Third Semester Syllabus

Programme	Course Code	Name of the Course	L	T	P	C
B.E	22MA3102	COMPLEX ANALYSIS AND TRANSFORMS (EEE, EIE, ECE)	3	1	0	4

Course Objective	**The learner should be able to** 1. To understand the analytic functions and its properties. 2. To review Cauchy's theorem and its applications in evaluation of integral. 3. To examine Fourier series which is central to many applications in engineering 4. To gain knowledge in Fourier transform techniques in various situations. 5. To upskill the concept in Z transform techniques for discrete time systems

Unit	Description	Instructional Hours
I	**COMPLEX DIFFERENTIATION** Functions of complex variables – Analytic functions – Cauchy's – Riemann equations and sufficient conditions (excluding proof) – Construction of analytic functions – Milne –Thomson's method – Conformal mapping $w = A+z$, Az, $1/z$ and bilinear transformations.	12
II	**COMPLEX INTEGRATION** Cauchy's integral theorem – Cauchy's integral formula –Taylor's and Laurent's series (statement only) –Residues - Cauchy's Residue theorem - Contour Integration with unit circle only.	12
III	**FOURIER SERIES** Dirichlet's conditions- General Fourier Series – Odd and Even Functions – Change of Interval - Parseval's Identity - Half Range Sine and Cosine Series.-Harmonic analysis	12
IV	**FOURIER TRANSFORMS** Fourier Transform Pairs - Fourier Sine and Cosine transforms – Properties - Transforms of Simple functions – Convolution Theorem (Statement only) – Parseval's identity (Statement only).	12
V	**Z - TRANSFORMS AND DIFFERENCE EQUATIONS** Z- Transforms - Elementary properties – Inverse Z - transform (using partial fraction and residues) – Convolution theorem(excluding proof)– Solution of difference equations using Z – transform	12
	Total Instructional Hours	**60**

Course Outcome	**At the end of the course, the learner will be able to** CO1: Understand the concept of analytic functions and discuss its properties. CO2: Evaluate various integrals by using Cauchy's residue theorem and classify singularities and derive Laurent series expansion CO3: Understand the principles of Fourier series which helps them to solve physical problems of Engineering CO4: Apply Fourier transform techniques which extend its applications. CO5: Illustrate the Z- transforms for analyzing discrete-time signals and systems

TEXT BOOKS:

T1 – Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 2019.

T2 - Veerarajan T, "Engineering Mathematics", McGraw Hill Education (India) Pvt Ltd, New Delhi, 2016.

REFERENCE BOOKS:

R1 - James Ward Brown, Ruel Vance Churchill, Complex Variables and Applications, McGraw-Hill Higher Education, 2004.

R2 - Dennis Zill, Warren S. Wright, Michael R. Cullen, Advanced Engineering Mathematics, Jones & Bartlett Learning, 2011

R3 - Ian N. Sneddon, Elements of Partial Differential Equations, Courier Corporation, 2013

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	2	1	1	-	-	1	-	2	2	2
CO2	3	3	3	2	2	1	1	-	-	1	-	2	2	2
CO3	3	3	3	3	3	1	-	-	-	1	-	2	2	2
CO4	3	3	3	2	2	1	-	-	-	1	-	2	2	2
CO5	3	3	3	3	3	1	-	-	-	1	-	2	2	2
AVG	3	3	3	2.4	2.4	1	1			1		2	2	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.E	22EC3201	Electronic Circuits	3	0	0	3

Course Objective

The learner should be able to

1. To discover about biasing of BJT and JFET circuits.
2. To observe the behavior of small signal amplifiers using BJT.
3. To provide an insight on the large signal amplifiers and linear wave shaping circuits.
4. To impart knowledge on feedback amplifiers.
5. To discuss the operating principles of oscillators and multivibrators.

Unit	Description	Instructional Hours
I	**BIASING OF BJT AND FET** BJT– Need for biasing, DC Load Line and Bias Point – Various biasing methods of BJT – Thermal stability – Stability factors – Bias compensation techniques using Diode, thermistor and sensistor – Biasing BJT Switching Circuits- JFET – DC Load Line and Bias Point – Various biasing methods of JFET – MOSFET Biasing – Biasing FET Switching Circuit.	9

II	**SMALL SIGNAL AMPLIFIERS** h-parameter small-signal equivalent circuit –Midband analysis of single stage, CE amplifiers - Low frequency response of CE amplifiers - High frequency π model -High frequency response of CE amplifiers, Multistage amplifiers -Darlington Amplifier.	9
III	**LARGE SIGNAL AMPLIFIERS AND LINEAR WAVE SHAPING CIRCUITS** Classification of large signal amplifiers –Class A , Class B amplifier – Cross over Distortion -Push-Pull amplifier – complementary symmetry push-pull amplifier, Tuned amplifiers -Class C tuned amplifier - Integrator- Differentiator- Clippers- Clampers- Diode comparator .	9
IV	**FEEDBACK AMPLIFIERS** Block diagram, Loop gain, Gain with feedback, Effects of negative feedback. Sensitivity and desensitivity of gain, Cut-off frequencies, distortion, noise, input impedance and output impedance with feedback, Four types of negative feedback connections - voltage series feedback, voltage shunt feedback, current series feedback and current shunt feedback.	9
V	**OSCILLATORS AND MULTIVIBRATORS** Classification of oscillator, Barkhausen Criterion - Mechanism for start of oscillation and stabilization of amplitude. General form of an Oscillator, Analysis of Hartley, Colpitt's, RC phase shift and Wien bridge Oscillator- Astablemultivibrator–Monostablemultivibrator and Bistablemultivibrator.	9
	Total Instructional Hours	45
Course Outcome	**At the end of the course, the learner will be able to** CO1: Understand the need, methods, and thermal stability of biasing BJT and FET, including biasing for switching circuits. CO2: Analyze small signal amplifiers using h-parameters and understand their frequency responses and configurations, including CE and multistage amplifiers. CO3: Classify and analyze large signal amplifiers and wave shaping circuits like integrators, differentiators, clippers, clampers, and diode comparators. CO4: Comprehend the effects of negative feedback on gain, frequency response, distortion, noise, and impedance in various feedback configurations. CO5: Analyze the principles, design, and operation of various oscillators and multivibrators, including Hartley, Colpitt's, RC phase shift.	

TEXT BOOKS:

T1- S.Salivahanan, N.Suresh Kumar and A.Vallavaraj, "Electronic Devices and Circuits", 3rd Edition,2012, McGraw Hill.(All units)

T2- Donald .A. Neamen, "Electronic Circuit Analysis and Design" ,3 rd edition, Tata McGraw Hill, 2010(Unit IV)

REFERENCE BOOKS:

R1-Robert L.Boylestad, Louis Nasheisky, "Electronic Devices and Circuit Theory", 9th Edition, 2007.

R2- Jacob Millman,Christos C.Halkias,"Electronic Devices and Circuits" McGraw Hill , Edition 1991.

R3- D.Schilling and C.Belove, "Electronic Circuits", 3rd Edition, McGraw Hill, 1989.

R4- David A. Bell, "Electronic Devices and Circuits", fifth edition, Oxford Higher education

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	-		-	-	-	-	-	3	3	2
CO2	3	3	3	2	-		-	-	-	-	-	3	3	2
CO3	3	2	3	2	-		-	-	-	-	-	3	3	2
CO4	3	2	3	2	-		-	-	-	-	-	3	3	2
CO5	3	2	3	2	-		-	-	-	-	-	3	3	2
AVG	3	2.4	3	2								3	3	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.E	22EC3202	Signals and Systems	3	0	0	3

Course Objective

The learner should be able to

1. To understand the basic signals and their properties.
2. To observe the mathematical tool of Fourier series and transforms.
3. To analyses the concept of system analysis using Laplace transforms.
4. To upskill the knowledge in discrete signal analysis using transforms.

Unit	Description	Instructional Hours
I	**SIGNALS AND SYSTEM REPRESENTATION & CLASSIFICATION** Standard signal representation –continuous and discrete domain. Sampling: Nyquist theorem, Representation of CT signals by samples, Reconstruction of CT signal from samples Mathematical operation on signals, classification of signals and system -analog and discrete.	9
II	**CONTINUOUS TIME (CT) SIGNALS** Fourier series analysis-Trigonometric form, spectrum of continuous time (CT) signals- Fourier and Laplace transform of standard signals-Region of Convergence (ROC).Inverse Fourier and Laplace transform–partial fraction method, Properties.	9
III	**LINEAR TIME INVARIANT- CONTINUOUS TIME (CT) SYSTEMS** Block diagram representation of system- Direct form I & II. Applying Fourier and Laplace transform : Transfer function ,impulse response and Frequency response of CT system , Convolution integrals-Integral & Graphical method.	9
IV	**DISCRETE TIME SIGNALS** DTFT and Inverse DTFT – properties of DTFT - z transform and Inverse z-transform – Region of Convergence, properties of z transform. Convolution sum-Graphical and Matrix method.	9
V	**LINEAR TIME INVARIANT-DISCRETE TIME SYSTEMS** Block diagram representation of system- Direct form I & II structure.DTFT and Z transform analysis of systems: Transfer function, impulse response, system response and Frequency response, Convolution and de-convolution	9
	Total Instructional Hours	45

Course Outcome	**At the end of the course, the learner will be able to** CO1: Understand and apply signal representation, Nyquist theorem, and signal reconstruction. CO2: Analyze CT signals using Fourier and Laplace transforms, including ROC and properties. CO3: Examine CT systems using Fourier and Laplace transforms to derive transfer functions and appraise impulse responses. CO4: Utilize DTFT and z-transform for signal analysis, including convolution operations. CO5: Represent and evaluate DT systems by applying DTFT and z-transform to determine transfer functions and system responses.

TEXT BOOKS:

T1 - AllanV.Oppenheim, S.Wilsky and S.H.Nawab, "Signals and Systems", Pearson, 2007.

T2 - P Ramakrishna Rao, "Signals and System", Tata McGraw-Hill Education,2010.

REFERENCE BOOKS:

R1 - M.J.Roberts, "Signals & Systems Analysis using Transform Methods & MATLAB", McGraw Hill, 2017.

R2 - B. P. Lathi, "Principles of Linear Systems and Signals", Second Edition, Oxford, 2009.

R3 - RameshBabu.P and Anandanatarajan, "Signals and Systems",Fifthedition,Scitech publications,2017.

R4 - NagoorKani, "Signals and Systems,Simplified", McGrawHill Publication, 2018.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	-		-	-	-	-	-	3	3	2
CO2	3	3	3	3	-		-	-	-	-	-	3	3	2
CO3	3	3	3	3	-		-	-	-	-	-	3	3	2
CO4	3	3	3	3	-		-	-	-	-	-	3	3	2
CO5	3	3	3	3	-		-	-	-	-	-	3	3	2
AVG	3	3	3	3	-		-	-	-	-	-	3	3	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.E	22EC3203	Digital Electronics	3	0	0	3

Course Objective	**The learner should be able to** 1. To impart knowledge on different methods used for the simplification of Boolean functions 2. To explain the working of various combinational circuits 3. To convey the knowledge about synchronous sequential circuits. 4. To gain knowledge about asynchronous sequential circuits. 5. To disseminate knowledge on different types of memories.

Unit	Description	Instructional Hours

I	**DIGITAL FUNDAMENTALS** Boolean operation and expressions- Laws and rules of Boolean algebra - Simplification using Boolean algebra - Sum of Products (SOP) - Product of Sums (POS)- Karnaugh map Minimization- Quine - McCluskey method of minimization- Logic Gates- NAND–NOR implementations.	9
II	**COMBINATIONAL CIRCUIT DESIGN** Analysis and design of combinational circuits - Circuits for arithmetic operations: adder, subtractor, Carry look ahead adder-BCD adder-Magnitude Comparator-Encoders and Decoders-Multiplexers and Demultiplexers, Parity checker and generators.	9
III	**SYNCHRONOUS SEQUENTIAL CIRCUITS** Latches- Flip-flops- SR, JK, D, T, and Master-Slave - Edge triggering - Level Triggering-Analysis and design of synchronous sequential circuits: State diagram - State table – State minimization - State assignment, Synchronous Up/Down counters, mod n counters, Shift registers, Universal shift registers.	9
IV	**ASYNCHRONOUS SEQUENTIAL CIRCUITS** Analysis and design of asynchronous sequential circuits - Reduction of state and flow tables – Race-free state assignment – Hazards.	9
V	**MEMORY DEVICES AND DIGITAL INTEGRATED CIRCUITS** Classification of memories, Read/write operations- Memory decoding and expansion, Static and Dynamic RAM- PLDs- Architecture and implementation - Digital logic families -Characteristics - TTL, ECL and CMOS logic.	9
	Total Instructional Hours	45
Course Outcome	**At the end of the course, the learner will be able to** CO1: Understand Boolean operations, algebra simplification methods, and implement logic gates using NAND and NOR. CO2: Structuring and design combinational circuits for arithmetic operations and components including parity checkers. CO3: Analyze and design synchronous sequential circuits, including flip-flops, counters, and shift registers, using state diagrams and tables. CO4: Integrating and design asynchronous sequential circuits with state and flow table reduction, race-free state assignment, and hazard elimination. CO5: Construct memory classification, operations, decoding, PLDs, and the characteristics of various digital logic families like TTL, ECL, and CMOS.	

TEXT BOOKS:

T1- M. Morris Mano and Michael D. Ciletti, "Digital Design", 5th Edition, Pearson, 2013.

T2-Thomas L. Floyd, "Digital Fundamentals", 10th Edition, Pearson Education Inc, 2011.

REFERENCE BOOKS:

R1- A.Anandkumar, "Fundamentals of Digital Electronics", fourth edition ,PHI Learning Pvt. Ltd,2016.

R2- S.Salivahanan and S.Arivazhagan, "Digital Circuits and Design" ,Vikas publishing House Pvt. Ltd, 2013

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	2	-	-	-	-	-	1	1	3	2
CO2	3	3	2	2	2	-	-	-	-	-	1	1	3	2
CO3	3	2	3	2	2	-	-	-	-	-	1	1	3	3
CO4	3	3	3	2	2	-	-	-	-	-	1	1	3	3
CO5	3	3	3	2	2	-	-	-	-	-	1	1	3	3
AVG	3	2.8	2.8	2	2						1	1	3	2.6

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Programme	Course Code	Name of the Course	L	T	P	C
B.E	22EC3204	Circuits and Networks	2	0	0	2

Course Objective	**The learner should be able to** CO1:To upskill the fundamental concepts and introduce mesh and nodal analysis techniques for DC and AC Circuits CO2:To introduce various network reduction techniques and different network Theorems used for circuit analysis CO3:To introduce the phenomenon of resonance in coupled circuits CO4:To impart knowledge on transient response of the electric circuits CO5:To review two port networks and their characterization

Unit	Description	Instructional Hours
I	**BASIC CONCEPTS OF DC AND AC CIRCUITS** Introduction to Basic Circuit Elements, Ohm's Law – Kirchhoff's Voltage law –Kirchhoff's Current law–Resistors in series and parallel Combinations, A.C Circuits –Complex Impedance, Mesh and Nodal analysis for D.C and A.C. circuits	9
II	**NETWORK REDUCTION AND THEOREMS** Network Reduction: Voltage and Current Division, Source Transformation, T & π Networks- Star-Delta conversion. Network theorems: Superposition theorem, Thevenin's theorem, Norton's theorem, Reciprocity theorem, Millman's theorem, and Maximum power transfer theorem, Application of Network theorems to DC and AC Circuits.	9
III	**RESONANCE AND COUPLED CIRCUITS** Resonance – Series and Parallel resonance – Variation of impedance with frequency -Variation in current through and voltage across L and C with frequency – Bandwidth – Q factor -Selectivity. Self-inductance – Mutual inductance – Dot rule – Coefficient of coupling –Series, Parallel connection of coupled inductors – Single tuned and double tuned coupled circuits	9
IV	**TRANSIENT ANALYSIS** Natural response-Forced response – Transient response of RC, RL and RLC circuits to excitation by Step Signal, Impulse Signal and exponential sources – Complete response of RC, RL and RLC Circuits to sinusoidal excitation.	9

V	**TWO PORT NETWORKS** Two port networks, Z parameters, Y parameters, Transmission (ABCD) parameters, Hybrid(H) Parameters, Interconnection of Two Port Networks (Series, Parallel and Cascade)	9
	Total Instructional Hours	45
Course Outcome	**At the end of the course, the learner will be able to** CO1: Understand circuit elements, laws (Ohm's, Kirchhoff's), and analyze circuits using mesh and nodal methods for both DC and AC scenarios. CO2: Apply network reduction techniques/network theorems and determine behaviour of the given DC and AC circuit CO3: Analyze series and parallel resonance, impedance variation with frequency, Q factor, and coupled circuits. CO4: Evaluate natural, forced, and transient responses of RC, RL, and RLC circuits to various excitation signals. CO5: Comprehend and assess two port networks utilizing Z, Y, ABCD, and H parameters, and their interrelationships (series, parallel, cascade).	

