SEMESTER III

S.No	Category	Course Code	Course Title	L	T	P	C
Theory							
1	BS	MA19302	Linear algebra and Partial Differential equations	3	1	0	4
2	ES	BM19301	Electron Devices and Circuits	3	0	0	3
3	PC	BM19302	Signals and Systems	3	1	0	4
4	PC	BM19303	Sensors and Measurements	3	0	0	3
5	PC	BM19304	Anatomy and Physiology	3	0	0	3
6	MC	MC19301	Value Education	2	0	0	0
Practical							
7	ES	BM19305	Electronic Devices and Circuits Laboratory	0	0	4	2
8	PC	BM19306	Sensors and Measurements Laboratory	0	0	4	2
			TOTAL	**18**	**2**	**8**	**21**
			Cumulative Total				**60**

SEMESTER IV

S.No	Category	Course Code	Course Title	L	T	P	C
Theory							
1	PC	BM19401	Analog and Digital Integrated Circuits	3	0	0	3
2	PC	BM19402	Biomedical Instrumentation	3	0	0	3
3	PC	BM19403	Pathology and Microbiology	3	0	0	3
4	MC	MC19401	Environmental Science and Engineering	3	0	0	0
5	ES	IT19404	Object Oriented Programming with C++	3	0	0	3
Practical							
6	PC	BM19404	Analog and Digital Integrated Circuits Laboratory	0	0	4	2
7	PC	BM19405	BioMedical Instrumentation Laboratory	0	0	4	2
8	ES	IT19407	Object Oriented Programming with C++ Laboratory	0	0	4	2
9	HS	EN19401	English proficiency course laboratory	0	0	2	1
			TOTAL	**15**	**0**	**14**	**19**
			Cumulative Total				**79**

MA19302	LINEAR ALGEBRA AND PARTIAL DIFFERENTIAL EQUATIONS	3	1	0	4

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 digonalisation.
- 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.

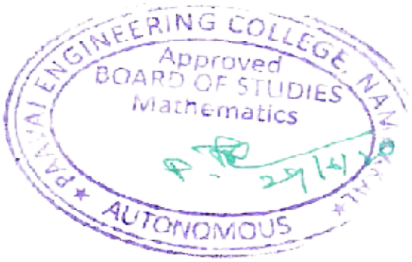
TEXT BOOKS

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" 10^{th} Edition, Wiley Publications.

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**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
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**



BM19301 ELECTRON DEVICES AND CIRCUITS 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- Outline the structure of basic electronic devices.
- Interpret to active and passive circuit elements.
- Relate the operation and applications of transistor like BJT and FET.
- Infer the characteristics of amplifier gain and frequency response.
- Classify 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 TRANSISTORSAND 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 ANDDIFFERENTIALAMPLIFIER 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 AMPLIFIERSAND 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.
- Design amplifier circuits and apply negative feedback principle to amplifier stages.
- 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. Sedraandsmith,–Microelectroniccircuits‖,7thEd., Oxford University Press.

REFERENCES

1. BalbirKumar,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 DesignTataMcGrawHill,3rdEdition, 2003.
4. RobertL.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)	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	3	3	3		2					2	3	3	3
CO 2	3	3	3				2	2			3	3	3	3
CO 3	2	3	3	3	3	2	2	2		3	2	3	3	3
CO 4	1	3	3	3	3		2	2		3	2	3	3	3
CO 5	3	3	2	2	3	3	2	2		3	3	3	3	3

MD19302 SIGNALS AND SYSTEMS 3 1 0 4

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 12

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.

NIT 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 LINEAR TIME INVARIANT - CONTINUOUS TIME SYSTEMS 12

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

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

- 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 BOOKS

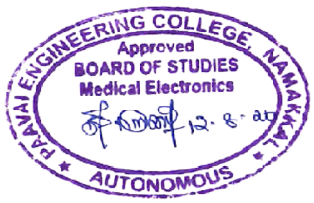
1. Allan V.Oppenheim, S.Wilsky and S.H.Nawab, "Signals and Systems", Pearson, Indian Reprint, 2007.
2. Simon Haykin and Barry Van Veen, —Signals and Systems, John Wiley, 1999.

