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	PC	MD19301	Analog Electronics	3	0	0	3
3	PC	MD19302	Signals and Systems	3	1	0	4
4	PC	MD19303	Sensors and Measurements	3	0	0	3
5	PC	MD19304	Digital Design and HDL	3	0	0	3
6	MC	MC19301	Value Education	2	0	0	0
Practicals							
7	PC	MD19305	Analog Electronic Circuits Laboratory	0	0	4	2
8	PC	MD19306	Sensors and Measurements Laboratory	0	0	4	2
9	PC	MD19307	Digital Electronic Circuits Laboratory	0	0	4	2
			Total	**18**	**2**	**12**	**23**

SEMESTER IV

S.No.	Category	Course Code	Course Title	L	T	P	C
Theory							
1	BS	MA19403	Probability and Statistics	3	1	0	4
2	ES	IT19404	Object Oriented Programming with C++	3	0	0	3
3	PC	MD19401	Linear Integrated Circuits	3	0	0	3
4	PC	MD19402	Biomedical Instrumentation	3	0	0	3
5	PC	MD19403	Anatomy and Physiology	3	0	0	3
6	MC	MC19401	Environmental Science and Engineering	3	0	0	0
Practicals							
7	HS	EN19401	English Proficiency Course Laboratory	0	0	2	1
8	ES	IT19407	Object Oriented Programming with C++ Laboratory	0	0	4	2
			Total	**18**	**1**	**6**	**19**

SYLLABI

SEMESTER III

MA19302	**LINEAR ALGEBRA AND PARTIAL DIFFERENTIAL EQUATIONS**	**3**	**1**	**0**	**4**

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 andlinear 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 and heat equation; Steady state two-dimensional heat equation.

TOTAL PERIODS: 60

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., ManickavasagamPillai.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

Course Outcomes (Cos)	Programme Outcomes(POs)														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
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	

MD19301 **ANALOG ELECTRONICS** **3 0 0 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 poweramplifiers
- 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 - MOSFETs: 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 AMPLIFIERSANDOSCILLATORS 9

Basic concepts of feedback - Block diagram - General characteristics of negative feedback – Transfergain, 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 ANDPOWER 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 – 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 poweramplifiers
- elucidate rectifiers, filters and Power supply.

TEXT BOOKS

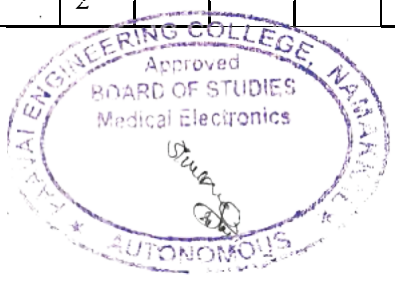
1. Robert L Boylestad and Louis Nashelsky, 'Electronic Devices and Circuit Theory' 11th Edition, Pearson Education, 2013.
2. Salivahanan.S, Sureshkumar.N, "Electronic Devices and Circuits", 3rd edition, McGraw Hill,2014.

REFERENCES

1. David A Bell., "Electronic Devices and Circuits", Prentice Hall of India, New Delhi,2010.
2. Fundamentals of Microelectronics, BehzadRazavi, 2nd Edition, John Weily, 2015.
3. J.Millman&C.C.Halkias—Integrated Electronics, 2nd edition, 2010, TMH.
4. K. A. Navas, "Electronics Lab Manual", Volume I, PHI, 5th Edition, 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)	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	2	1	3	1				2					3	
CO 2	2	1	3	1									3	
CO 3	2	1	3	1									3	
CO 4	2	1	3	1									2	
CO 5	2	1	3	1				2					2	



MD19302 SIGNALS AND SYSTEMS 3 1 0 4

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 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

At the end 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 systems

- apply the knowledge in Sampling and Z transform for real time applications
- analyse differential equations for various responses.
- apply the knowledge of LTI - discrete time systemsin solving problems.

TEXT BOOK

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

REFERENCES

1. John G.Proakis and DimitrisG.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)	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	2	1		3									3	
CO 2	2	1		2									3	
CO 3	2	1		3									3	
CO 4	2	1		3									2	
CO 5	2	1		2									2	

MD19303 SENSORS AND MEASUREMENTS 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- explainthe purpose of measurement, the methods of measurements, errors associated with measurements.
- concludethe principle of transduction, classifications of different transducers.
- analyzethe characteristics of different transducers and study its biomedical applications.
- describethe need and function of various signal conditioning circuits.
- concludethe 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 the 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)	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	2			1			2	2					3	
CO 2	2			1			2	2					3	
CO 3	2			1			2	2					3	
CO 4	2			1			2	2					2	
CO 5	2			1			2	2					2	

MD19304 **DIGITAL DESIGN AND HDL** **3 0 0 3**

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 HDL-Verilog

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; TheMaster 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**

Registers; Counters - Binary Ripple Counters, Synchronous Binary Counters, Counters based on Shift Registers, Design of Synchronous mod-n Counter using clocked T , JK , D and SR flip-flops.