TEXT BOOKS:

T1- William H. Hayt, Jr. Jack E. Kemmerly and Steven M. Durbin, —Engineering Circuit Analysisl, McGraw Hill Science Engineering, Eighth Edition, 11th Reprint 2016.

T2- Joseph Edminister and Mahmood Nahvi, —Electric Circuitsl, Schaum's Outline Series, Tata McGraw Hill Publishing Company, New Delhi, Fifth Edition Reprint 2016.

REFERENCE BOOKS:

R1-Hayt and Kemmerly, "Engineering Circuit Analysis", McGraw Hill Education, New Delhi, 8th Ed, 2013.

R2-Van Valkenberg, "Network Analysis", Prentice Hall India Learning Pvt. Ltd., 3rd Edition, 1980.

R3-K. S. Suresh Kumar, "Electric Circuit Analysis", Pearson Publications, 2013.

R4-Chakrabarti, "Circuit Theory Analysis and Synthesis", DhanpatRai& Co., Seventh - Revised edition, 2018

R5-R. Gupta, "Network Analysis and Synthesis", S. Chand & Company Ltd, 2010.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	-		-	-	-	-	-	3	3	2
CO2	3	3	3	2	-		-	-	-	-	-	3	3	2
CO3	3	2	3	2	-		-	-	-	-	-	3	3	2
CO4	3	2	3	2	-		-	-	-	-	-	3	3	2
CO5	3	2	3	2	-		-	-	-	-	-	3	3	2
AVG	3	2.4	3	2								3	3	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.E	22EC3251	Object Oriented Programming using Java	2	0	2	3

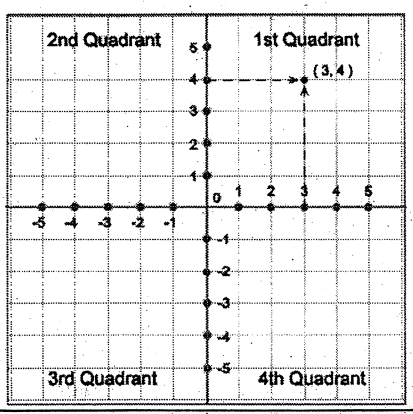
Course Objective

The learner should be able to

1. To understand the concepts of Object Oriented Programming.
2. To impart the fundamental concepts of core JAVA.
3. To enable the students to gain programming skills in JAVA.
4. To know how to handle exceptions.
5. To develop multithread programming logic

Unit	Description	Instructional Hours
I	**INTRODUCTIONTOOBJECTORIENTEDPROGRAMMING** Object oriented programming concepts – objects-classes- methods and messages-abstraction and encapsulation-inheritance- abstract classes-polymorphism-Benefits of OOP, Application of OOP-Java Evolution-Features of Java-Difference of Java from C and C++.	9
II	**OVERVIEW OF JAVA LANGUAGE** Basics of Java programming, Data types, constants -Variables and Arrays, Operators and expressions , Decision making and branching – looping –Classes, Objects and Methods- access specifiers – static members –Constructors-this keyword-finalize method	9
III	**PACKAGES AND INTERFACES** Java API Packages –Naming conventions-creating, accessing, using Packages- Inheritance– Method Overriding- Abstract class Interfaces: Multiple inheritance-defining, extending, implementing interfaces- -final keyword	9
IV	**EXCEPTION HANDLING** Fundamentals-Exception types –Uncaught exceptions-Using try and catch-Multiple Catch-Nested try-Throws-Finally-Built in Exceptions-Throwing own exceptions	9
V	**MULTITHREAD PROGRAMMING** Creating Threads- Extending thread class-Stopping and Blocking Thread-Life cycle –Using Thread-Thread Exceptions-Thread priority-Synchronization-Runnable Interface-Inter thread communication	9
	Total Instructional Hours	45

S.No	List of Experiments
1	Ramu went to a restaurant to had his meals. He is charged with Rs. 70.50. The tax should be8% of the meal cost. The tip should be 10% of the total after adding the tax. Write a java program to display the mealcost,taxamount, tip amount, andtotalbillon the screen.
2	Rhea Pandey's teacher has asked her to prepare well for the lesson on seasons. When her teacher tells a month, she needs to say the season corresponding to that month. Write a java program to solve the above task. Spring – March to May, Summer – June to August, Autumn – September to November and, Winter – December to February. Month should be in the range 1 to 12. If not the output should be "Invalid month"
3	Write a Java program to find the eligibility of admission for a professional course based on the following criteria: Eligibility Criteria: Marks in Maths>=65 and Marks in Phy>=55 and Marks in Chem>=50 and Total in all three subject >=190 or Total in Maths and Physics >=140 Input the marks obtained in Physics :65 Input the marks obtained in Chemistry :51 Input the marks obtained in Mathematics :72 Total marks of Maths, Physics and Chemistry: 188 Total marks of Maths and Physics: 137 The candidate is not eligible.

4	Write a Java program to accept a coordinate point in a XY coordinate system and determine in which quadrant the coordinate pointlies. 
5	XYZ Technologies is in the process of increment the salary of the employees. This increment is done based on their salary and their performance appraisal rating. If the appraisal rating is between 1 and 3, the increment is 10% of the salary. If the appraisal rating is between 3.1 and 4, the increment is 25% of the salary. If the appraisal rating is between 4.1 and 5, the increment is 30% of the salary. Help them to do this, by writing a Java program that displays the incremented salary. Note: If either the salary is 0 or negative (or) if the appraisal rating is not in the range 1 to 5 (inclusive), then the output should be "Invalid Input". XYZ TECHNOLOGIES
6	DraftajavaProgramtoCalculateAverageof'n'NumbersUsingArrays
7	Suppose you have a Piggie Bank with an initial amount of $50 and you have to add some more amount to it. Create a class 'AddAmount' with a data member named 'amount' with an initial value of $50. Now make two constructors of this class as follows: 1 - without any parameter - no amount will be added to the PiggieBank 2 - having a parameter which is the amount that will be added to the PiggieBank Create an object of the 'AddAmount' class and display the final amount in the Piggie Bank.
8	Write a java program for multilevel inheritance
9	Write a java program to create an abstract class named Shape that contains an empty method named number Of Sides( ).Provide three classes named Trapezoid, Triangle and Hexagon such that each one of the classes extends the class Shape. Each one of the classes contains only the method number Of Sides( ) that shows the number of sides in the given geometrical figures
10	Write a java program in which you will declare two interface sum and sub inherits these interfaces through class A1 and display their content.
11	Write a java program for multiple exception handling.
12	Write a java program to implement multithreading
Course Outcome	**At the end of the course, the learner will be able to** CO1: Understand the concepts of OOPs. CO2: Simulate the syntax, semantics and classes in Java language. CO3: Design program using User Defined packages and interfaces. CO4: Develop applications using Exception handling in java CO5: Implement the use of multithread programming.

TEXT BOOKS:

T1 – Herbert Schild, "Java The Complete Reference", Eighth Edition, McGraw Hill, 201
T2 - E Balagurusamy, "Programming with JAVA", Fifth Edition, McGraw Hill, 2015.

REFERENCE BOOKS:

R1 - .Balagurusamy, "Programming with java A Primer", fifth edition, McGraw – Hill 2014
R2 - H.M.Deitel, P.J.Deitel, "Java : how to program", Fifth edition, Prentice Hall of India private limited,2003.
R3 - Cay S. Horstmann, "Core Java Fundamentals", Volume 1, 11 th Edition, Prentice Hall, 2018

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	3	3		-	-	3	-	-	2	3	1
CO2	3	2	3	3	3		-	-		-	-	3	3	3
CO3	3	3	3	3	2		-	-	3	2	-	2	3	3
CO4	3	2	2	3	3		-	-			-	3	3	2
CO5	3	3	3	3	2		-	-	3	2	-	2	3	2
AVG	3	3	3	3	3				3	2		2	3	2

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Programme	Course Code	Name of the Course	L	P	T	C
BE	22EC3001	Electronic Circuits Lab	0	0	3	1.5
Course Objective	To introduce various methods of biasing transistors for designing amplifiers. To design and analysis transistor as amplifiers. To analyze and design wave shaping circuits and signal generator. To design and analysis multivibrators. To simulate various electronic circuits using multisim.					
Exp.No.	Description of the Experiments					
1	Design, construct and test the following biasing circuits and find the transient analysis and frequency response of Single BJT and FET. a) Fixed bias b) Self bias					
2	Current series Feedback Amplifiers					
3	RC Phase shift oscillator					
4	Hartley Oscillator					
5	Class C tuned Amplifier					
6	Class B and					
7	Class AB Amplifiers					
8	Common Collector Amplifier					
9	Astablemultivibrator					
Simulation Experiments						
10	Darlington Amplifier					
11	Colpitt's Oscillator					
12	Integrator, Differentiator, Clipper and Clamper circuits.					

13	Monostable multivibrator
Total Practical Hours	**45**
Course Outcome	CO1: Design and analyze the biasing circuits CO2: Construct and analyze various amplifier configurations CO3: Construct and analyze the performance of signal generators for a specified frequency CO4: Design and analyze the multivibrator circuits CO5: Analyze the performance of electronic circuits using PSPICE.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	3	3		-	-	2	2	-	3	3	3
CO2	3	2	3	3	3		-	-	2	2	-	3	3	3
CO3	3	2	3	3	3		-	-	2	2	-	3	3	3
CO4	3	2	3	3	3		-	-	2	2	-	3	3	3
C05	3	2	3	3	3		-	-	2	2	-	3	3	3
AVG	3	2	3	3	3				2	2		3	3	3

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Programme	Course Code	Name of the Course	L	P	T	C
BE	**22EC3002**	**Digital Electronics Lab**	**0**	**0**	**3**	**1.5**
Course Objective	To design and analysis different adder circuits. To Demonstrate the formal procedures for the analysis and design of combinational circuits To Use appropriate design technique to design the different sequential circuits. To Apply the concepts of Hardware Description Language for designing combinational circuits To Apply the concepts of Hardware Description Language for designing sequential circuits					
Exp.No.	**Description of the Experiments**					
	Design, implement and test the following digital circuits,					
1	4-bit binary Adder / Subtractor using IC 7483.					
2	BCD adder using IC 7483.					
3	Multiplexer and De-multiplexer using logic gates.					
4	Encoder and Decoder using logic gates.					

5	Parity checker and generator.
6	4 – bit binary ripple counter.
7	3-bit synchronous up / down counter.
8	4 – bit shift register using Flip – flops.
	Software Experiments
1	Adder / Subtractor Circuits and BCD adder using Verilog code
2	Magnitude Comparator and ALU using Verilog code
3	Synchronous Counters using Verilog code
4	Asynchronous counters using Verilog code
5	Sequence Detector using Verilog code for digital lab
	Total Practical Hours **45**
Course Outcome	CO1: Construct the performance of various combinational circuits. CO2: Implement and develop various synchronous logic circuits. CO3: Analyze the performance of various combinational circuits. CO4: Design and develop various synchronous logic circuits. CO5: Formulate the design procedure of combinational and sequential digital circuits using Hardware Description Language

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	3	3		-	-	2	2	-	3	3	3
CO2	3	2	3	3	3		-	-	2	2	-	3	3	3
CO3	3	2	3	3	3		-	-	2	2	-	3	3	3
CO4	3	2	3	3	3		-	-	2	2	-	3	3	3
CO5	3	2	3	3	3		-	-	2	2	-	3	3	3
AVG	3	2	3	3	3				2	2		3	3	3

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Programme	Course Code	Course Title	L	T	P	C
BE/BTECH	22HE3071	Soft Skill-II	1	0	0	1

Course Objectives:

1. To make the students aware of the importance, the role and the content of soft skills through Instruction, knowledge acquisition, demonstration and practice.
2. To learn everything from equations to probability with a completely different approach.
3. To make the students learn on an increased ability to explain the problem comprehensively.

Unit	Description	Instructional Hours
I	**Group Discussion & Presentation Skills:** GD skills – Understanding the objective and skills tested in a GD – General types of GDs – Roles in a GD – Do's & Don'ts – Mock GD & Feedback. - Presentation Skills – Stages involved in an effective presentation – selection of topic, content, aids – Engaging the audience – Time management – Mock Presentations & Feedback	4
II	**Interview Skills and Personality Skills:** Interview handling Skills – Self preparation checklist – Grooming tips: do's & don'ts – mock interview & feedback - Interpersonal skills-creative thinking-problem solving-analytical skills	3
III	**Business Etiquette & Ethics:** Etiquette – Telephone & E-mail etiquette – Dining etiquette – do's & Don'ts in a formal setting – how to impress. Ethics – Importance of Ethics and Values – Choices and Dilemmas faced – Discussions from news headlines.	3
IV	**Quantitative Aptitude:** Permutation, Combination - Probability - Logarithm - Quadratic Equations - Algebra - Progression - Geometry - Mensuration.	3
V	**Logical Reasoning:** Logical Connectives - Syllogisms - Venn Diagrams – Cubes - Coded inequalities - Conditions and Grouping	2

Course Outcome:

CO1:	Develop skills for effective participation in group discussions and delivering impactful presentations, with mock sessions for practical feedback.
CO2:	Enhancing interview skills with preparation, grooming tips, and practice sessions, cultivating interpersonal, creative, problem-solving, and analytical abilities.
CO3:	Apply proper etiquette in communication and formal settings, alongside discussions on ethics, values, and real-world dilemmas.
CO4:	Master mathematical concepts including permutation, combination, probability, logarithm, quadratic equations, algebra, progression, geometry, and mensuration.
CO5:	Develop proficiency in logical connectives, syllogisms, Venn diagrams, cubes, coded inequalities, conditions, and grouping for logical reasoning challenges.

REFERENCE BOOKS

R1:	Bridging the Soft Skills Gap: How to Teach the Missing Basics to Todays Young Talent- Bruce Tulgan
R2:	Quantitative Aptitude for Competitive Examinations (5th Edition) - Abhjit Guha
R3:	How to crack test of Reasoning - Jaikishan and Premkishan
R4:	The hand on guide to Analytical Reasoning and Logical Reasoning - Peeyush Bhardwaj

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Programme	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech	22MC3191	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	2	0	0	0

Course Objective	**The student should be able** 1.To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the Importance of roots of knowledge system. 2.To make the students understand the traditional knowledge and analyze it and apply it to their day to day life. 3.To impart basic principles of thought process, Itihas and Dharma Shastra and connecting society and nature. 4. To understand the concept of Intellectual and intellectual property rights with special Reference. 5. The course focuses on introduction to Indian Knowledge System, Indian perspective of modern scientific world-view and basic principles of Yoga and Indian philosophy

Unit	Description	Instructional Hours
I	**Introduction to traditional knowledge:** Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, Indigenous Knowledge (IK), characteristics, traditional knowledge vs indigenous knowledge, traditional knowledge vs western knowledge	6
II	**Protection of traditional knowledge:** The need for protecting traditional knowledge, Significance of TK Protection, value of TK in global economy, Role of Government to harness TK	6
III	**Itihas and Dharma-Shastra** **Itihas:** The Mahabharata - The Puranas - The Ramayana **Dharma-Shastra:** Manu Needhi - The Tirukkural– ThiruArutpa	6
IV	**Traditional knowledge and intellectual property:** Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge	6
V	**Indian philosophy** Jain – Buddhist – Charvaka – Samkhya - Yoga - Nyaya - Vaisheshika-SaivaSiddhanta	6
	Total Instructional Hours	30

Course Outcome	**After completion of the course the learner will be able** 1. Identify the concept of Traditional knowledge and its importance. 2. Explain the need and importance of protecting traditional knowledge. 3. Explain the need and importance of Itihas and Dharma Shastra. 4. Interpret the concepts of Intellectual property to protect the traditional knowledge. 5. Interpret the concepts of indian philosophy to protect the traditional knowledge.