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													
	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	2	3	3	3	2	3	2	3	3	3	3
CO 2	2	2	2	2	2	2	2	2	2	1	3	1	3	3
CO 3	3	3	3	2	3	3	3	2	2	2	3	1	3	3
CO 4	2	2	2	2	2	2	2	2	2	2	2	3	3	3
CO 5	3	3	3	3	3	3	3	2	3	2	3	1	3	3



BM19303 SENSORS AND MEASUREMENTS 3 0 0 3

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.
- Conclude 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 as 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

Phototube, scintillation counter, Photo Multiplier Tube (PMT), photovoltaic, Photo conductive cells, photo diodes, phototransistor, comparison of photoelectric transducers, spectrophotometric applications of photo electric transducers. 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

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

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 2008.
3. Albert D.Helfrick and William D.Cooper, "Modern Electronic Instrumentation and Measurement Techniques", Prentice Hall of India, 2007.

REFERENCES

1. A.K.Sawhney, "Electrical & Electronics Measurement and Instrumentation", DhanpatRai&Co, New Delhi, 17th Edition, 2004.
2. Khandpur R.S, "Handbook of Biomedical Instrumentation", Tata McGraw Hill, New Delhi, 3rd Edition, 2014.
3. Leslie Cromwell, Fred J. Weibell, Erich A. Pfeiffer, "Biomedical Instrumentation and Measurement", Prentice Hall India Pvt. Ltd, New Delhi, 2nd Edition, Reprint, 2013.

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

BM19304 **ANATOMY AND PHYSIOLOGY** **3 0 0 3**

COURSE OBJECTIVES

To enable the students to

- be acquainted 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**

Respiratory System: Components of respiratory system – Respiratory Mechanism. Types of respiration - Oxygen and carbon dioxide transport and acid base regulation.

Structure of a Neuron – Types of Neuron. Neuroglial 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, Appendicular Skeleton and musculoskelton. 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. 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.
- identify all systems in the human body.
- elucidate special senses in the human body.

TEXT BOOKS:

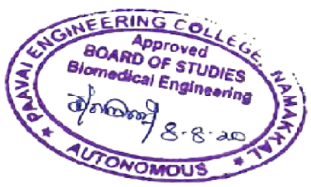
1. Elaine.N. Marieb , ―Essential of Human Anatomy and Physiology‖, Eight Edition, Pearson Education, New Delhi, 2007

REFERENCES:

1. William F.Ganong, ―Review of Medical Physiology‖, 22nd Edition, McGraw Hill, New Delhi, 2010
2. Arthur C. Guyton, "Text book of Medical Physiology", Elsevier Saunders, 11th Edition, 2006
3. Eldra Pearl Solomon, ―Introduction to Human Anatomy and Physiology‖, W.B. Saunders Company, 2015

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



MC19301 **VALUE EDUCATION** **0 0 2 0**

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, Punctuality and Faith - Perseverance - Courage - Competence - Co-operation- Curbing unethical practices - Integrity, Social Consciousness and Responsibility. Global Values - Computer Ethics – Moral Leadership - Code of Conduct - Corporate Social Responsibility.

UNIT IV SPIRITUAL VALUES **6**

Developing Spirituality - Thinking process, Moralization of Desires - 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

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:

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	-	-	-	-	-	1	3	3	-	2	-	3	1	-
CO 2	-	-	-	-	-	1	2	3	-	2	-	3	1	-
CO 3	1	-	2	-	1	1	2	3	-	2	-	3	1	2
CO 4	-	-	2	-	2	1	3	3	-	2	-	2	1	1
CO 5	-	1	-	-	-	1	3	3	-	2	-	2	1	-

BM19305 ELECTRONIC DEVICES AND CIRCUITS LABORATORY 0 0 4 2

COURSE OBJECTIVES

To provide practice on:

- Show 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
- Categorize the Hartley Oscillator / Colpitts Oscillator analyzer.

LIST OF EXPERIMENTS

1. Characteristics of PN JunctionDiode
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
- Demonstrate the characteristics of Transistors and SCR
- Design the feedback amplifiers and Oscillators
- Classify the character of UJT and SCR
- Categorize the Hartley Oscillator / Colpitts Oscillator analyzer.

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

BM19306 SENSORS AND MEASUREMENTS LABORATORY 0 0 4 2

COURSE OBJECTIVES

To provide practice to

- Describe the characteristics of various transducers
- Develop bridge circuits to find unknown variables
- Compare filter characteristics
- Demonstrate various read out and display devices
- Construct a measurement system for various applications

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 of this course, the 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.
- Design a measurement system for various applications.

