers
- provide hands on training on measurement of heart sounds, pulse rate.
- demonstrate the measurements of physiological parameters like blood flow velocity, blood pressure.
- find various vital parameters using patient monitoring system

LIST OF EXPERIMENTS

1. Design of low noise pre-amplifier.
2. Design of ECG amplifier and Measurement of heart rate.
3. Design of EMG amplifier
4. Measurement of heart sounds using PCG.
5. Measurement of pulse-rate using Photo transducer.
6. Measurement of respiration rate.
7. Measurement of pH and conductivity.
8. Measure Earth resistance using Resistance meter and find leakage current.
9. Characteristics of optical Isolation amplifiers.
10. Measurement of vital parameters using Patient Monitoring System
11. Study of Biotelemetry
12. Calibration of Medical Equipment (Eg: Thermometer, Glucometer)

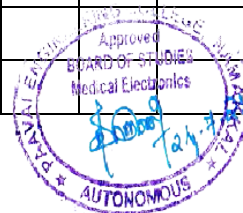
TOTAL PERIODS 60**COURSE OUTCOMES**

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

- design the amplifier for bio signal measurements
- measure heart rate and heart sounds.
- record and analyze pulse rate and respiration rate
- measure blood pressure and blood flow

CO-PO Mapping

Mapping of course objectives with PO's and PSO's (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes (Pos)													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 0	PO1 1	PO1 2	PSO 1	PSO 2
CO1	3	3				3						3	2	2
CO2	3	2		3	3	3						3	2	2
CO3	3	3		3	3	3						3	2	2
CO4	3	3		3	3	3						3	2	2



COURSE OBJECTIVES

To enable the students to

- familiarize with the reading skills such as skimming and scanning.
- practise writing tasks to the level expected.
- develop listening strategies such as listening for key words, making inferences and identifying main ideas.
- speak well without inhibition and to assist the students in improving their vocabulary, pronunciation and comprehension of grammar.
- enrich their LSRW skills so as to crack on-line proficiency tests and to bring their career aspirations true.

EXERCISES FOR PRACTICE

1. Listening Exercises from TOEFL
 - a. Conversations, Lectures
2. Listening Exercises from IELTS
 - a. Places and directions
 - b. Actions and processes
3. Reading Exercises from PTE
 - a. Re-order paragraphs
4. Reading Exercises from IELTS
 - a. Opinions and attitudes
 - b. Locating and matching information
 - c. Identifying information
5. Reading Exercises from BEC Vantage & BEC Higher
 - a. Error identification
 - b. Gap filling
6. Writing Exercises from PTE
 - a. Summarize written text
7. Writing Exercises from IELTS
 - a. Describing maps
 - b. Describing diagrams
8. Speaking IELTS format
 - a. Talking about familiar topics
 - b. Giving a talk
 - c. Discussion on a Topic

COURSE OUTCOMES

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

- skim, scan and infer the given texts and attend the tasks successfully.
- write coherently using appropriate vocabulary and grammar.
- listen to speeches and conversations and answer the questions.
- communicate fluently and effectively on any given topics.
- appear with confidence for on-line tests.

REFERENCES

1. Cambridge University Press India Pvt.Ltd, New Delhi.2016.
2. PTE Academic Testbuilder. Macmillan Education.London. 2012.
3. Cambridge IELTS 12 Academic Student's Book with Answers: Authentic Examination Papers
IELTS by Cambridge University Press . New Delhi.2016
4. TOEFL iBT Prep Plus 2018-2019 4 Practice Tests) Kaplan Publishing. Newyork.2017.

CO-PO MAPPING

		CO/PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak													
COs	Programmes Outcomes (POs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
CO1	-	-	-	2	3	-	-	-	3	2	-	-	-	2	
CO2	-	-	2	2	-	-	1	1	3	2	-	2	-	2	
CO3	-	-	-	-	-	3	1	2	3	2	2	3	2	-	
CO4	-	-	-	-	-	2	2	3	3	2	2	-	2	-	
CO5	-	-	2	-	-	1	2	-	3	3	-	1	2	3	