REFERENCE BOOKS:

Traditional Knowledge System in India, by Amit Jha, 2009.
2. Traditional Knowledge System in India by Amit Jha Atlantic publishers, 2002.
3. "Knowledge Traditions and Practices of India" Kapil Kapoor1, Michel Danino2.
4. V. Sivaramakrishna (Ed.), Cultural Heritage of India-Course Material, BharatiyaVidya Bhavan, Mumbai, 5th Edition, 2014.
5. V N Jha (Eng. Trans,), Tarkasangraha of Annam Bhatta, InernationalChinmay Foundation, Velliarnad, Amaku,am.

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Programme	Course code	Name of the course	L	T	P	C
B.E.	22HE4101	IPR AND START-UPS	2	0	0	2

The student should be able

Course Objective

1. The main objective of the IPR is to make the students aware of their rights for the protection of their invention done in their project work.
2. To get registration in our country and foreign countries of their invention, designs and thesis or theory written by the students during their project work and for this they must have knowledge of patents, copy right,
3. To learn about the trademarks and geographical indications (GI) in our country and foreign countries of their invention.
4. To gain the knowledge about designsand layout design Act-2000.
5. To learn about the technology transfer to product andStart-up knowledge.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO IPR** Meaning of property, Origin, Nature, Meaning of Intellectual Property RightsIntroduction to Trade-Related of Intellectual Property Rights (TRIPS), and World Trade Organization (WTO). - Kinds of Intellectual property rights—Copy Right, Patent, Trade Mark, Trade Secret and trade dress, Design, Layout Design, Geographical Indication, Plant Varieties and Traditional Knowledge.	6
II	**PATENT RIGHTS AND COPY RIGHTS** Origin, Meaning of Patent, Types, Procedure to follow the methods of IP agents, Inventions, which are not patentable, Registration Procedure, Rights and Duties of Patentee, Assignment and licence, Restoration of lapsed Patents, Surrender and Revocation of Patents, Infringement, Remedies & Penalties, IT Act- introduction. COPY RIGHT- Origin, Definition &Types of Copy Right, Patent Ethics, Registration procedure, Assignment & licence, Terms of Copy Right, Piracy, Infringement, Remedies,	6
III	**TRADE MARKS AND GEOGRAPHICAL INDICATION** Origin, Meaning & Nature of Trade Marks, Types, Registration of Trade Marks, Infringement & Remedies, Offences relating to Trade Marks, Passing off, Penalties. GEOGRAPHICAL INDICATION – International Protection, plant varieties, Infringement of GI, licencing, legal issues.	6
IV	**DESIGN** Meaning, Definition, Object, Registration of Design, Cancellation of Registration, International convention on design, functions of Design. Semiconductor Integrated circuits and layout design Act-2000.	6
V	**START-UPS** Process of Innovation, Monetizing Ideas,Technology transfer to product, Funding Options for Start-up,Start-up Models,Preparation of Project Report, Start up to MNC, Start-up Audit.	6
	Total Instructional Hours	30

Course Outcome

Upon completion of the course, the students will be able to:
CO1: Understand IPR and aware the invention rights.
CO2: Get awareness of acquiringthe patent for their project ideas
CO3: Learn obtaining copyright for their innovative works
CO4:Understand the designs and layout design Act-2000.
CO5:Understand the concept of start-ups, identify the required strategic resources.

TEXT BOOK:

T1. Intellectual Property Rights (IPR) by M.K Bhandari 2021
T2. Law relating to Intellectual Property Rights, by V.K Ahuja 2017
T3. Intellectual Property Rights (IPR) for Start-ups by Vinay Vaish 2016
T4. Intellectual Property - Patents, Copyright, Trade Marks and Allied Rights (South Asian Edition) by W Cornish and D Llewelyn and T Pain 8th South Asian Edition, 2016.
T5 Peter Thiel & Blake Masters, Zero to One: Notes on Start Ups, or How to Build the Future, Random House, 2014.

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PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	3	-	-	3	-	-	-	-	-	3	2	2
CO2	3	-	3	-	-	3	-	-	-	-	-	3	2	2
CO3	3	-	3	-	-	3	-	-	-	-	-	3	2	2
CO4	3	-	3	-	-	3	-	-	-	-	-	3	2	2
CO5	3	-	3	-	-	3	-	-	-	-	-	3	2	2
Avg.	3	-	3	-	-	3	-	-	-	-	-	3	2	2

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Programme	Course Code	Name of the Course	L	T	P	C
BE	22EC4201	Electro Magnetic Fields	3	1	0	3

Course Objective

1. To explore the basic laws and concepts of electromagnetism
2. To acquire a profound understanding of electric field and potentials due to static charges
3. To comprehend the magnetic fields for simple configurations under static conditions along with fundamental laws.
4. To explain Maxwell's equation in different forms and wave propagation in different media.
5. To interpret wave characteristics inperfect conductor and dielectric media.

Unit	Description	Instructional Hours
I	**INTRODUCTION** Different co-ordinate systems- Vectorcalculus – Gradient, Divergence and Curl - Divergence theorem, Theorems and applications:Stoke's theorem.Coulomb's law,Electric field intensity, Electric flux density, Gauss's law,ApplicationsofGauss's law.	9
II	**UNIT - II** **ELECTROSTATIC FIELDS** Electric potential,Potential difference andpotential, Dipole, Current and current density, Continuity of currentequation, Boundary conditions: Conductors,dielectric materials, Nature of dielectric materials, Capacitance, Parallel plate capacitor, Poisson's and Laplace's equations.	9
III	**UNIT – III** **MAGNETOSTATIC FIELDS:** Biot Savart law, Ampere's Circuital law, Magnetic flux and magnetic fluxdensity, Scalar and vector magnetic potentials, Nature of magnetic materials, Magnetization andpermeability, Magnetic boundary conditions, Self-inductance and mutual inductance, Solenoid and Toroid.	9
IV	**UNIT – IV** **MAXWELL'S EQUATIONS AND WAVE PROPAGATION:** Faraday's law, Displacement current, Maxwell's equations in point form, Maxwell's equations in integral form, Wave equations for free space and conducting medium, Uniform plane wave equation, Wave propagation in free space, dielectrics and in good Skin effect, Wave polarization.	9
V	**UNIT - V** **WAVE CHARACTERISTICS:** Normal incidence of waves on perfect conductor and dielectric, Oblique incidence of waves on perfect conductor and dielectric, Brewster angle, Surface impedance, Poynting theorem and Poynting vector.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Interpret complex electromagnetic phenomena, applying concepts such as vector calculus, integral theorems and fundamental laws.
CO2: Analyze electric field characteristics in both conductors and dielectrics and along boundaries of different media.
CO3: Apply the magnetic field laws to calculate the magnetic potentials and inductance for various configurations.

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CO4: Apply these concepts of Maxwell's equations to analyze and predict electromagnetic wave propagation in various media.
CO5 :Interpret the behavior of electromagnetic waves under normal and oblique incidences on perfect conductors and dielectrics.

TEXT BOOKS:

T1-Matthew N.O. Sadiku, "Elements of Electromagnetics", 3rd edition, Oxford Univ. Press, 2001.
T2- William H. Hayt and John A. Buck, "Engineering Electromagnetics" 6th edition, TMH, 2001.

REFERENCE BOOKS :

R1- Edward C Jordan and Keith G Balmain "Electromagnetic Waves and Radiating Systems" 2nd edition PHI, 2003.
R2- R.K Shevgaonkar, "Electromagnetic waves", 1st edition, TMH, 2005.
R3-. Samuel Y Liao, "Microwave Devices and Circuits", 3rd edition, Pearson Education, 2003.
R4-. K.D.Prasad and Satya Prakasan, "Antenna and Wave Propagation", 1st edition, Tech India

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2		2	2	2	2	2		2	2	3
CO2	3	3	3	3		2	2	3	2	2		2	3	3
CO3	3	3	3	3		2	2	3	2	2		2	3	3
CO4	3	3	3	3		2	2	3	2	2		2	3	3
CO5	3	2	2	2		2	2	2	2	2		2	2	3
AVG	3	2.6	2.6	2.6		2	2	2.6	2	2		2	2.6	3

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Programme	Course Code	Name of the Course	L	T	P	C
BE	22EC4202	Analog Communication	3	1	0	3

Course Objective

1. To impart the concepts of Amplitude Modulation and methods to generate and detect AM waves.
2. To familiarize the concepts of Angle Modulation and its spectral characteristics
3. To impart knowledge on the impact of noises on various analog communication systems
4. To understand different types of Radio Transmitters and receivers.
5. To emphasize the concepts of analog pulse modulation techniques.

Course pre-requisites: 22EC3201-Electronic Circuits
2.22EC3202-Signals and Systems

Unit	Description	Instructional Hours
I	**AMPLITUDE MODULATION SYSTEMS:** Communication system model - Need for modulation -Amplitude Modulation – - DSBSC, SSB, VSB– Amplitude modulator circuits- Balanced modulator, Ring modulator-Amplitude Demodulator circuits –Envelope detectors, square law demodulator.	9
II	**ANGLE MODULATION SYSTEMS:** Angle modulation –FM and PM –Narrow band, Wideband FM– Bandwidth requirements-Carson's Rule - Pre emphasis, De-emphasis - Generation and demodulation of FM waves -Indirect and Direct FM generation, Balanced Frequency Discriminator and PLL demodulator.	9
III	**NOISE IN CONTINUOUS WAVE MODULATION SYSTEMS:** Random variables, Random Process, Power Spectral Density-Friis Transmission equation -Noise Sources -Noise Figure, Effective Noise Temperature and Noise Bandwidth- Noise in CW Modulation systems- Noise in Linear Receiver using coherent detection, Noise in AM receivers using envelope Detection - Noise in FM receivers	9
IV	**TRANSMITTERS AND RECEIVERS:** AM broadcasting transmitters- Low Level and High Level transmitters - Pilot carrier SSB Transmitter- FM transmitters- Armstrong FM systems. AM Receivers Tuned radio frequency receiver - Super heterodyne receiver - FM receiver – Multiplexing-Diversity reception techniques-TDM,FDM	9
V	**ANALOG PULSE MODULATION SYSTEMS** Sampling,Quantization–Generation and Detection- Pulse-amplitude modulation – Pulse-Width modulation – Pulse Position Modulation - -noise trade off-Noise consideration in Pulse modulation systems.	9
	Total Instructional Hours	**45**

Course Outcome

1. Apply the concepts in selecting suitable amplitude modulation techniques for various applications
2. Apply the concepts in selecting appropriate angle modulation techniques for a message signal.
3. Analyze the impact of noise on analog communication systems
4. Interpret the concepts of modulation schemes and apply in the design of communication systems.

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5. Apply the concepts in selecting appropriate analog pulse modulation technique for various applications

TEXT BOOKS:

T1-Dennis Roddy, John Coolen ,"Electronic Communications", 4th edition, Pearson Education, 2009

T2-John. G. Proakis, Masoud Salehi, "Fundamentals of Communication Systems", Pearson Education, 6th edition, 2011.

REFERENCE BOOKS :

R1 - Wayne Tomasi ," Electronic Communications Systems –Fundamentals through advanced",5th edition, Pearson Education 2009

R2 - Lathi B P, "Introduction to Communication Systems", BS publications, New Delhi, 2001.

R3 - Kennedy G, "Electronic Communication systems", Tata McGraw Hill, New Delhi, 2009.

R4 - Carlson A B, "Communication systems: An Introduction to signals and noise in electrical communication", McGraw Hill, New Delhi, 2002.

R5 - Taub and Schilling, "Principles of Communication Systems", McGraw Hill, New Delhi, 1996

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	3	2	2	2	-	-	3	2	3
CO2	3	3	3	3	2	3	2	2	2	-	-	3	2	3
CO3	3	3	3	3	2	2	2	2	2	-	-	3	2	3
CO4	3	3	3	3	2	3	2	2	2	2	-	3	2	3
CO5	3	3	3	3	2	3	2	2	2	-	-	3	2	3
AVG	3	3	3	3	2	3	2	2	2	0.4		3	2	3

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Programme	Course Code	Name of the Course	L	T	P	C
BE	22EC4203	Linear Integrated Circuits	3	0	0	3

Course Objective

1. To understand the basic concepts of OPAMP.
2. To impart knowledge on various applications of OPAMP.
3. To analyze the comparators and waveform generators.
4. To apply the design concepts of ADC and DAC.
5. To design the PLL and voltage regulators.

Course pre-requisites:

1. 22EC3201-Electronic Circuits
2. 22EC3204-Circuits and Networks
3..22EC3202-Signals and Systems

Unit	Description	Instructional Hours
I	**BASICS OF OPERATIONAL AMPLIFIERS** Basic information about op-amps – Ideal Operational Amplifier - General operational amplifier stages,DC and AC performance characteristics, slew rate, Open and closed loop configurations.	9
II	**APPLICATIONS OF OPERATIONAL AMPLIFIERS** Sign Changer, Scale Changer, Phase Shift Circuits, Voltage Follower, V-to-I and I-to-V converters, adder, subtractor, Instrumentation amplifier, Integrator, Differentiator, Precision rectifier, clipper and clamper, Low-pass, high-pass and band-pass Butterworth filters.	9
III	**COMPARATORS AND WAVEFORM GENERATORS** Comparators, Schmitt trigger, Sine-wave generators, Multivibrators , Multivibrators using IC 555, Frequency to Voltage and Voltage to Frequency converters.	9
IV	**ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTERS** D/A converter – specifications - weighted resistor type, R-2R Ladder type, Voltage Mode and Current-Mode -R - 2RLadder types - switches for D/A converters, A/D Converters – specifications - Flash type - Successive Approximation type - Single Slope type – Dual Slope type.	9
V	**PLL AND VOLTAGE REGULATORS** Operation of the basic PLL, Voltage controlled oscillator, Application of PLL for AM detection, FM detection, IC Voltage regulators – Three terminal fixed and adjustable voltage regulators.	9
	Total Instructional Hours	45

Course Outcome

CO1: Understand the characteristics of Opamp.
CO2: Create any one application of Opamp.
CO3: Apply the various wave generating and shaping circuits.
CO4: Apply ADC and DAC for Opamp applications.
CO5: Analyze the concepts of PLL and voltage regulators.

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T1-D.Roy Choudhry, Shail Jain, "Linear Integrated Circuits", Wiley Eastern, New Delhi, 2014.
T2-Ramakant A. Gayakwad, "OP-AMP and Linear ICs", 4th Edition, Pearson Education, 2015 .