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

SEMESTER IV

BM19401 ANALOG AND DIGITAL INTEGRATED CIRCUITS 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- Study the circuit configuration and introduce practical applications of linear integrated circuits.
- Introduce the concept of application of ADC and DAC in real time systems and Phase Locked Loop with applications.
- Select Boolean algebra and apply it to digital systems.
- Introduce the design of various combinational digital circuits using logic gates.
- Bring out the analysis and design procedures for synchronous and asynchronous sequential circuits.

UNIT I INTRODUCTION TO OPERATIONAL AMPLIFIER AND ITS APPLICATIONS **9**

Operational amplifier –ideal characteristics, Performance Parameters, Linear and Nonlinear Circuits and their analysis- voltage follower, Inverting amplifier, Noninverting Amplifiers, Differentiator, Integrator, Voltage to Current converter, Instrumentation amplifier, Low pass, High pass filter and band pass filters, Comparator, Multivibrator and Schmitt trigger, Triangular wave generator.

UNIT II DIGITAL TO ANALOG AND ANALOG TO DIGITAL CONVERTERS AND PLL **9**

Analog switches, High speed sample and hold circuit and IC's, Types of D/A converter -Weighted resistor, R-2R ladder DAC, D/A Accuracy and Resolution. A/D converter - Flash, Dual slope, Successive approximation, A/D Accuracy and Resolution. Voltage controlled oscillator, Voltage to Frequency converters. PLL-Closed loop analysis of PLL, Frequency multiplication/ division, FSK demodulator.

UNIT III THE BASIC GATES ANDCOMBINATIONAL LOGIC CIRCUITS **9**

Number Systems – Decimal, Binary, Octal, Hexadecimal, 1's and 2's complements, Codes – Binary, BCD, 84-2-1, 2421, Excess 3, Biquinary, Gray, Alphanumeric codes, Boolean theorems, Logic gates, Universal gates, Sum of products and product of sums, Minterms and Maxterms, Karnaugh map and Tabulation methods. Logic families- TTL, MOS, CMOS, BiCMOS - Comparison of Logic families.

UNIT IV COMBINATIONAL LOGIC CIRCUITS **9**

Problem formulation and design of combinational circuits - Code-Converters, Half and Full Adders, Binary Parallel Adder – Carry look ahead Adder, BCD Adder, Magnitude Comparator, Decoder, Encoder, Priority Encoder, Mux/Demux, Implementation of combinational logic using standard ICs, ROM, PLA and PAL.

UNIT V SEQUENTIAL LOGIC CIRCUITS **9**

Flip flops – SR, JK, T, D, Master/Slave FF, Triggering of FF, Analysis and design of clocked sequential circuits − state minimization, state assignment, circuit implementation. Counters, Ripple Counters, Ring Counters. Types of Registers, Serial In - Serial Out, Serial In - Parallel out, Parallel In -Serial Out, Parallel In - Parallel Out, Universal Shift Register.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- Ability to design new analog linear circuits and develop linear IC based Systems.
- Understand the concept of application of ADC and DAC in real time systems and Phase Locked Loop with applications.
- Use Boolean algebra and apply it to digital systems.
- Design various combinational digital circuits using logic gates.
- Bring out the analysis and design procedures for synchronous and asynchronous sequential circuits.

TEXT BOOKS

1. Sergio Franco, "Design with operational amplifiers and analog integrated circuits", McGraw Hill Education, 3rd Edition, 2017.
2. M. Morris Mano and Michael D.Ciletti, "Digital Design", Pearson, 5th Edition, 2013.
3. Charles H.Roth, Jr, "Fundamentals of Logic Design", Jaico Books, 7th Edition, 2013.

REFERENCES

1. Gray and Meyer, "Analysis and Design of Analog Integrated Circuits", Wiley International, 2009.
2. Michael Jacob J., "Applications and Design with Analog Integrated Circuits", Prentice Hall of India, 2nd Edition, 2008.
3. Ramakant A. Gayakwad, "OP - AMP and Linear IC's", Prentice Hall, 2012.
4. Taub and Schilling, "Digital Integrated Electronics", McGraw Hill, 2017.
5. Coughlin and Driscoll, "Operational amplifiers and Linear Integrated Circuits", Prentice Hall, 6th Edition, 2001.
6. John.F.Wakerly, "Digital design principles and practices", Pearson Education, 5th Edition, 2018.
7. Floyd T.L., "Digital Fundamentals", Charles E.Merril publishing company, 8th Edition, 2005.