UNIT V VERILOG HDL PROGRAMMING **9**

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

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of the course, the 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

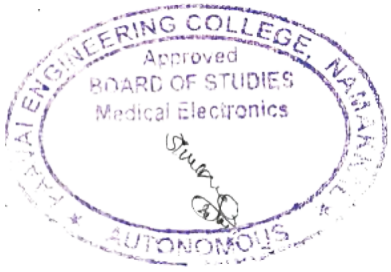
1. John M Yarbrough, "Digital Logic Applications and Design", Thomson Learning,2001
2. Donald D. Givone, "Digital Principles and Design", McGraw Hill, 2002.
3. Nazeih M. Botros, "HDL Programming VHDL and Verilog", 2009 reprint, Dreamtech press.

REFERENCES

1. Charles H Roth Jr ,"Fundamentals of logic design",., Cengage Learning, 2014
2. Donald D Givone, "Digital Principles and Design",12th reprint, TMH,2008
3. Sudhakar Samuel, "Logic Design," , Pearson/ Saguine, 2007
4. Cyril P R, "Fundamentals of HDL", Pearson/Sanguin 2010

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)	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	2	1	3	1				2					3	2
CO 2	2	1	3	1				2					3	2
CO 3	2	1	3	1				2					3	2
CO 4	2	1	3	1				2					2	1
CO 5	2	1	3	1				2					2	3



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

COURSE OBJECTIVES

To enable students to

- developthe 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 COMMUNAL 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 **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.

TEXT BOOKS

1. Sharma, S.P. Moral and Value Education; Principles and Practices, Kanishka publishers, 2013.

REFERENCES

1 Little, William, An introduction of Ethics. Allied publisher, Indian Reprint 1955.

2. "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	**PO 2**	**PO3**	**PO4**	**PO 5**	**PO 6**	**PO 7**	**PO8**	**PO9**	**PO1 0**	**PO1 1**	**PO1 2**	**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	-	-

PRACTICALS

MD19305 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
ANALOG CIRCUITS

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 usingPSpice
9. Analysis of Cascode and Cascade amplifiers using PSpice
10. Analysis of Frequency Response of BJT and FET using PSpice

TOTAL PERIODS 60

COURSE

OUTCOMES

At the end this course, students will be able to

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

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)	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO 1	2	1					2	2					3	
CO 2	2	1					2	2					3	
CO 3	2	1					2	2					3	
CO 4	2	1					2	2					2	

MD19306 SENSORS AND MEASUREMENTS LABORATORY 0 0 4 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

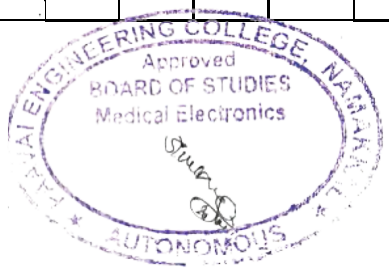
OUTCOMES

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:

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)	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	2	1	3	1	2	2	2	2					3	
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	



MD19307 DIGITAL ELECTRONIC CIRCUITS LABORATORY 0 0 4 2

COURSE OBJECTIVES

To enable the students to

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

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. Adder and Subtractor circuits
8. Code Converters : Excess 3 to BCD and Binary to Gray code converter and viceversa
9. Parity Generator and Checking
10. Multiplexer and demultiplexer
11. 3 –Bit modulo Counters as synchronous and asynchronous sequential circuits
12. SISO, SIPO, PISO, and PIPO

TOTAL PERIODS 60

COURSE OUTCOMES

At the end this course, students will be able to

- evaluate the implementation of Basic combinational circuits
- analyze the implementation of error checking using parity generator and checking
- analyze the design of synchronous and asynchronous sequential circuits using logic gates
- develop applications based on the implementation of Combinational and sequential logic circuits using Verilog HDL

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)	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	2	1	3			2	2	2					3	2
CO 2	2	1	3			2	2	2					3	2
CO 3	2	1	3			2	2	2					3	2
CO 4	2	1	3			2	2	2					2	2

SEMESTER IV

MA19403 PROBABILITY AND STATISTICS 3 1 0 4

OBJECTIVES

To enable the students to

- analyse the concept of Random variables and probability distribution in designing processes.
- know and differentiate the discrete and continuous two dimensional random variables.
- determine the concepts of hypotheses testing, its need and applications.
- equip with statistical techniques for designing experiments, analyzing, interpreting and presenting research data.
- emphasize the aspects of statistical tools in engineering problems.

UNIT I RANDOM VARIABLES 12

Discrete and continuous random variables; Moments - Moment generating functions; Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and Normal distributions.

UNIT II TWO - DIMENSIONAL RANDOM VARIABLES 12

Functions of random variables - Joint distributions, Marginal and conditional distributions; Covariance - Correlation and Linear regression; Transformation of random variables; Applications of Central limit theorem (for independent and identically distributed random variables).

UNIT III TESTING OF HYPOTHESIS 12

Sampling distributions; Estimation of parameters ; Statistical hypothesis - Large sample test for single mean and difference of means; Small samples - Tests based on t , Chi-square and F distributions for mean, variance and proportion; Contingency table (test for independent); Goodness of fit.