REFERENCE BOOKS:

R1-S.Salivahanan & V.S. Kanchana Bhaskaran, "Linear Integrated Circuits", 2nd edition McGraw Hill, 2014.
R2-Sergio Franco, "Design with Operational Amplifiers and Analog Integrated Circuits", 3rd Edition, Tata McGraw-Hill, 2007.
R3-Robert F.Coughlin, Frederick F.Driscoll, "Operational Amplifiers and Linear Integrated Circuits", Sixth Edition, PHI, 2001.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	2	-	2	-	-	-	-	-	-	2	2
CO2	3	3	3	3	2	2	2	-	-	-	-	-	2	2
CO3	3	3	3	2	2	3	-	-	-	-	-	-	2	2
CO4	3	3	3	3	2	3	-	-	-	-	-	-	2	2
CO5	3	3	3	3	1	2	-	-	-	-	-	-	2	2
AVG	3	3	3	2.6	1	2.4	0.4	-	-	-	-	-	2	2

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Programme	Course Code	Name of the Course	L	T	P	C
BE	22EC4304	*Transmission Lines and Wave Guides*	3	1	0	3

Course Objectives

1. To introduce transmission lines and its behavior.
2. To explain the characteristics of transmission lines at radio frequencies
3. To impart knowledge on impedance matching and solve problems using Smith Chart
4. To provide a thorough understanding on guided waves and its characteristics

Course pre-requisites: 22EC4201-Electromagnetic fields

Unit	Description	Instructional Hours
I	**INTRODUCTION** General theory of Transmission lines: the transmission line - general solution - The infinite line - Wavelength, velocity of propagation - Waveform distortion – Distortion less line - Loading and different methods of loading - Line not terminated in Z_0 - Reflection coefficient - calculation of current, voltage, power delivered and efficiency of transmission - Input and transfer impedance - Open and short circuited lines - reflection factor and reflection loss	9
II	**TRANSMISSION LINE CHARACTERISTICS** Transmission line equations at radio frequencies - Line of Zero dissipation - Voltage and current on the dissipation-less line, Standing Waves, Nodes, Standing Wave Ratio - Input impedance of the dissipation-less line - Open and short-circuited lines - Power and impedance measurement on lines - Reflection losses - Measurement of VSWR and wavelength.	9
III	**IMPEDANCE MATCHING** Impedance matching: Quarter wave transformer - Impedance matching by stubs - Single stub and double stub matching - Smith chart - Solutions of problems using Smith chart - Single and double stub matching using Smith chart.	9
IV	**GUIDED WAVES** Waves between parallel planes-Transverse Electric Waves-Transverse Magnetic Waves- Characteristics of TE and TM waves-Transverse Electromagnetic waves- Velocity of propagation-Attenuation in parallel plane guides- Wave Impedances	9
V	**WAVEGUIDES** Rectangular Waveguides - TM Waves in Rectangular guides -TE Waves in Rectangular Waveguides - Impossibility of TEM waves in waveguides - Bessel functions -TM and TE waves in Circular waveguides -Wave Impedance and Characteristic Impedances.	9
	Total Instructional Hours	**45**

Course Outcome

After completion of the course students are expected to be able to:

1. Interpret the physical meaning of transmission lines
2. Determine transmission line characteristics at radio frequencies
1. Solve impedance matching problems in transmission lines using tools such as Smith chart.
2. Understand and analyze the behavior of waves between parallel planes
3. Develop solutions using the governing equations for wave propagation, in

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TEXT BOOKS:

T1- John D Ryder, "Networks Lines and Fields", Prentice Hall of India, New Delhi, 2005.

T2- Edward C. Jordan & Keith G. Balmain, "Electromagnetic waves and Radiating Systems", Second Edition, Prentice-Hall Electrical Engineering Series, 2012.

REFERENCE BOOKS:

R1-Reinhold Ludwig and Powel Bretchko, RF Circuit Design – Theory and Applicationsl, Pearson Education Asia, First Edition,2001.
R2 - D. K. Misra, —Radio Frequency and Microwave Communication Circuits- Analysis and Designl, John Wiley & Sons, 2004.
R3 - Mathew M. Radmanesh, —Radio Frequency & Microwave Electronicsl, Pearson Education Asia, Second Edition,2002.
R4 - G.S.N Raju, "Electromagnetic Field Theory and Transmission Lines Pearson Education, First edition 2005.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	2	-	2	-	-	-	-	-	-	2	2
CO2	3	3	3	3	2	2	2	-	-	-	-	-	2	2
CO3	3	3	3	2	2	3	-	-	-	-	-	-	2	2
CO4	3	3	3	3	2	3	-	-	-	-	-	-	2	2
CO5	3	3	3	3	1	2	-	-	-	-	-	-	2	2
AV G	3	3	3	3	1	2	-	-	-	-	-	-	2	2

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rogramme	Course Code	Name of the Course	L	T	P	C
BE	22EC4251	Control Systems	2	0	2	3

Course Objective

1. To understand the concept of modeling of control systems.
2. To obtain sufficient understanding of first- and second-order systems' time response analysis.
3. To examine the various frequency response plots.
4. To enumerate the concept of different stability analysis techniques.
5. To describe the concept of state variable analysis.

Course pre-requisites: 22EC3201-Electronic Circuits
2.22EC3202-Signals and Systems

Unit	Description	Instructional Hours
I	**MATHEMATICAL MODELING OF CONTROL SYSTEMS** Basic components of Control System – Open loop and Closed loop systems – Introduction to Differential equation -Transfer function- Modeling of Electrical and Mechanical systems- Block diagram reduction methods - Signal flow graph. **Experimental study- Digital simulation of linear systems.**	6+3
II	**TIME RESPONSE ANALYSIS** Time response - Order and Type of the Systems – Standard test signals-Unit step Response analysis of first and second order systems – Time domain specifications-Steady state errors. **Experimental study- Time response analysis of unit step and impulse signal.**	6+3
III	**FREQUENCY RESPONSE ANALYSIS** Frequency Response –Introduction to frequency Domain specifications - Bode Plot, Polar Plot – Constant M and N Circles (derivative approach) **Experimental study- Frequency response analysis of bode plot.**	6+3
IV	**STABILITY ANALYSIS** Concept of stability -bounded input-bounded output stability, Routh-Hurwitz Criterion, Root Locus Technique, Construction of Root Locus. **Experimental study- Stability analysis of linear system using root locus.**	6+3
V	**STATE VARIABLE ANALYSIS** State space representation of Continuous Time systems – State equations – Phase and Canonical variable forms-Transfer function from State Variable Representation- Concepts of Controllability and Observability. **Experimental study- State space representation of Continuous Time systems.**	6+3
Total Instructional Hours		**30+15=45**

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Course Outcome

CO1: Compute the mathematically modeling of control systems.
CO2: Analysis the time domain specifications and steady state errors. concept.
CO3: Interpret the concepts of various frequency response plots.
CO4: Analysis the stability using root locus and Routh Hurwitz .
CO5: Illustrate the concepts of state space and implement in a state variable approach.

TEXT BOOKS:

T1- J.Nagrath and M.Gopal, "Control System Engineering", New Age International Publishers, 6th Edition, 2018.
T2- Benjamin.C.Kuo, "Automatic control systems", Wiley,9th Edition,2014.

REFERENCE BOOKS:

R1- KatsushikoOgata,"ModernControlEngineering",PearsonEducation,5th Edition, 2010.
R2- Schaum's Outline Series, "Feed Back and Control Systems" ,Tata McGraw-Hill, 2nd Edition,2013.
R3- A.Nagoorkani,"Control Systems Engineering",RBAPublications, First edition,2014.
R4- John J.DAzzo&ConstantineH.Houpis, "Linear Control System Analysis and Design", TMH, 1995.
R1- KatsushikoOgata,"ModernControlEngineering",PearsonEducation,5th Edition, 2010.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	**3**	**2**	3	**2**	-	**2**	-	-	-	-	-	-	**2**	**2**
CO2	3	3	3	3	2	2	2	-	-	-	-	-	2	2
CO3	3	3	3	2	2	3	-	-	-	-	-	-	2	2
CO4	3	3	3	3	2	3	-	-	-	-	-	-	2	2
CO5	3	3	3	3	1	2	-	-	-	-	-	-	2	2
AVG	3	3	3	3	1	2	-	-	-	-	-	-	2	2

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Programme	Course Code	Name of the Course	L	T	P	C
BE	22EC4253	Data Communication and Networks	2	0	2	3

Course Objective

- Introduce data communication fundamentals and state-of-the-art in network models
- Explain the role of Data Link layer protocols in data transmission and describe how the Data Link layer prepares data for transmission on network media.
- Describe the functions of Network Layer i.e. Logical addressing, and Routing Mechanism
- Be exposed to the required functionality of each network application.
- Acquire knowledge in Wide Area Networks.

Course pre-requisites:

1. 22EC3203-Digital Electronics
2. 22EC4202-Analog communication

Unit	Description	Instructional Hours
I	**PHYSICAL LAYER** OSI reference model , TCP/IP Protocol suite.Line Configuration, Encoding and Decoding, Multiplexing-transmission media - Circuit Switching, Packet Switching, Message Switching. **Simulation of Network Topology – Star, Bus and Ring**	6+5
II	**LINK LAYER ALGORITHMS AND PROTOCOLS** Flow control and error control, stop and wait, Sliding windows , Local Area Networks -IEEE 802 standards, LLC, MAC layer protocols – CSMA/CD Ethernet, Token Ring,FDDI. **Study And Compare the performance of Stop And Wait Protocol, Study And Compare the performance of Selective Repeat Protocol,Go Back N Protocol**	6+5
III	**ROUTING ALGORITHMS AND PROTOCOLS** Routing Algorithms- RIP, OSPF, BGP, multicast routing (DVMRP, PIM)-IPv4 -IPv6. UDP-TCP-congestion Control Algorithms. **Simulation of Distance Vector Routing Algorithm,Link State Routing Algorithm,Study of Network Simulator (Ns) ,Simulation of Congestion Control Algorithms Using Ns.**	6+5
IV	**APPLICATION LAYER** Domain Name system – Remote logging, Electronic Mail, File Transfer - WWW and HTTP- Simple Network Management Protocol – Data Security.	6
V	**WIDE AREA NETWORKS** Integrated Services Digital Network (ISDN), *B-ISDN*, Frame delay and Asynchronous Transfer Mode (ATM) Protocol	6
	Total Instructional Hours	**30+15=45**

Course Outcome

After completion of the course the learner will be able to
CO1: Demonstrate the networking strategies.
CO2: Identify the technical issues related to networking technologies.
CO3: Discriminate various routing techniques.
CO4: Illustrate the web applications
CO5: Implement various network algorithms and protocols

TEXT BOOKS:

T1 - Behrouz A Forouzan , "Data Communication and Networking", McGraw-Hill, New Delhi, 2012.

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T2 - Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", Fifth Edition, MorganKaufmann Publishers, 2011

REFERENCE BOOKS:

R1 - Andrew S Tanenbaum, "Computer networks", Prentice Hall of India, New Delhi, 2010.
R2 - William Stallings, "Data and Computer Communication", Prentice Hall of India, New Delhi, 2007

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2-	3	2	2	3	2	2	3	3	2
CO2	3	3	3	3	3	3	2	2	3	2	2	3	3	3
CO3	3	3	3	3	3	2	3	2	3	2-	2	3	3	3
CO4	3	3	3	3	2	2	2	2	3	2	2	3	3	3
CO5	3	3	3	3	3	3	2	2	3	2	2	3	3	3
AVG	3	3	3	3	2.75	2.6	2.2	2	3	2	2	3	3	2.8

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Programme	Course Code	Name of the Course	L	T	P	C
BE	22EC4001	Linear Integrated Circuits Lab	0	0	3	1.5

Course Objective

1. To design and analyze linear applications nod Non-Linear Applications of OpAmp
2. To explore and utilize SPICE software for various circuit designs.
3. To understand documentation and record writing.

Course pre-requisites:

1. 22EC3001-Electronic Circuits Lab
2. 22EC42032-Linear Integrated Circuits Lab

Exp.No.	Description of the Experiments
	Design and Test the following experiments
1	Voltage Follower, Inverting & Non inverting amplifiers using 741 op-amp.
2	Active low-pass, High-pass and band-pass filters using 741 op-amp.
3	Astablemulti vibrator, Monostable multivibrator and Schmitt Trigger using 741 op-amp.
4	Phase shift and Wien bridge oscillators using 741 op-amp.
5	Astable and Mono stable multivibrators using NE555 Timer.
6	Function Generator using ICL8038.
	Simulate the following experiments
7	Integrator, Differentiator and Instrumentation Amplifier using SPICE.
8	Astable & Monostable multivibrators with NE555 Timer using SPICE.
9	Phase shift and Wien bridge oscillators with op-amp using SPICE.
10	D/A and A/D converters using SPICE.
	Total Practical Hours 45

Course Outcome

Students will be able to

CO1: Design and analyze linear applications nod Non-Linear Applications of OpAmp
CO2: Utilize SPICE software for various circuit designs.
CO3:Understand documentation and record writing

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PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	2	1	3	3	1	-	3	2	3
CO2	3	3	3	3	3	2	1	3	3	1	-	3	2	3
CO3	3	3	3	3	3	2	1	3	3	1	-	3	2	3

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Programme	Course Code	Name of the Course	L	T	P	C
B.E	22EC4002	Analog Communication Laboratory	0	0	3	1.5

Course Objective

1. To understand different modulation and demodulation schemes.
2. To analyze spectral characteristics of modulated signals
3. To understand documentation and record writing.

Course pre-requisites:

3. 22EC3001-Electronic Circuits Lab
4. 22EC4202-Analog Communication

Exp.No.	Description of the Experiments
1	Design and testing of Amplitude Modulation and Demodulation
2	Design and testing of Frequency Modulation and Demodulation.
3	Design and testing of Pre-Emphasis - De Emphasis Circuits
4	Design and testing of Mixer Circuit
5	AM Transmitter and Superheterodyne Receiver
6	Pulse Amplitude Modulation
7	Time Division Multiplexing.
	Simulation Experiments using MATLAB
8	DSB SC Modulation
9	SSB Modulation (added)
10	Pulse Width and Pulse Position modulation

Total Practical Hours 45

Course Outcome

Students will be able to

CO1: Analyze the performance of various modulation and demodulation methods.

CO2: Design the Transmitters and Receivers for analog communication and analyze the impact of noise in analog communication.