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
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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

PAAVAI ENGINEERING COLLEGE, NAMAKKAL
Approved
BOARD OF STUDIES
Biomedical Engineering
8-8-20
AUTONOMOUS

BM19402 BIOMEDICAL INSTRUMENTATION 3 0 0 3

COURSE OBJECTIVES

At the end of this course the student is expected to

- Explain the basic theory of Bio potential Electrodes.
- Illustrate the concept of Bio potential measurement.
- Design Bio potential amplifiers for acquisition of bio signals.
- Study the various non-electrical physiological parameter measurement.
- Outline the bio chemical measurements.

UNIT I BIOPOTENTIAL ELECTRODES 9

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

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 and ERG.

UNIT III BIOPOTENTIAL AMPLIFIER 9

Need for bio-amplifier - single ended bio-amplifier, differential bio-amplifier – right leg driven ECG amplifier. 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

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 and ultrasound blood flow measurement. Cardiac output measurement- Indicator dilution, dye dilution and thermodilution method.

UNIT V BIOCHEMICAL MEASUREMENT 9

Biochemical sensors - pH, pO_2 and pCO_2, 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, 2014.
2. John G.Webster, "Medical Instrumentation Application and Design", John Wiley and Sons, New York, 4th Edition, 2009.

REFERENCES

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

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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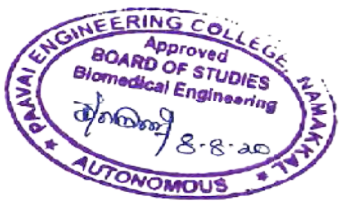
CO 2	2	1	3	1	2	2	2	2					3	
CO 3	2	1	3	1	2	2	2	2					3	
CO 4	2	1	3	1	2	2	2	2					2	
CO 5	2	1	3	1	2	2	2	2					2	



BM19403 PATHOLOGY AND MICROBIOLOGY 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- achieve a knowledge on the structural and functional aspects of living organisms.
- be acquainted with the etiology and remedy in treating the pathological diseases.
- practice on chemical and structural examinations, histopathological examinations etc.
- empathize the structure and function of human body
- empathize the structure and function of organs and its synthesize.

UNIT I CELL DEGENERATION, REPAIR AND NEOPLASIA 9

Cell injury and necrosis, apoptosis, intracellular accumulations, cellular adaptations of growth and differentiation. Inflammation and repair including fracture healing, neoplasia, benign and malignant tumors, spread of tumors and biopsy. Visualization of histopathological slides of benign and malignant tumors.

UNIT II FLUID AND HEMODYNAMIC DERANGEMENTS 9

Edema, normal hemostasis, thrombosis, disseminated intravascular coagulation, embolism, infarction, shock. Hematological disorders-bleeding disorders, leukemia's, lymphomas. Visualization of hematology slides of anemia and leukemia (acute and chronic). Bleeding time and clotting time.

UNIT III MICROSCOPES 9

Light microscope – bright field, dark field, phase contrast, fluorescence, electron microscope (TEM& SEM). Preparation of samples for electron microscope. Staining methods – simple, gram staining and AFB staining. Staining techniques – hematoxylin and eosin staining.

UNIT IV MICROBIAL CULTURES 9

Morphological features and structural organization of bacteria, growth curve, sterilization techniques – physical and chemical methods, identification of bacteria, culture media and its types, culture techniques and observation of culture. Demonstration on sterilization techniques.

UNIT V IMMUNOLOGY 9

Natural and artificial immunity, phagocytosis, inflammation, antibodies, antigen and antibody reactions, hypersensitivity, immunological techniques- immune diffusion, immuno electrophoresis, radioimmunoassay and enzyme linked immuno sorbent assay, monoclonal antibodies. Disease caused by bacteria and protozoa. Visualization of slides of malarial parasites, microfilaria and leishmaniadonovani.

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
- confer the importance of public health.
- depict treatment methods involved in curing the pathological diseases.

- Perform practical experiments on tissue processing, sterilization techniques and staining processes.

TEXT BOOKS

1. Ramzi S Cotran, Vinay Kumar and Stanley L Robbins -Pathologic Basis of Diseases,7th edition,WB Saunders Co. 2005 (Units I and II).
2. Harsh Mohan, "Text book of Pathology". Jaypee Brothers Medical publishers private Limited, 7th Edition, 2014.