UNIT IV DESIGN OF EXPERIMENTS 12

ANOVA; One way and Two way classifications; Completely randomized design; Randomized block design; Latin square design; 2^2 factorial design.

UNIT V STATISTICAL QUALITY CONTROL 12

Control charts for measurements (X and R charts); Control charts for attributes (P, C and NP charts); Tolerance limits - Acceptance sampling.

TOTAL PERIODS: 60

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 date using control chart in quality control

TEXT BOOKS

1. Milton. J. S. and Arnold. J.C., "Introduction to Probability and Statistics", Tata McGraw Hill, 4th Edition, 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, 4th Edition, New Delhi, 2010.

REFERENCE BOOKS

1. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 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

CO	Programme Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 1 1	PO 12	PSO1	PSO2
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

IT19404 OBJECT ORIENTED PROGRAMMING WITH C++ 3 0 0 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 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

At the end of the course, the 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:

CO/PO MAPPING **(1,2,3 indicates the strength of correlation) 3 – Strong, 2 – Medium , 1 - Weak**														
CO	**PO**												**PSO**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO12**	**PSO 1**	**PSO 2**
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

MD19401 LINEAR INTEGRATED CIRCUITS 3 0 0 3

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 OPERATIONALAMPLIFIER 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 – Basicinformation 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, slewrate

UNIT II APPLICATIONS OF OPERATIONAL AMPLIFIER 9

Basic OpAmp 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 holdcircuits; Analog to Digital converters - Flash type ADC, Counter type ADC, Successiveapproximation 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 monostablemultivibrators using Op Amp; ICL8038 Function Generator; 555 timer - Description of functional diagram, Astablemonostable 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

At the end 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..Fourth edition 2010.
2. Sergio Franco, "Design with operational amplifiers and analog integrated circuits", McGraw Hill.3rd edition 2007.

REFERENCES

1. William D.Stanely, "Operational Amplifiers with Linear Integrated Circuits", Pearson Education,2004.
2. David L.Terrell, "Op Amps-Design, Application, and Troubleshooting", Elsevier publications2005.
3. Ramakant A. Gayakwad, "OP - AMP and Linear IC's", Prentice Hall, 1994.

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)	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	2	1	3				2	2					3	
CO 2	2	1	3				2	2					3	
CO 3	2	1	3				2	2					3	
CO 4	2	1	3				2	2					2	
CO 5	2	1	3				2	2					2	

MD19402 BIOMEDICAL INSTRUMENTATION 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- learn the basics properties of electrodes and its types
- understand the different biopotential measurement techniques
- learn the various biopotential amplifiers
- learn the non-electrical physiological measurement systems
- understand 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 - ausculatory 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, 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

COURSEOUTCOMES

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

- summarize on the various electrodes and their applications based on its properties
- illustrate the different biopotential measurement techniques

- illustrate the various biopotential amplifiers
- apply the knowledge on the non-electrical physiological measurement systems
- classify the types of biochemical measurement

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. L.A Geddes and L.E.Baker, "Principles of Applied Biomedical Instrumentation", John Wiley and Sons, 3rd Edition, Reprint 2008.
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:

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)	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	2	1	3				2	2					3	
CO 2	2	1	3				2	2					3	
CO 3	2	1	3				2	2					3	
CO 4	2	1	3				2	2					2	
CO 5	2	1	3				2	2					2	

MD19403 **ANATOMY AND PHYSIOLOGY** **3 0 0 3**

COURSE OBJECTIVES

To enable the students to

- beacquainted with basic structural and functional elements of human body.
- comprehendstructure 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
- impartthe knowledge of physiological parameters of normal health and factors affecting various physiological processes in the body.
- gainknowledge 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; 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 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

At the end 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
2. Gillian Pocock, Christopher D. Richards, "The Human Body An introduction for Biomedical and Health Sciences", Oxford University Press, USA, 2009.

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)	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	2					2	2	2					3	
CO 2	2					2	2	2					3	
CO 3	2					2	2	2					3	
CO 4	2					2	2	2					2	
CO 5	2					2	2	2					2	

MC19401 **ENVIRONMENTAL SCIENCE AND ENGINEERING (Mandatory, Non-credit Course)** **3 0 0 0**

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 : 45 PERIODS

COURSE OUTCOMES

At the end of the course, the 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) ltdPublication, NewDelhi 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)	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	2					2	2	2					3	
CO 2	2					2	2	2					3	
CO 3	2					2	2	2					3	
CO 4	2					2	2	2					2	
CO 5	2					2	2	2					2	

EN19401 ENGLISH PROFICIENCY COURSE LABORATORY 0 0 2 1

COURSE OBJECTIVES

To enable students to

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

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 a Topic

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.

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)	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
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

IT19407 **OBJECT ORIENTED PROGRAMMING WITH C++ LABORATORY** **0 0 4 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, 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

At the end of the course, the 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:

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)	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	2					2	2	2					3	
CO 2	2					2	2	2					3	
CO 3	2					2	2	2					3	
CO 4	2					2	2	2					2