CO3: Able to analyze multiplexing techniques in signal reception

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PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	2	1	3	3	1	-	3	2	3
CO2	3	3	3	3	3	2	1	3	3	1	-	3	2	3
CO3	3	3	3	3	3	2	1	3	3	1	-	3	2	3

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Programme	Course Code	Name of the Course	L	T	P	C
BE	21EC5201	MICROPROCESSOR AND MICRO CONTROLLER	3	0	0	3

Course Objective

1. Study the Architecture of 8085 and 8086 microprocessor.
2. Learn the design aspects of I/O and Memory Interfacing circuits.
3. Study about communication and bus interfacing.
4. Study the Architecture of 8051 microcontroller
5. Study the concepts of microcontroller interfacing

Unit	Description	Instructional Hours
I	**THE 8085 AND 8086 MICROPROCESSOR** 9Introduction to 8085 – Microprocessor architecture – Addressing modes - Instruction set - Introduction to 8086 – Microprocessor architecture – Addressing modes - Instruction set- Assembly language programming – Modular Programming - Interrupts and interrupt service routines.	9
II	**8086 SYSTEM BUS STRUCTURE** 8086 signals – Basic configurations – System bus timing –System design using 8086 – Introduction to Multiprogramming – Multiprocessor configurations – Coprocessor, Closely coupled and loosely Coupled configurations – Introduction to advanced processors	9
III	**I/O INTERFACING** Parallel communication interface – Serial communication interface – D/A and A/D Interface – Timer Interface – Keyboard /display controller – Interrupt controller – DMA controller – Programming and applications Case studies: Traffic Light control, LED display, LCD display.	9
IV	**MICROCONTROLLER AND INTERFACING MICROCONTROLLER** Architecture of 8051 – Special Function Registers(SFRs) - I/O Pins Ports and Circuits – Instruction set - Addressing modes - Assembly language programming. Programming 8051 Timers - Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - ADC, DAC & Sensor Interfacing - Stepper Motor	9
V	**ARM PROCESSOR 9** Arcon RISC Machine – Architectural Inheritance – Core & Architectures - Registers – Pipeline - Interrupts – ARM organization - ARM processor family – Co-processors - ARM instruction set- Thumb Instruction set - Instruction cycle timings - The ARM Programmer"s model- ARM Assembly Language Programming	9
	Total Instructional Hours	45

Course Outcome

CO1-Understand 8086 microprocessor and execute the assembly Language programs using 8086 microprocessor
CO2-Interpret System Bus Structure and implement the Multiprocessor Configuration.
CO3-Assess the various peripheral devices interfacing with 8086 microprocessors.
CO4-Analyze 8051 microcontroller and execute the assembly Language programs using 8051 microcontroller
CO5-Design 8051 microcontroller for interfacing various peripheral devices and construct the water level indicator and Zigbee interfacing

TEXT BOOKS:

T1-Ramesh S. Goankar, "Microprocessor Architecture, Programming and Applications with 8085", 5th Edition, Prentice Hall (Unit 1)

T2- Yu-Cheng Liu, Glenn A.Gibson, "Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programming and Design", Prentice Hall of India, 2011. (Unit 1, 2, 3)

T3- Mohamed Ali Mazidi, Janice GillispieMazidi, Rolin McKinlay, "The 8051 Microcontroller and Embedded Systems: Using Assembly and C", Second Edition, Pearson education, 2011 (Unit 4, 5)

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REFERENCE BOOKS:

R1 - DoughlasV.Hall, "Microprocessors and Interfacing, Programming and Hardware",TMH,2012

R2- Krishna Kant , "Microprocessors and microcontrollers architecture programming and system design 8085 8086 8051 8096 PHI Learning Private Limited", 2014

	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
CO1	3	3	2	2			-	-	-	-	-	2	3	3
CO2	3	3	3	3			-	-	3	-	-	2	3	3
CO3	3	2	2	2			-	-	2	-	-	3	3	3
CO4	3	3	3	2			-	-	3	-	-	3	3	3
CO5	3	3	2	3			-	-	3	-	-	3	3	3
AVG	3	2.8	2.4	2.4			-	-	2.8	-	-	2.6	3	3

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Programme	Course Code	Name of the Course	L	T	P	C
BE	21EC5202	Transmission Lines and Wave Guides	3	0	0	3

Course Objective	1.To teach general theory on transmission lines and its characteristics 2. To give thorough understanding about high frequency line, power and impedance measurements 3 .To impart technical knowledge in impedance matching using smith chart 4. To study the behavior of guided waves between parallel planes 5. To provide an insight on the characteristics of guided waves in in rectangular and circular waveguides

Unit	Description	Instructional Hours
I	**TRANSMISSION LINE THEORY** General theory of Transmission lines - the transmission line - general solution - The infinite line - Wavelength, velocity of propagation - Waveform distortion – Distortion less line - Loading and different methods of loading - Line not terminated in Z_0 - Reflection coefficient - calculation of current, voltage, power delivered and efficiency of transmission - Input and transfer impedance - Open and short circuited lines - reflection factor and reflection loss	12
II	**HIGH FREQUENCY TRANSMISSION LINES** Transmission line equations at radio frequencies - Line of Zero dissipation - Voltage and current on the dissipation-less line, Standing Waves, Nodes, Standing Wave Ratio - Input impedance of the dissipation-less line - Open and short circuited lines - Power and impedance measurement on lines - Reflection losses - Measurement of VSWR and wavelength.	12
III	**IMPEDANCE MATCHING IN HIGH FREQUENCY LINES** Impedance matching: Quarter wave transformer - Impedance matching by stubs - Single stub and double stub matching - Smith chart - Solutions of problems using Smith chart - Single and double stub matching using Smith chart.	12
IV	**GUIDED WAVES** Waves between parallel planes-Transverse Electric Waves-Transverse Magnetic Waves-Characteristics of TE and TM waves-Transverse Electromagnetic waves- Velocity of propagation-Attenuation in parallel plane guides- Wave Impedances	12
V	**WAVEGUIDES** Rectangular Waveguides - TM Waves in Rectangular guides -TE Waves in Rectangular Waveguides - Impossibility of TEM waves in waveguides -Bessel functions -TM and TE waves in Circular waveguides -Wave Impedance and Characteristic Impedances.	12
	Total Instructional Hours	60

Course Outcome	After completion of the course the learner will be able to CO1-Understand the characteristics of transmission lines and its losses CO2-Analyze the standing wave ratio and input impedance in high frequency transmission lines CO3-Analyze impedance matching for high frequency lines using smith charts CO4-Interpret the behavior of guided waves between parallel planes CO5-Assess the Characteristics of guided waves in rectangular and circular waveguides

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	TEXT BOOKS:
	T1-John D Ryder, "Networks, Lines and Fields", 2nd Edition, Prentice Hall India, 2015. (UNIT I to III)
	T2-E.C.Jordan and K.G. Balmain, "Electromagnetic Waves and Radiating Systems"2nd Edition, Prentice Hall of India, 2006. (UNIT IV & V)
	REFERENCE BOOKS:
	R1-Reinhold Ludwig and Powel Bretchko,‖ RF Circuit Design – Theory and Applications‖, Pearson Education Asia, First Edition,2001.
	R2 - D. K. Misra, —Radio Frequency and Microwave Communication Circuits- Analysis and Design‖, John Wiley & Sons, 2004.
	R3 - Mathew M. Radmanesh, —Radio Frequency &Microwave Electronics‖, Pearson Education Asia, Second Edition,2002.
	R4 - G.S.N Raju, "Electromagnetic Field Theory and Transmission Lines Pearson Education, First edition 2005.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	2		-	-	-	-	-	3	3	3
CO2	2	2	2	2	3		-	-	-	-	-	3	3	2
CO3	3	3	2	2	2		-	-	-	-	-	3	3	2
CO4	3	3	2	2	3		-	-	-	-	-	3	2	2
CO5	3	3	1	2	1		-	-	-	-	-	3	2	1
AVG	2.8	2.8	2	2	2.2		-	-	-	-	-	3	2.6	2

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Programme	Course Code	Name of the Course	L	T	P	C
BE	21EC5203	VLSI Design	3	0	0	3

Course Objective	6. To learn the fundamentals of CMOS and MOS design 7. To understand silicon processing 8. To familiarize with VLSI combinational logic and sequential logic circuits design 9. To learn high speed processing material and data path

Unit	Description	Instructional Hours
I	**INTRODUCTION TO CMOS CIRCUITS AND MOS TRANSISTOR THEORY** MOS transistors – CMOS logic – Circuits and System Representation – An example – Introduction to nMOS, pMOS enhancement transistor – MOS device design equation – Basic DC equation, second order effects – Complementary CMOS inverter – DC characteristics	9
II	**CMOS PROCESSING, CIRCUIT CHARACTERIZATION AND PERFORMANCE ESTIMATION** Silicon semiconductor technology: An overview – Basic CMOS technology, –CMOS process enhancement –Reistance estimation – Capicatence estimation – Switching characteristics – Analytical delay models, Gate delays – Power dissipation.	9
III	**CMOS CIRCUITS AND LOGIC DESIGN** CMOS logic gate design –physical design of simple logic gates – INVERTER, NAND and NOR gates, Complex logic gateslayout, CMOS standard cell design – CMOS logic structures – Pseudo nMOS logic, Dynamic CMOS logic, Clocked CMOS logic, Pass transistor logic – Clocking strategies – Clocked system, latches and registers, system timing, setup and hold time, single phase memory structure PLL clock technique, two phase clocking	9
IV	**INTRODUCTION TO GaAs TECHNOLOGY &ARITHMETIC BUILDING BLOC** Ultra-fast systems – Gallium arsenide crystal structure – Technology development – Architectures for ripple carry adders, carry look ahead adders, High speed adders, accumulators, Multipliers	9
V	**VERILOG PROGRAMMING INTRODUCTION** Hierarchical modelling concepts – Basic concepts – Modules and ports – Gate level modelling – Behavioural modelling – Data flow modelling: An introduction.	9
	Total Instructional Hours	**45**

Course Outcome	After completion of the course the learner will be able to CO1-Understand the basics of to analyze CMOS and MOS transistors CO2-Analyze passive components required for physical design. CO3-Analyze timing issues of sequential logic CO4-Understand advanced semiconductor processing materials and data processing architecture CO5-Acquire knowledge on the programming concepts of Verilog HDL language

TEXT BOOKS:

T1-- Neil H E Weste and Kamran Eshranghian, "Principles of CMOS VLSI Design: A system Perspective", Second edition, Pearson tion Asia.

T2- Douglas A Pucknell and Kamran Eshranghian, "Basic VLSI Design", Third edition, Prentice Hall of India.

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REFERENCE BOOKS:

R1- -Samir Palnitkar, "Verilog HDL – A guide top Digital Design and Synthesis", Second edition, Pearson education.

R2 - Neil H E Weste and David money Haris, "CMOS VLSI Design: A circuits and systems Perspective",Addison Wesley, New Delhi, 2010.

R3 - Sung-Mo Kanga and Yusuf Leblebici, "CMOS Digital Integrated Circuits- Analysis and Design", Tata McGraw Hill, New , 2004.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	3	2		-	-	-	3	-	2	3	2
CO2	3	3	2	3	2		-	-	-	2	-	2	3	2
CO3	3	2	3	3	2		-	-	-	2	-	2	3	2
CO4	3	2	3	2	2		-	-	-	2	-	2	3	2
CO5	3	2	3	3	2		-	-	-	2	-	2	3	3
AVG	3	2.4	2.6	3	2		-	-	-	2.2	-	2	3	2.2

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Programme	Course Code	Name of the Course	L	T	P	C
BE	21EC5251	Data Communication and Networks	2	0	2	3

Course Objective	1. To understand the state-of-the-art in network models 2. To analyze the flow control and error control algorithms in a network. 3. To familiarize the various aspects of routing algorithms. 4. Be exposed to the required functionality of each network application. 5. To familiarize with various wide area network.

Unit	Description	Instructional Hours
I	**PHYSICAL LAYER** OSI reference model . TCP/IP Protocol suite.Line Configuration, Encoding and Decoding, Multiplexing-transmission media - Circuit Switching, Packet Switching, Message Switching. **Simulation of Network Topology – Star, Bus and Ring**	6+5
II	**LINK LAYER ALGORITHMS AND PROTOCOLS** Flow control and error control, stop and wait, Sliding windows ,Local Area Networks - IEEE 802 standards, LLC, MAC layer protocols – CSMA/CD Ethernet, Token Ring,FDDI. **Study And Compare the performance of Stop And Wait Protocol,Study And Compare the performance of Selective Repeat Protocol,Go Back N Protocol**	6+5
III	**ROUTING ALGORITHMS AND PROTOCOLS** Routing Algorithms- RIP, OSPF, BGP, multicast routing (DVMRP, PIM)- IPv4 - IPv6. UDP-TCP-congestion Control Algorithms. **Simulation of Distance Vector Routing Algorithm,Link State Routing Algorithm,Study of Network Simulator (Ns) ,Simulation of Congestion Control Algorithms Using Ns.**	6+5
IV	**APPLICATION LAYER** Domain Name system – Remote logging, Electronic Mail, File Transfer - WWW and HTTP- Simple Network Management Protocol – Data Security.	6
V	**WIDE AREA NETWORKS** Integrated Services Digital Network (ISDN), *B-ISDN*, Frame delay and Asynchronous Transfer Mode (ATM) Protocol	6
	Total Instructional Hours	**30+15=45**

Course Outcome	After completion of the course the learner will be able to CO1-Demonstrating the network layer Strategies CO2-Identify the technical issues related to networking technologies. CO3-Discriminate various routing techniques. CO4-Discuss the various application layer protocols for web applications CO5-Elaborate and compare various wide area networks

TEXT BOOKS:

T1 - Behrouz A Forouzan , "Data Communication and Networking", McGraw-Hill, New Delhi, 2012.

T2 - Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", Fifth Edition, MorganKaufmann Publishers, 2011

REFERENCE BOOKS:

R1 - Andrew S Tanenbaum, "Computer networks", Prentice Hall of India, New Delhi, 2010.

R2 - William Stallings, "Data and Computer Communication", Prentice Hall of India, New Delhi, 2007

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3		-	-		3	-	3	3	2
CO2	3	3	3	3	3		-	-	-	3	-	3	3	3
CO3	3	3	3	3	3		-	-	-	-	-	3	3	3
CO4	3	3	3	3	3		-		3	-	-	3	3	3
CO5	3	3	3	3	3		-	-	3	3	-	3	3	2
AVG	3	3	3	3	3		-	-	3	3	-	3	3	2.6

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Programme	Course code	Name of the course	L	T	P	C
BE	21EC5202	Digital Signal Processing	2	0	2	3

Course Objective	1. To learn discrete Fourier transform and its properties. 2. To know the characteristics of IIR filters. 3. To learn the design of Finite Impulse Response filters. 4. To understand Finite word length effects. 5. To study the concept of MultirateSignal Processing.

Unit	Description	Instructional Hours
I	**DISCRETE FOURIER TRANSFORM** Introduction to DFT–FFT Algorithms –Radix 2 FFT algorithms, Decimation in time Algorithms, Decimation in frequency Algorithms, Inverse DFT using FFT	7
II	**IIR FILTER DESIGN** IIR filter design: Butterworth approximation using Impulse Invariance Transform and Bilinear transformation, Chebyshev approximation using Impulse Invariance Transform and Bilinear transformation .(LPF)	7
III	**FIR FILTER DESIGN** Linear phase realization of FIR filters-Design of linear phase FIR filters using Windows (Rectangular Window, Hamming Window, Hanning Window)- FIR filter Design using Frequency sampling method.	7
IV	**FINITE WORDLENGTH EFFECTS** Quantization by Truncation and Rounding – Quantization of filter coefficients – Product quantization error - Limit cycle oscillations in recursive systems: Zero input limit cycle oscillation, Overflow limit cycle oscillation – Scaling to prevent Overflow.	7
V	**MULTI RATE DIGITAL SIGNAL PROCESSING** Decimation, Interpolation, Sampling rate conversion by a rational factor, Applications of Multirate Signal Processing:Subband Coding of Speech signals.	7
	List of Experiments	
	1. Spectral analysis using FFT algorithms. 2. Filtering very long sequence using sectioned convolution. 3. Design of FIR filters using Rectangular, Hamming and Hanningwindows. 4. Design of Digital IIR filters using Bilinear and Impulse Invariant Transforms. 5. Analysis of limit cycle oscillations in recursive digital filters due to quantization.	10
Total Instructional Hours		45

Course Outcome	**On the completion of the course the students could able to:** CO1-Apply DFT for the analysis of digital signals & systems CO2-Design IIR Butterworth and Chebyshev filters CO3-Design FIR filters and apply them in real time applications of information processing CO4-Illustrate finite word length effects on filters CO5-Design and implement Multirate filters

TEXT BOOKS

1. John G. Proakis& Dimitris G.Manolakis, "Digital Signal Processing – Principles, Algorithms & Applications", Fourth Edition, Pearson Education / Prentice Hall, 2007. (Unit I, II, III,IV)
2. A .NagoorKani, "Digital Signal Processing", 2010 Edition,Mc Graw Hill Education (India) Pvt. Ltd (Unit V)

REFERENCE BOOK

1. Emmanuel C..Ifeachor, &Barrie.W.Jervis, "Digital Signal Processing", Second Edition, Pearson Education, Prentice Hall, 2002
2. Sanjit K. Mitra, "Digital Signal Processing – A Computer Based Approach", Mc Graw Hill, 2007

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3. Andreas Antoniou, "Digital Signal Processing", Mc Graw Hill, 2006

4. A.V.Oppenheim, R.W. Schafer and J.R. Buck, "Discrete-Time Signal Processing", 8th Indian Reprint, Pearson,2004

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	3		-	-	-	-	-	3	2	3
CO2	3	2	2	3	3		-	-	-	-	-	3	3	3
CO3	2	3	3	2	3		-	-	-	-	-	3	3	3
CO4	3	3	3	2	2		-	-	-	-	-	3	3	3
CO5	3	3	3	3	2		-	-	-	-	-	3	2	3
AVG	2.8	2.8	2.8	2.6	2.6		-	-	-	-	-	3	2.6	3

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Programme	Course code	Name of the course	L	T	P	C
BE	21EC5001	VLSI Design Lab	0	0	3	1.5

Course Objective	1. To learn Hardware Descriptive Language(Verilog). 2. To learn fusing of logical modules on FPGAs. 3. To learn the fundamental principles of VLSI circuit design in digital and analog domain.