REFERENCES

1. Underwood JCE: General and Systematic Pathology Churchill Livingstone, 3rd edition, 2000.
2. Ananthanarayanan, "Microbiology", Panicker University press. 9th Edition, 2013.
3. Dubey RC and Maheswari D K.-A Text Book of Microbiology‖ Chand and Company Ltd,2007.
4. Prescott, Harleyand Klein,-Microbiology‖,10thedition,McGrawHill,2017.

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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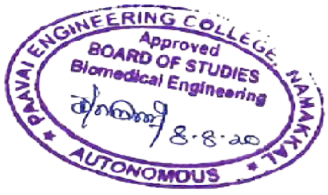
CO 1	3			3	2			2				2	2	
CO 2			2										2	
CO 3	2			3						3			3	
CO 4		2			3		2						3	
CO 5		3	2							3			1	



MC19401 **ENVIRONMENTAL SCIENCE AND ENGINEERING** **3 0 0 0**
(Common to all B.E./ B.Tech Programmes)
(Mandatory, Non credit Course)

COURSE OBJECTIVES

To enable the students to

- recognize the interdisciplinary and holistic nature of the environment.
- create awareness on ecosystem and biodiversity preserve.
- study about the integrated themes of pollution control and waste management.
- understand the significance of natural resources and environment to stimulate sustainable development.
- assess the socio-economic, political and ethical issues on population with environment.

UNIT I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES **9**

Environment: Definition- scope - importance – need for public awareness. Forest resources: Use –over exploitation deforestation - effects on forests and tribal people. Water resources: Use – over utilization of - surface and ground water. Mineral resources Use – exploitation- environmental effects of extracting and using mineral resources – Food resources: effects of modern agriculture- fertilizer-pesticide problems. Role of an individual in conservation of natural resources. **Activity:** Slogan making event on conserving natural resources or plantation of trees.

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. Ecosystems- Types of ecosystem: Introduction - forest ecosystem –aquatic ecosystems(lakes, rivers). Biodiversity: Introduction– definition (genetic - species –ecosystem). Diversity- Value of biodiversity: Consumptive use - productive use – social values – ethical values- aesthetic values- Hotspots of biodiversity- Conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.

UNIT III POLLUTION **9**

Pollution: Définition –air pollution - water pollution - marine pollution - noise pollution - thermal pollution. Solid waste management: Causes - effects - control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Disaster management Floods – earthquake - cyclone - landslides. Electronic waste -Sources-Causes and its effects.

UNIT IV SOCIAL ISSUES AND ENVIRONMENT **9**

Water conservation - rain water harvesting - watershed management. Environmental ethics:– climate change- global warming and its effects on flora and fauna - acid rain - ozone layer depletion - nuclear accidents- nuclear holocaust - Environment protection act: Air (Prevention and Control of Pollution) act– water (Prevention and control of Pollution) act .

UNIT V HUMAN POPULATION AND ENVIRONMENT **9**

Human population: Population growth - variation among nations – population explosion – family welfare

programme– environment and human health – Human rights – value education – HIV/AIDS– women and child welfare. Role of information technology in environment and human health.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- explain the importance of interdisciplinary nature of environment studies, uses and exploitation of natural resources.
- analyze the different types of ecosystem and biodiversity, its values and protecting the environment from degradation.
- investigate the existing environmental challenges related to pollution and its management.
- select suitable strategies for sustainable management of components of environment.
- correlate the impacts of population and human activities on environment.

TEXT BOOKS

1. Raman Sivakumar, Introduction to Environmental Science and Engineering, 2nd Edn, Tata McGraw Hill Education Private Limited, New Delhi,(2010).
2. Benny Joseph, "Environmental Science and Engineering", Tata McGraw Hill, (2010).

REFERENCES

1. S. Divan, Environmental Law and Policy in India, Oxford University Press, New Delhi, 2001.
2. A.K.De, Environmental Chemistry, VI edition,2015 NewAge International (P) ltd Publication, New Delhi.
3. C.S.Rao, Environmental Pollution and Control engineering, Vedition, New Age International (P) ltd Publication, New Delhi 110002
4. Clair Nathan Sawyer, Perry L. McCarty, Gene F. Parkin, "Chemistry for Environmental Engineering

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
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CO 3	2	2	3	2	3	3	3	3	3		2	3	3	2
CO 4	2	2	3	2	2	3	3	3	3	-	-	3	-	2
CO 5	3	1	2	3	2	3	3	3	3	-	-	3	2	1

PAAVAI ENGINEERING COLLEGE
Approved
BOARD OF STUDIES
Chemistry
24/6/20
AUTONOMOUS

IT19404 **OBJECT ORIENTED PROGRAMMING WITH C++** **3 0 0 3**

(Common To BM, ME and EEE)

COURSE OBJECTIVES

To enable students to

- introductionto C++ and its variables, data type, operators.
- acquire the knowledge about Object Oriented Programming (OOP)
- study about operator overloading and inheritance in C++.
- understandthe concepts of polymorphism and templates.
- familiarizethe 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 data types – Symbolic constants – Declaration ofvariables – Dynamic initialization of variables – Reference variables – Operators in C++ – Scope resolutionoperator – Manipulators – Expressions and their types – Control structures - The main function – Functionprototyping – Call by reference – Return by reference – Inline functions – Default arguments – Functionoverloading.

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 functionarguments – Friendly functions – Returning objects. Constructors: Parameterized constructors – Multipleconstructors in a class – Constructors with default arguments – Dynamic initialization of objects – Copyconstructor – 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 - Defining derived classes – Single inheritance – MultilevelInheritance – 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. Function templates, user defined template arguments, class templates.

UNIT V EXCEPTION HANDING 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

Upon the completion of the 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, JoseeLajoie, 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:

PANVAI ENGINEERING COLLEGE, NAMAKKAL
Approved
BOARD OF STUDIES
Information Technology
AUTONOMOUS

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
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CO 4	2	2	3	2	2	-	-	2	-	-	-	3	-	2
CO 5	3	1	2	3	2	-	-	1	-	-	-	3	2	1

BM19404	ANALOG AND DIGITAL INTEGRATED CIRCUITS LABORATORY	0	0	4	2

COURSE OBJECTIVES

To enable the students to

- Design digital logic and circuits
- Learn the function of different ICs
- Understand the applications of operation amplifier.
- Learn the working of multivibrators
- Design circuits for generating waveforms using ICs.

LIST OF EXPERIMENTS

1. Inverting, non-inverting amplifier and comparator
2. Integrator and Differentiator
3. Design and analysis of active filters using opamp
4. Schmitt trigger using operational amplifier
5. Instrumentation amplifier using operational amplifier
6. RC and LC oscillators
7. Multivibrators using IC555 Timer
8. Study of logic gates, Half adder and Full adder
9. Encoder and BCD to 7 segment decoder
10. Multiplexer and demultiplexer using digital ICs
11. Universal shift register using flip flops
12. Design of mod-N counter
13. USAGE OF TOOL (SOME OTHER SIMULATION METHOD)

TOTAL PERIODS 60

COURSE OUTCOMES

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

- Design Combinational Circuits using logic gates
- Design and implement arithmetic circuits for different applications using opamp
- Design Sequential Circuits using logic gates
- Design wave form generators and analyse their characteristics
- Simulate and analyse circuits using ICs

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 5	3	3	3	3	3	2	2		3		3	3	3	3

OBJECT ORIENTED PROGRAMMING WITH C++

IT16407 **LABORATORY** **0 0 4 2**

(Common To BM, ME and EEE)

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, friend functions.
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

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

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

RECOMMENDED SYSTEM/SOFTWARE REQUIREMENTS

Software: Turbo C++.

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

Co – Po Mapping:

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CO 3	2	2	3	2	3	-	-	-	-		2	2	3	2
CO 4	2	2	3	2	2	-	-	2	-	-	-	3	2	3

BM19405 BIOMEDICAL INSTRUMENTATIONLABORATORY 0 0 4 2

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
- Study about Biotelemetry

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
- Design isolation amplifier

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

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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
5. Reading Exercises from BEC Vantage
    a. Single informational text with lexical gaps
    b. Error identification
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 aTopic

TOTAL PERIODS 30

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 Test builder. 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.

WEB LINKS

1. https://magoosh.com/toefl/2018/best-toefl-books/
2. https://ptetutorials.com/
3. http://ieltsliz.com/recent-ielts-questions-and-topics/

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CO 1	-	-	-	2	3	-	-	-	3	2	-	-	-	2
CO 2	-	-	2	2	-	-	1	1	3	2	-	2	-	2
CO 3	-	-	-	-	-	3	1	2	3	2	2	3	2	-
CO 4	-	-	-	-	-	2	2	3	3	2	2	-	2	-
CO 5	-	-	2	-	-	1	2	-	3	3	-	1	2	3