Expt.No.	Description of the Experiments	
1	Write Verilog Code for the following circuits and their Test Bench for verification, do the initial timing verification and observe the waveform. 1. Basic logical gates. 2.Half and full adder 3.8-bit adder. 4.Flip flop -RS, D and JK 5.4 bit up/down counter 6.Multiplier minimum 4 bit	
2	Synthesize and implement 8 bit adder, 4 bit up/down counter and multiplier (minimum 4 bit) in a FPGA.	
3	Design an Inverterusing CMOS and complete the design flow mentioned below: i. Draw the schematic and verify the DC Analysis and Transient Analysis ii.Draw the Layout and verify the Design Rule Check and ERC iii. Check for Layout verses schematic iv. Extract RC and back annotate the same and verify the Design v. Verify for Time, Power and Area.	
	Total Instructional Hours	**45**

Course Outcome	CO1-Write HDL code for basic as well as advanced digital integrated circuits. CO2-Import the logic modules into FPGA Boards and Synthesize digital logics on FPGA CO3-Design the layouts of Analog IC Blocks using EDA tools. CO4-Simulate the layouts of Analog IC Blocks using EDA tools. CO5-Extract the layouts of Analog IC Blocks using EDA tools.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3		-		3	2	-	3	3	3
CO2	3	3	3	3	3		-		3	2	-	3	3	3
CO3	3	3	3	3	3		-		3	2	-	3	3	3
CO4	3	3	3	3	3		-		3	2	-	3	3	3
CO5	3	3	3	3	3		-		3	2	-	3	3	3
AVG	3	3	3	3	3		-		3	2	-	3	3	3

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Programme	Course code	Name of the course	L	T	P	C
BE	21EC5002	Microprocessor and Micro Controller Lab	0	0	3	1.5

Course Objective	1.Introduce ALP concepts and features 2. Write ALP for arithmetic and logical operations in 8086 and 8051 3. Differentiate Serial and Parallel Interface 4. Interface different I/Os with Microprocessors 5. Be familiar with MASM

Expt.No.	Description of the Experiments
	Using 8086 Micro processor and MASM software
1.	Basic arithmetic and Logical operations.
2.	Code conversion and decimal arithmetic
3.	Matrix operations
4.	Searching
5.	Sorting
	Using 8086 Micro processor and Interfacing
6.	Parallel interface
7.	Key board and Display interface
8.	Serial interface
9.	A/D and D/A interface
	Using 8051 Micro controller
10.	Basic arithmetic and Logical operations
11.	Square and Cube program, Find 2's complement of a number
12.	Stepper motor control interface
	Total Instructional Hours 45

Course Outcome	CO1- Understand and implement programs on 8086 microprocessors. CO2-Design I/O circuits. CO3-Assess Memory Interfacing circuits. CO4-Interpret and implement 8051 microcontroller-based systems. CO5-Develop various interfacing and its programming methodologies

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	3		-		-	-	-	2	3	3
CO2	3	3	3	3	3		-		3	-	-	2	2	3
CO3	3	2	2	2	3		-		2	-	-	-	3	3
CO4	3	3	3	2	3		-		3	-	-	3	2	3
CO5	3	3	2	3	3		-		3	-	-	3	3	3
AVG	3	2.8	2.4	2.4	3		-		2.8	-	-	2.5	2.6	3

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Programme	Course Code	Course Title	L	T	P	C
BE/BTECH	19HE5071	Soft Skills - I	1	0	0	1

Course Objectives:	1.To employ soft skills to enhance employability and ensure workplace and career success. 2.To enrich students' numerical ability of an individual and is available in technical flavor. 3.To interpret things objectively, to be able to perceive and interpret trends to make generalizations and be able to analyze assumptions behind an argument/statement.

Unit	Description	Instructional Hours
I	**Introduction to Soft Skills:** Introduction- Objective -Hard vs Soft Skills - Measuring Soft Skills- Structure of the Soft Skills -Self Management-Critical Thinking-Reflective thinking and writing- p2p Interaction	3
II	**Art of Communication:** Verbal Communication - Effective Communication - Active listening –Paraphrasing - Feedback - Non-Verbal Communication – Roles-Types- How nonverbal communication can go wrong- How to Improve nonverbal Communication - Importance of feelings in communication - dealing with feelings in communication.	4
III	**World of Teams:** Self Enhancement - importance of developing assertive skills- developing self-confidence – developing emotional intelligence - Importance of Team work – Team vs. Group - Attributes of a successful team – Barriers involved - Working with Groups – Dealing with People- Group Decision Making.	3
IV	**Quantitative Aptitude:** Averages - Profit and loss - Partnerships - Time and work - Time, Speed and Distance - Problems based on trains - Problems based on boats and streams	3
V	**Logical Reasoning:** Clocks - Calendars - Direction Sense - Data Interpretation: Tables, Pie Chart, Bar Graph - Data Sufficiency	2

Course Outcome:	CO1:	Students will have clarity on their career exploration process and to match their skills and interests with a chosen career path.
	CO2:	Students will develop knowledge, skills, and judgment around human communication that facilitate their ability to work collaboratively with others
	CO3:	Students will understand how teamwork can support leadership skills
	CO4:	Students will be able to make sense of problems, develop strategies to find solutions, and persevere in solving them.
	CO5:	Students will demonstrate an enhanced ability to draw logical conclusions and implications to solve logical problems.

REFERENCE BOOKS:

R1:	Soft Skills Training: A Workbook to Develop Skills for Employment - Frederick H. Wentz
R2:	How to prepare for data interpretation for CAT by Arun Sharma.
R3:	How to Crack TEST OF REASONING in all competitive examinations by Jaikishan and Premkishan.
R4:	A New Approach To Reasoning Verbal & Non-Verbal By B.S. Sijwali
R5:	Quantitative Aptitude for Competitive Examinations - Dr. R.S. Aggarwal, S. Chand

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	1	2	3	2	2	2	3	-	3	2	3
CO2	3	3	1	1	2	3	2	2	2	3	-	3	2	3
CO3	3	3	1	1	2	3	2	2	2	3	-	3	2	3
CO4	3	3	1	1	2	3	2	2	2	3	-	3	2	3
CO5	3	3	1	1	2	3	2	2	2	3	-	3	2	3
AVG	3	3	1	1	2	3	2	2	2	3	-	3	2	3

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Programme	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech.	21HE5072	**DESIGN THINKING**	1	0	0	1

Course Objective	OBJECTIVES: • To expose students to the design process • To develop and test innovative ideas through a rapid iteration cycle. • To provide an authentic opportunity for students to develop teamwork and leadership skills

Unit	Description	Instructional Hours
I	**DESIGN ABILITY** Asking Designers about what they Do – Deconstructing what Designers Do – Watching what Designers Do – Thinking about what Designers Do – The Natural Intelligence of Design Sources	4
II	**DESIGNING TO WIN** Formula One Designing – Radical Innovations – City Car Design – Learning From Failures – Design Process and Working Methods	4
III	**DESIGN TO PLEASE AND DESIGNING TOGETHER** Background – Product Innovations – Teamwork versus Individual work – Roles and Responsibilities – Avoiding and Resolving Conflicts.	4
IV	**DESIGN EXPERTISE** Design Process – Creative Design - Design Intelligence – Development of Expertise – Novice to Expert. Critical Thinking – Case studies: Brief history of Albert Einstein, Isaac Newton and Nikola Tesla	3
	Total Instructional Hours	**15**

Course Outcome	Upon completion of the course, students will be able to CO1: Develop a strong understanding of the Design Process CO2: Learn to develop and test innovative ideas through a rapid iteration cycle. CO3: Develop teamwork and leadership skills

TEXT BOOKS:

T1 -Nigel Cross, "Design Thinking", Kindle Edition.

REFERENCE BOOKS:

R1 - Tom Kelley, "Creative Confidence", 2013.

R2 - Tim Brown, "Change by Design", 2009.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	1	2	3	2	2	2	3	-	3	2	3
CO2	3	3	1	1	2	3	2	2	2	3	-	3	2	3
CO3	3	3	1	1	2	3	2	2	2	3	-	3	2	3
CO4	3	3	1	1	2	3	2	2	2	3	-	3	2	3
CO5	3	3	1	1	2	3	2	2	2	3	-	3	2	3
AVG	3	3	1	1	2	3	2	2	2	3	-	3	2	3

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Programme	Course Code	Name of the Course	L	T	P	C
BE	21EC6202	Antenna and Wave Propagation	3	1	0	4

Course Objective	1. To provide an insight of the radiation phenomena and the antenna parameters 2. To teach the radiation characteristics of different types of aperture and slot antennas 3. To study the radiation mechanism of array antennas 4. To impart knowledge on special antennas and antenna measurements 5. To understand the propagation of radio waves and various types of wave propagation

Unit	Description	Instructional Hours
I	**FUNDAMENTALS OF RADIATION:** Definition of antenna parameters – Gain, Directivity, Effective aperture, Radiation Resistance, Band width, Beam width, Input Impedance. Matching – Baluns, Polarization mismatch, Antenna noise temperature, Radiation from Oscillating dipole, Half-wave dipole, Folded dipole, Yagi array	12
II	**APERTURE AND SLOT ANTENNAS:** Radiation from rectangular apertures, Uniform and Tapered aperture, Horn antenna, Reflector antenna, Aperture blockage, Feeding structures, Slot antennas, Microstrip antennas – Radiation mechanism – Applications	12
III	**ANTENNA ARRAYS:** Point Source, Array of Two-point sources, N -Element Uniform Linear Array, Broad-Side array, End-Fire Array, Pattern multiplication, Concept of Phased arrays, Adaptive array, Antenna synthesis-Binomial array.	12
IV	**SPECIAL ANTENNAS:** Frequency independent antennas –Spiral antenna, Helical antenna, Log periodic Antenna. Modern antennas- Reconfigurable antenna, Active antenna, Dielectric antennas, Electronic band gap structure and applications, Antenna Measurements-Test Ranges, Measurement of Gain, Radiation pattern, Polarization, VSWR	12
V	**PROPAGATION OF RADIO WAVES:** Modes of propagation , Structure of atmosphere , Ground wave propagation, Tropospheric propagation , Duct propagation, Troposcatter propagation , Flat earth and Curved earth concept, Sky wave propagation – Virtual height, critical frequency, Maximum usable frequency – Skip distance, Fading , Multi hop propagation	12
	Total Instructional Hours	60

Course Outcome	After completion of the course the learner will be able to CO1-Understand the radiation phenomena and the antenna parameters CO2-Interpret the radiation characteristics of different types of aperture and slot antennas CO3-Discriminate the radiation mechanism of various types of array antennas. CO4-Analyze the purpose on special antennas and some of the basic antenna measurements CO5-Understand the characteristics of different types of radio wave propagation at different frequencies

TEXT BOOKS:

T1- John D Kraus, Ronald J Marhefka, Ahmad S Khan "Antennas and Wave Propagation", Fifth Edition, Mc Graw Hill Education (India) Private Limited, Special Edition 2012. Unit-I-IV

T2 - K.D.Prasad, "Antenna and Wave propagation", Satya Prakashan Publishers, Third Reprint Edition, 2016 Unit-I-V

REFERENCE BOOKS:

R1- Constantine.A.Balanis "Antenna Theory Analysis and Design", Third Edition, Wiley India Pvt.Ltd., Reprint 2016- Unit-I,III&IV

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R2 - Edward.C.Jordan and Keith G.Balmain, "Electromagnetic Waves and Radiating Systems", Second Edition, PHI Learning Private Limited, 2011. Unit-V

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	**3**	3	3	3	-		-		-	-	-	**3**	3	**2**
CO2	**3**	3	3	3	-		-		-	-	-	**3**	3	**2**
CO3	**3**	3	3	3	-		-		-	-	-	**3**	3	**2**
CO4	**3**	3	3	3	-		-		-	-	-	**3**	3	**2**
CO5	**3**	3	3	3	-		-		-	-	-	**3**	3	**2**
AVG	**3**	3	3	3	-		-		-	-	-	**3**	3	**2**

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Programme	Course Code	Name of the Course	L	T	P	C
BE	21EC6181	Principles of Management	3	0	0	3

Course Objective

The student should be able to
1. Acquire fundamental knowledge on management and organization
2. Extend the knowledge about the planning strategies.
3. Understand the nature of organizing and organization
4. Gain knowledge about the role of communication and types of leadership
5. Understand the system and process of controlling.

Unit	Description	Instructional Hours
I	**OVERVIEW OF MANAGEMENT AND ORGANIZATION** Definition of Management – Science or Art – Manager Vs Entrepreneur – types of managers -managerial roles and skills – Evolution of Management – Scientific, human relations , system and contingency approaches – Types of Business organization – Sole proprietorship, partnership, company-public and private sector enterprises – Organization culture and Environment – Current trends and issues in Management.	9
II	**PLANNING** Nature and purpose of planning – planning process – types of planning – objectives – setting objectives – policies – Planning premises – Strategic Management – Planning Tools and Techniques – Decision making steps and process.	9
III	**ORGANIZING** Nature and purpose – Formal and informal organization – organization chart – organization structure – types – Line and staff authority – departmentalization – delegation of authority –centralization and decentralization – Job Design – Human Resource Management – HR Planning, Recruitment, selection, Training and Development, Performance Management , Career planning and management	9
IV	**DIRECTING** Foundations of individual and group behaviour – motivation – motivation theories – motivational techniques – job satisfaction – job enrichment – leadership – types and theories of leadership –communication – process of communication – barrier in communication - effective communication –communication and IT.	9
V	**CONTROLLING** System and process of controlling – budgetary and non-budgetary control techniques – use of computers and IT in Management control – Productivity problems and management – control and performance – direct and preventive control – reporting.	9
	Total Instructional Hours	45

Course Outcome

After completion of the course the learner will be able to
CO1-Analyze strategies to handle the given issues in management
CO2-Discuss the nature of decision-making process
CO3-Analyze the types of organization structure and departmentation.
CO4-Evaluate the theories of leadership.
CO5-Understand the techniques of budgetary and non – budgetary control.

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TEXT BOOKS:

T1 - Harold Koontz & Heinz Weihrich ,A.RamachandraAryasri , "Principles of management" ,2 Edition, Tata Mc Graw Hill, 2016 -UNIT (1to 5)

T2- Tripathy PC & Reddy PN, "Principles of Management", Tata McGraw Hill, 5th Edition UNIT (1to 5)

REFERENCE BOOKS:

R1- Stephen A. Robbins & David A. Decenzo& Mary Coulter, "Fundamentals of Management" 7th Edition, Pearson Education, 2011

R2 - Robert Kreitner&MamataMohapatra, "Management", Biztantra, 2008.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2								2	2	2	3	2	1
CO2	1								-	1	2	3	2	1
CO3	2								3	1	2	3	2	2
CO4	-								3	3	2	3	1	3
CO5	1								2	3	2	3	1	3
AVG	1.5								2.5	2	2	3	1.6	2.2

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Programme	Course Code	Name of the Course	L	T	P	C
BE	21EC6251	Embedded Systems and IoT	2	0	3	3.5

Course Objective

The student should be able to

1. Learn the internal architecture and interfaces of an embedded system.
2. Understand the concepts of real-time operating systems.
3. Build a small low-cost embedded and IoT system using Raspberry Pi/open platform.
4. Get an idea where the application areas are available for the Internet of Things.
5. Survey successful IoT products and solutions to analyze their architecture and technologies.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO EMBEDDED SYSTEMS** Introduction to Embedded Systems – Classification – Major Applications – General purpose and Domain specific processors – Sensors and Actuators – Communication Interfaces.	7
II	**REAL TIME OPERATING SYSTEMS** OS Basics – Types – Tasks – Process and Threads – Multiprocessor and Multitasking – VxWorks – MicroC/OS-II.	6
III	**GETTING STARTED WITH RASPBERRY PI** About the Board – Linux on Raspberry Pi - Interfaces - Programming Raspberry Pi with python – Examples.	5
IV	**OVERVIEW OF IoT UNDERSTANDING** Introduction – Physical and Logical design of IoT – IoT Enabling Technologies – IoT levels and deployment templates.	6
V	**APPLICATION DEVELOPMENT** Home Automation – Cities – **Environment**: Weather monitoring system – Forest Fire detection – Agriculture – Productivity Applications.	6
	Practicals- IoT 1. Study of ARM Processor 2. LED blinking usingARM 3. ADC and temperature sensor interfacing withARM 4. Installation of OS in RaspberryPi 5. GPIO Control over WebBrowser 6. Communicating data usingon-boardmodule 7. Home automation usingPi 8. Node-RED, MQTTProtocol 9. Using Node-RED Visual Editor onRpi 10. IoT Applications based onPi	15
	Total Instructional Hours	45

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Course Outcome	After completion of the course the learner will be able to CO1-Design and development of embedded systems applications. CO2-Analyze the real time operating system concepts and scheduling of the process. CO3-Apply the concepts of RTOS using Raspberry Pi /open platform. CO4-Understand the IoT fundamentals using IoT enabling Technologies. CO5-Explore deployment platforms for IoT applications and automation

TEXT BOOKS:

T1-Introduction to Embedded System, Shibu.K.V, McGraw and Hill Education, 13th Edition, 2014. (Unit 1&2).

T2- Internet of Things: An hands on approach, ArshdeepBahga, Vijay Madisetti, University Press, 2014. (Unit 3, 4, 5).

REFERENCE BOOKS:

R1 - Raspberry Pi cookbook: Software and hardware problems and solutions, Monk, Simon. O'Reilly Media, Inc., 2016.

R2- The Internet of Things: Applications to the Smart Grid and Building Automation by – Olivier Hersent, Omar Elloumi and David Boswarthick – Wiley Publications -2012.

R3- Robert Barton, Patrick Grossetete, David Hanes, Jerome Henry, Gonzalo Salgueiro,"IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for theInternet of Things", CISCO Press, 2017.

R4- Wayne Wolf, "Computers as Components: Principles of Embedded ComputerSystem Design", Elsevier, 2006.

R5-Andrew N Sloss, D. Symes, C. Wright, "Arm System Developers Guide", MorganKauffman/ Elsevier, 2006.

R6- IOT (Internet of Things) Programming: A Simple and Fast Way of Learning,IoT Kindle Edition.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	-		-	-	3	3		3	3	2
CO2	3	3	3	3	3		-	-	-	3		3	3	3
CO3	3	3	3	3	3		-	-	-	-		3	3	3
CO4	3	3	3	3	-		-	-	3	-		-	3	3
CO5	3	3	3	3	3			-	3	3		3	3	2
AVG	3	3	3	3	3			-	3	3		3	3	2

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Programme	Course Code	Name of the Course	L	T	P	C
BE	21EC6001	Digital Communication Lab	0	0	3	1.5

S.NO	LIST OF EXPERIMENTS
1.	Signal Sampling and TDM.
2.	Pulse Amplitude Modulation.
3.	Pulse Code Modulation and Demodulation.
4.	Line Coding Schemes.
5.	Pulse Width and Pulse Time Modulation
	SIMULATION EXPERIMENTS
6.	Generation and Detection of Delta modulation Scheme.
7.	ASK Modulator and Demodulator.
8.	Simulation of FSK schemes.
9.	Signal constellations of BPSK and QPSK .
10.	Simulation of Communication Channel(AWGN).
	TOTAL PRACTICAL HOURS 45
Course Outcome	CO1-Design sampling and reconstruction for given signal CO2-Interpret multiplex signals without aliasing effect. CO3-Analyze the performance of various Pulse Modulations and Demodulation. CO4-Understand & Implement the various bandpass modulation/demodulation schemes CO5-Design a communication channel

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	2	3		-		3	2	3	3	3	3
CO2	3	2	3	2	3		-	-	3	2	3	3	3	3
CO3	2	3	3	2	3		-	-	3	2	3	3	3	3
CO4	3	3	3	2	3		-	-	3	3	3	3	3	3
CO5	3	3	3	2	3		-	-	3		2	3	3	3
AVG	2.6	2.6	3	2	3		-	-	3	2.2	2.8	3	3	3

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Programme	Course Code	Name of the Course	L	T	P	C
BE	21EC6701	Internship	0	0	0	1

Course Objective	1. To provide students with opportunities to make connections between the theory and practice of academic study and the practical application of that study in a professional work environment. 2. Gain insight into a possible career path of interest while learning about the industry in which the organization resides, organizational structure, and roles and responsibilities within that structure 3. Develop professional connections and identify a strategy for maintaining those connections.

S.NO.	Description
1.	Conduct an informational interview with an individual at your organization other than your site supervisor to explore a profession of interest and summarize your findings.
2.	Analyze your internship experience, reflecting on lessons learned and how your liberal arts education prepared you for the internship.
3.	Add details about your experience including new skills developed and results obtained during the internship.

Course Outcome	CO1-Ability to articulate what was learned and how it will be apply to your professional goals CO2-Identify about of professions that may be of interest as a result of this experiences CO3-Develop additional skills that will need to be developed to ensure CO4-Create a new technology, career readiness include learning a new technology..

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	3	2	3	3	2	3	3	3	3
CO2	3	3	3	3	3	3	2	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	2	3	3	2	3	3	3	3
CO4	3	3	3	3	3	3	2	3	3	3	3	3	3	3
AVG	3	3	3	3	3	3	2	3	3	2.5	3	3	3	3

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Programme	Course Code	Course Title	L	T	P	C
BE/BTECH	21HE6071	Soft Skill-II	1	0	0	1

Course Objectives:

1. To make the students aware of the importance, the role and the content of soft skills through instruction, knowledge acquisition, demonstration and practice.
2. To learn everything from equations to probability with a completely different approach.
3. To make the students learn on an increased ability to explain the problem comprehensively.

Unit	Description	Instructional Hours
I	**Group Discussion & Presentation Skills:** GD skills – Understanding the objective and skills tested in a GD – General types of GDs – Roles in a GD – Do's & Don'ts – Mock GD & Feedback. - Presentation Skills – Stages involved in an effective presentation – selection of topic, content, aids – Engaging the audience – Time management – Mock Presentations & Feedback	4
II	**Interview Skills and Personality Skills:** Interview handling Skills – Self preparation checklist – Grooming tips: do's & don'ts – mock interview & feedback - Interpersonal skills-creative thinking-problem solving-analytical skills	3
III	**Business Etiquette & Ethics:** Etiquette – Telephone & E-mail etiquette – Dining etiquette – do's & Don'ts in a formal setting – how to impress. Ethics – Importance of Ethics and Values – Choices and Dilemmas faced – Discussions from news headlines.	3
IV	**Quantitative Aptitude:** Permutation, Combination - Probability - Logarithm - Quadratic Equations - Algebra - Progression - Geometry - Mensuration.	3
V	**Logical Reasoning:** Logical Connectives - Syllogisms - Venn Diagrams – Cubes - Coded inequalities - Conditions and Grouping	2

Course Outcome:

CO1:	Students will have learnt to keep going according to plan, coping with the unfamiliar, managing disappointment and dealing with conflict.
CO2:	Students will Actively participate meetings, Group Discussions / interviews and prepare & deliver presentations
CO3:	Students will define professional behavior and suggest standards for appearance, actions and attitude in a Business environment
CO4:	Students will be able to apply quantitative reasoning and mathematical analysis methodologies to understand and solve problems.
CO5:	Students will excel in complex reasoning.

REFERENCE BOOKS

R1:	Bridging the Soft Skills Gap: How to Teach the Missing Basics to Todays Young Talent- Bruce Tulgan
R2:	Quantitative Aptitude for Competitive Examinations (5th Edition) - Abhjit Guha
R3:	How to crack test of Reasoning - Jaikishan and Premkishan
R4:	The hand on guide to Analytical Reasoning and Logical Reasoning - Peeyush Bhardwaj

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Programme	Course Code	Course Title	L	T	P	C
BE/BTECH	21HE6072	**Intellectual Property Rights (IPR)**	1	0	0	1

Course Objectives:

1. To introduce fundamental aspects of Intellectual property Rights to students who are going to play a major role in development and management of innovative projects in industries.
2. To disseminate knowledge on patents, patent regime in India and abroad and registration aspects.
3. To disseminate knowledge on copyrights and its related rights and registration aspects.
4. To disseminate knowledge on trademarks and registration aspects.
5. To disseminate knowledge on Design, Geographical Indication (GI) and their registration aspects.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO INTELLECTUAL PROPERTY** Introduction, Types of Intellectual Property, International Organizations, Agencies and Treaties, Importance of Intellectual Property Rights.	3
II	**PATENTS** Patents -Elements of Patentability: Novelty, Non-Obviousness (Inventive Steps), Industrial Application -Non -Patentable Subject Matter -Registration Procedure, Rights and Duties of Patentee, Assignment and license.	3
III	**COPYRIGHTS** Purpose And Function Of Trade Marks, Acquisition Of Trade Mark Rights, Protectable Matter, Selecting And Evaluating Trade Mark, Trade Mark Registration Processes.	3
IV	**TRADEMARKS** Concept of Trademarks -Different kinds of marks (brand names, logos, signatures, symbols, well known marks, certification marks and service marks) -Non-Registrable Trademarks - Registration of Trademarks.	3
V	**DESIGN AND GEOGRAPHICAL INDICATION** Design: meaning and concept of novel and original -Procedure for registration. Geographical indication: meaning, and difference between GI and trademarks -Procedure for registration.	3

Course Outcome:

CO1:	Identify different types of Intellectual Properties (IPs), the right of ownership, scope of protection as well as the ways to create and to extract value from IP.
CO2:	Recognize the crucial role of IP in organizations of different industrial sectors for the purposes of product and technology development.
CO3:	Identify, apply and assess ownership rights and marketing protection under intellectual property law as applicable to information, ideas, new products and product marketing.
CO4:	Identify different types of trademarks and procedure for registration
CO5:	Recognize the concept of design, geographical indication and procedure for registration

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	1	2	3	2	2	2	3	-	3	2	3
CO2	3	3	1	1	2	3	2	2	2	3	-	3	2	3
CO3	3	3	1	1	2	3	2	2	2	3	-	3	2	3
CO4	3	3	1	1	2	3	2	2	2	3	-	3	2	3
CO5	3	3	1	1	2	3	2	2	2	3	-	3	2	3
AVG	3	3	1	1	2	3	2	2	2	3	-	3	2	3

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Professional Elective I

Programme	Course Code	Name of the Course	L	T	P	C
BE	21EC5301	Measurements and Instrumentation	3	0	0	3

Course Objective

The student should be able to

1. Know the concept of measurements and learn the use of DC & AC bridges.
2. Understand the working principle of electronic instruments.
3. Learn the use of different types of signal generators and analyzers.
4. Understand the use of different types of transducers.
5. Learn the principle of working and applications of digital data acquisition system and fiber optic measurements.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO MEASUREMENT SYSTEMS & INDICATING EQUIPMENTS** Introduction to Instruments & their Representation, Static & Dynamic characteristics of Instruments, Types Of Errors-Error Analysis. PMMC, DC Ammeters & Voltmeters, Multimeter or VOM, Calibration of DC Instruments Bridge Measurements: Wheatstone, Kelvin, Maxwell, Schering and Wien Bridge.	9
II	**ELECTRONIC INSTRUMENTS FOR MEASURING & RECORDING** AC Voltmeter using Rectifier, True RMS-Responding voltmeters, Electronic Multimeter Digital Voltmeter, Q meter, Cathode Ray Oscilloscope (CRO), Recorders: Galvanometric, Servo type Potentiometric, Magnetic type & Digital Recorder.	9
III	**SIGNAL GENERATION & SIGNAL ANALYSIS** Sine wave generator, Frequency synthesized signal generator, Sweep frequency generators Function generators-Audio frequency signal generation. Wave analyzers - Harmonic distortion analyzer -spectrum analysis.	9
IV	**TRANSDUCERS** Classification of Transducers-Selecting a Transducer -Strain Gages-Displacement Transducers- Pressure Measurements, Temperature Measurements- Non-Electrical , Electrical & radiation methods. Flow Measurements.	9
V	**DATA ACQUISITION SYSTEMS AND FIBER OPTIC MEASUREMENTS** Elements of a Digital Data Acquisition System - Interfacing Transducers to Electronic Control & Measuring Systems - Multiplexing - Computer Controlled Test Systems: Testing of Audio Amplifier & Radio Receiver, - IEEE 488 Bus & Electrical interface - Fiber Optic Measurements: Power Measurement and System Loss - Optical Time Domains Reflectometer.	9
	Total Instructional Hours	**45**

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Course Outcome	After completion of the course the learner will be able to CO1: Understand the measurements concept and usage of AC/DC bridges. CO2: Explore knowledge on Electronic Instruments. CO3: Explain the different types of Signal generators and CRO. CO4: Identify various types of transducers and their working. CO5: Learn the various process of computer controlled instrumentation.

TEXT BOOKS:

T1- Albert D.Helfrick and William D.Cooper, Modern Electronic Instrumentation and Measurement Techniques, PHI, 2003. (Unit I to V)

T2- Ernest O.Doebelin, Measurements System-Application & Design, McGraw-Hill,1990,Fourth Edition.(Unit I to Unit V)

REFERENCE BOOKS:

R1 - B.C.Nakara, K.K.Chaudhry, Instrumentation Measurement and Analysis , McGraw - Hill , 2004. . (Unit I & IV)

R2 - J.B.Gupta, "A Course In Electronics And Electrical Measurements And Instrumentation", S.K.Kataria and sons,2013

R3 - A.K.Sawhney, "A Course In Electrical And Electronic Measurement And Instrumentation" ,Dhanpat Raj and Sons,2005 (Unit I, II, III, V)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2				-	-	-	2	3	3
CO2	3	3	3	3	3		-	-		-	-	2	2	3
CO3	3	2	2	2	2		-	-		-	-	-	3	3
CO4	3	3	3	2	2		-	-		-	-	3	2	3
CO5	3	3	2	3	3		-	-		-	-	3	3	3
AVG	3	2.8	2.4	2.4	2.4		-	-		-	-	2.5	2.6	3

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Programme	Course Code	Name of the Course	L	T	P	C
BE	21EC5302	PCB Design	3	0	0	3

Course Objective

1. To describe the basics, layout planning and design in the field of Printed Circuit boards.
2. To design the PCB deals with the various considerations for special circuits.
3. To learn the Image Transfer, Plating and Etching techniques.
4. To know the different technology involves in the Printed Circuit Boards.
5. To summarize the PCB Technology trends.

Unit	Description	Instructional Hours
I	**BASICS OF PRINTER CIRCUIT BOARDS** Component of a PCB – Classification of PCB - Manufacturing of Basic PCB – Layout planning: General PCB considerations – Electrical Design Considerations –Layout Design: Layout Scale – Layout Sketch / Design – Layout considerations.	9
II	**DESIGN CONSIDERATIONS FOR SPECIAL CIRCUITS** Design Rules for Analog Circuits: Components and Placement – Signal Conductors – Supply and Ground Connectors – General Rules for design of Analog PCBs. Design Rules for Digital Circuits: Transmission Lines. Design rules for PCBs for High frequency circuits, Fast Pulse Circuits, Microwave Circuits and Power Electronic Circuits.	9
III	**IMAGE TRANSFER, PLATING AND ETCHING TECHNIQUES** Image Transfer Techniques: Laminates Surface Preparation – Screen Printing – Pattern Transferring Techniques – Printing Inks – Printing Process - Photo Painting - Laser Diode Imaging(LDI) - Plating Process : need for Plating – Plating Techniques - Special plating Techniques - Etching Techniques : Etching Parameters – Equipment and Techniques - Optimizing Etchant Economy	9
IV	**TECHNOLOGY OF PRINTED CIRCUIT BOARDS** Film Master Production: Emulsion Parameters – Film Emulsions – Dimensional Stability of Film Masters – Reprographic Cameras – Film Processing - Film Registration - Photo printing: Basic processes for Double sided PCBs – Wet Film resists and Dry Film resists.	9
V	**PCB TECHNOLOGY TRENDS** Fine–line Conductors with Ultra Thin copper Foil - Multilayer Boards - Multiwire Boards – Subtractive - Semi-Additive Processes – Additive Processes – Flexible Printed Circuit Boards – Metal Core Circuit Boards – Mechanical Milling of PCBs.	9
	Total Instructional Hours	45

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Course Outcome	After completion of the course the learner will be able to CO1: Explain the basics PCB and layout design considerations. CO2: Enumerate PCB Design considerations in Special circuits. CO3: Enhance the knowledge in image transfer, plating and Etching techniques in PCBs. CO4: Recognize the various Technologies in Printed Circuit boards. CO5: Summarize the PCB technology trends.

TEXT BOOKS:

T1-R.S. Khandpur, "Printed Circuit Boards Design, Fabrication, Assemble and Testing", TMH, 2005. (Unit 1,2 & 3)

T2 - Walter C Bosshart , "Printed Circuits Boards Design and Technology" - Tata McGraw- Hill , 2008. (Unit 4 & 5)

REFERENCE BOOKS:

R1 - ChristoperT.Robertson, "PCB Designers Reference: Basics", Prentice Hall, First edition, 2003.

R2 - C.F.Coombs, "Printed Circuits Handbook", McGraw-Hill, 2001.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2				-	-	-	2	3	3
CO2	3	3	3	3	3		-	-		-	-	2	2	3
CO3	3	2	2	2	2		-	-		-	-	-	3	3
CO4	3	3	3	2	2		-	-		-	-	3	2	3
CO5	3	3	2	3	3		-	-		-	-	3	3	3
AVG	3	2.8	2.4	2.4	2.4		-	-		-	-	2.5	2.6	3

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Programme	Course Code	Name of the Course	L	T	P	C
BE	21EC5303	RF System Design	3	0	0	3

Course Objective	The student should be able to 1.To learn the various passive and active components for radio frequency circuits 2. To gain knowledge on microstrip line filters 3. To understand the working principle of active RF components for various applications. 4. To design biasing circuits for RF amplifiers 5. To learn various RF oscillators, Mixers, power dividers and couplers

Unit	Description	Instructional Hours
I	**INTRODUCTION TO RF DESIGN** Importance of RF design, Electromagnetic Spectrum, RF behavior of passive Components, Chip components and Circuit Board considerations, Scattering Parameters, Smith Chart and applications.	9
II	**RF FILTER DESIGN** Overview, Basic resonator and filter configuration, Special Filter Realizations, Filter Implementations, Unit element, KurodasIdentity , Coupled Filters.	9
III	**ACTIVE RF COMPONENTS & APPLICATIONS** RF Diodes, BJT, RF FETs, High electron mobility transistors; Matching and Biasing Networks – Impedance matching using discrete components, Microstrip line matching networks, Amplifier classes of operation and biasing networks.	9
IV	**RF AMPLIFIER DESIGN** Characteristics, Amplifier Power relations, Stability Considerations, Constant gain circles, Constant VSWR circles, Broadband, Low power,High power and multistage amplifiers.	9
V	**OSCILLATORS, MIXERS & APPLICATIONS** Basic oscillator Model - high frequency oscillator configuration - Basic characteristics of mixers - RF couplers - Wilkinson divider - Detector and demodulator circuits.	9
	Total Instructional Hours	45

Course Outcome	After completion of the course the learner will be able to CO1: Describe the various passive and active components for radio frequency circuits CO2: Design and analyze microstrip line filters CO3: Design matching networks using Smith chart CO4: Design biasing circuits for RF amplifiers CO5: Describe various RF oscillators, Mixers, power dividers and couplers.

TEXT BOOKS:

T1 - Reinhold Ludwig and Powel Bretchko, —RF Circuit Design – Theory and Applications‖, Pearson Education Asia, First Edition, 2011

T2- Joseph. J.Carr, —Secrets of RF Circuit Design‖, McGraw Hill Publishers, Third Edition, 2000

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REFERENCE BOOKS:
R1 -Matthew M.Radmanesh, — Radio frequency and Microwave Electronics ‖, Pearson Education Asia, 2nd Edition ,2002.
R2- Ulrich L. Rohde and David P. NewKirk, —RF/ microwave Circuit Design‖, John Wiley & Sons USA, 2000
R3-Roland E. Best, —Phase –Locked loops: Design, simulation and Applications‖, McGraw Hill Publishers , 5th Edition,2003

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2				-	-	-	2	3	3
CO2	3	3	3	3	3		-	-		-	-	2	2	3
CO3	3	2	2	2	2		-	-		-	-	-	3	3
CO4	3	3	3	2	2		-	-		-	-	3	2	3
CO5	3	3	2	3	3		-	-		-	-	3	3	3
AVG	3	2.8	2.4	2.4	2.4		-	-		-	-	2.5	2.6	3

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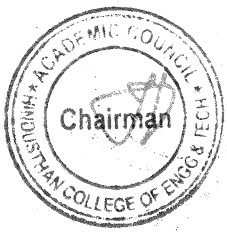

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Programme	Course code	Name of the Course	L	T	P	C
BE	21EC5304	Network Security	3	0	0	3

Course Objective

1. To impart knowledge on the Network security services, attacks and mechanisms.
2. To introduce the principles of block ciphers and stream ciphers
3. To enlighten the concepts of public key cryptography and the authentication techniques.
4. To give a clear idea on various Data Integrity algorithms and the methods used for key distribution
5. To understand the security services provided to internet.

Unit	Description	Instructional Hours
I	**INTRODUCTION** OSI security architecture –Security Services, Mechanisms and attacks-Network security model-Symmetric cipher model- substitution techniques, transposition techniques, steganography.	9
II	**SYMMETRIC CIPHERS** Block cipher principles- Data Encryption Standard(DES)-Advanced Encryption Standard (AES)-Multiple Encryption-Triple DES- modes of block cipher-stream ciphers-RC5 algorithm.	9
III	**ASYMMETRIC CIPHERS** Principles of public key cryptosystems-RSA algorithm-Key management – Diffie Hellman Key exchange- EI Gamal cryptography-Elliptic curve arithmetic-Elliptic curve cryptography.	9
IV	**MUTUAL TRUST , AUTHENTICATION AND DATA INTEGRITY** Mutual trust, Symmetric key distribution using symmetric encryption-symmetric key distribution using asymmetric encryption-distribution of public keys-X.509 Authentication services-Remote user- Authentication principles-Kerberos, Data integrity : Security of hash function and MAC –SHA - HMAC –DSS .	9
V	**INTERNET SECURITY:** Security Services for E-mail-Pretty Good Privacy-S/MIME. Overview of IP Security – IP security policy-Encapsulation Security Payload (ESP)-SSL/TLS Basic Protocol-combining security associations-Internet key exchange.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Analyze and apply the appropriate Cryptographic technique to overcome the security attacks.
CO2: Categorize Symmetric and asymmetric ciphers .
CO3: Develop Symmetric and asymmetric ciphers.
CO4: Develop a secured system with authentication and integrity services.
CO5: Apply the necessary internet security algorithm for various applications.

TEXT BOOKS:

T1- William Stallings, Cryptography and Network Security, 6th Edition, Pearson Education, March 2013.

T2- Behrouz A. Ferouzan, "Cryptography & Network Security", 3rd Edition, Tata Mc Graw Hill, 2007.

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REFERENCE BOOKS :

R1 - Charlie Kaufman, Radia Perlman and Mike Speciner, "Network Security", 2nd Edition, Prentice Hall of India, 2002.

R2 - Bruce Schneier and Neils Ferguson, "Practical Cryptography", First Edition, Wiley Dream tech India Pvt Ltd, 2003

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2				-	-	-	2	3	3
CO2	3	3	3	3	3		-	-		-	-	2	2	3
CO3	3	2	2	2	2		-	-		-	-	-	3	3
CO4	3	3	3	2	2		-	-		-	-	3	2	3
CO5	3	3	2	3	3		-	-		-	-	3	3	3
AVG	3	2.8	2.4	2.4	2.4		-	-		-	-	2.5	2.6	3

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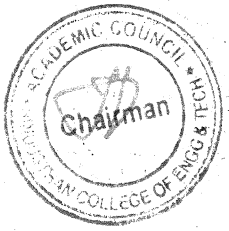

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Programme	Course Code	Name of the Course	L	T	P	C
BE	21EC5181	Total Quality Management	3	0	0	3

Course Objective	The student should be able to 1. To learn the quality philosophies and tools in the managerial perspective. 2. To learn the quality philosophies 3. To learn the various tools of TQM 4.To apply the statistical techniques in quality management 5. To make the students aware about the quality loss and its role in economy

Unit	Description	Instructional Hours
I	**UNIT I INTRODUCTION** Introduction - Need for quality - Evolution of quality - Definitions of quality - Dimensions of product and service quality - Basic concepts of TQM - TQM Framework - Contributions of Deming, Juran 95 and Crosby - Barriers to TQM - Customer focus - Customer orientation, Customer satisfaction, Customer complaints, Customer retention.	9
II	**TQM PRINCIPLES** Leadership - Quality Statements, Strategic quality planning, Quality Councils - Employee involvement - Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal - Continuous process improvement - PDCA cycle, 5S, Kaizen - Supplier partnership - Partnering, Supplier selection, Supplier Rating.	9
III	**TQM TOOLS AND TECHNIQUES I** The seven traditional tools of quality - New management tools - Six sigma: Concepts, Methodology, applications to manufacturing, service sector including IT - Bench marking - Reason to bench mark, Bench marking process - FMEA - Stages, Types.	9
IV	**TQM TOOLS AND TECHNIQUES II** Quality Circles - Cost of Quality - Quality Function Deployment (QFD) - Taguchi quality loss function - TPM - Concepts, improvement needs - Performance measures.	9
V	**QUALITY MANAGEMENT SYSTEM** Introduction—Benefits of ISO Registration—ISO 9000 Series of Standards—Sector-Specific Standards—AS 9100, TS16949 and TL 9000-- ISO 9001 Requirements—Implementation—Documentation—Internal Audits—Registration- ENVIRONMENTAL MANAGEMENT SYSTEM: Introduction—ISO 14000 Series Standards—Concepts of ISO 14001—Requirements of ISO 14001—Benefits of EMS.	9
	Total Instructional Hours	45

Course Outcome	After completion of the course the learner will be able to CO1: To make the students clear about the quality concepts. CO2: The different contributions of quality experts CO3: To apply the quality philosophies and tools CO4: To facilitate continuous improvement practices and ensure customer delight CO5: To make them understand the importance of quality awards as a competitive advantage.

TEXT BOOKS:

T1 - Dale H.Besterfield et al, Total Quality Management, Third edition, Pearson Education (First Indian Reprints 2004).

T2 - SubburajRamasamy, Total Quality Management, Sixth edition, Tata McGraw Hill Education(India) Pvt Ltd, Reprint 2015.

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REFERENCE BOOKS:
R1- James R. Evans and William M. Lindsay, "The Management and Control of Quality", 8 th Edition, First Indian Edition, Cengage Learning, 2012.
R2- Janakiraman. B and Gopal .R.K., "Total Quality Management - Text and Cases", Prentice Hall (India) Pvt. Ltd., 2006..
R3- Suganthi.L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd., 2006. R4- ISO9001-2015 standards

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2				-	-	-	2	3	3
CO2	3	3	3	3	3		-	-		-	-	2	2	3
CO3	3	2	2	2	2		-	-		-	-	-	3	3
CO4	3	3	3	2	2		-	-		-	-	3	2	3
CO5	3	3	2	3	3		-	-		-	-	3	3	3
AVG	3	2.8	2.4	2.4	2.4		-	-		-	-	2.5	2.6	3

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Professional Elective II

Programme	Course Code	Name of the Course	L	T	P	C
BE	21EC6301	Medical Electronics	3	0	0	3

Course Objective	The student should be able to 1. Gainknowledgeaboutthevariousphysiologicalparametersbothelectricalandnonelectrical and themethodsofrecordingandalsothemethodoftransmittingtheseparameters. 2. Understand the measurement concepts of various bio-chemical and non electrical Parameters. 3. Studyaboutthevarious assist devices used in the hospitals. 4. Acquire fundamental knowledge about equipment used for physical medicine and bio telemetry. 5. Explore the variousrecentlydevelopeddiagnosticandtherapeutictechniques.

Unit	Description	Instructional Hours
I	**ELECTRO-PHYSIOLOGYAND BIO-POTENTIALRECORDING** TheoriginofBio-potentials;biopotentialelectrodes,biologicalamplifiers,ECG,EEG,EMG,PCG,leadsystemsandrecording methods, typical waveformsandsignal characteristics.	9
II	**BIO-CHEMICALAND NON ELECTRICALPARAMETER MEASUREMENT** pH, PO_2, PCO_2, colorimeter, Auto analyzer, Blood flow meter, cardiac output, respiratory measurement, Blood pressure, temperature, pulse, BloodCellCounters..	9
III	**ASSIST DEVICES** Cardiac pacemakers,DCDefibrillator, Dialyser, Ventilators, Magnetic Resonance Imaging Systems, Ultrasonic Imaging Systems, Heartlungmachine.	9
IV	**PHYSICAL MEDICINEAND BIOTELEMETRY** Diathermies-Shortwave,ultrasonicandmicrowavetypeandtheirapplications,SurgicalDiathermy-Telemetryprinciples,biotelemetry	9
V	**RECENTTRENDS IN MEDICAL INSTRUMENTATION** Thermograph,endoscopyunit,Laserinmedicine, Introductiontotelemedicine, Insulin Pumps, Radio pill, Brain machine interface, Lab on a chip.	9
	Total Instructional Hours	45

Course Outcome	After completion of the course the learner will be able to CO1: Know the human body electro- physiological parameters and recording of bio-potentials CO2:Comprehend the non-electrical physiological parameters and their measurement – body temperature, blood pressure, pulse, blood cell count, blood flow meter etc. CO3: Interpret the various assist devices used in the hospitals viz. pacemakers, defibrillators, dialyzers and ventilators CO4: Understand the physical medicine methods eg. ultrasonic, shortwave, microwave surgical diathermies ,

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T1- LeslieCromwell,"BiomedicalInstrumentationandMeasurement",PrenticeHallofIndia,New Delhi,2007. (Unit I to V).

REFERENCE BOOKS:

R1 - JohnG.Webster,"MedicalInstrumentationApplicationandDesign",3rd Edition,WileyIndiaEdition,2007.

R2 - Khandpur,R.S.,"HandbookofBiomedicalInstrumentation",TATAMcGraw-Hill,NewDelhi,2003.

R3 - JosephJ.CarrandJohnM.Brown,"IntroductiontoBiomedicalEquipmentTechnology",JohnWileyand Sons, NewYork, 2004

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	I
CO1	3	3	3	2	2		-	-	-	-	1	2	3	3
CO2	3	3	2	2	2		-	-	-	-	1	2	3	2
CO3	3	2	3	2	2		-	-	-	-	1	2	2	2
CO4	3	3	3	2	2		-	-	-	-	1	2	3	2
CO5	3	3	3	2	2		-	-	-	-	1	2	3	3
AVG	3	3	3	2	2		-	-	-	-	1	2	3	2

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Programme	Course Code	Name of the Course	L	T	P	C
BE	21EC6302	Industrial Automation	3	0	0	3

Course Objective	1. To Provide the knowledge of automation component and machine elements 2. To learn the SCADA communication and protocols 3. To educate on the components used in distributed network protocol 4. To introduce the M2M to Internet of Things 5. To study the Modern Industrial Automation

Unit	Description	Instructional Hours
I	**AUTOMATION COMPONENT AND MACHINE ELEMENTS** Automation, concept – analog and digital, input and output data, Components and hardware-Controllers, operator interfaces, sensors, power control, distribution and discrete controls, actuators and movements, AC and DC motors, mechanisms and machine elements, structure and framing.	9
II	**SCADA AND PROTOCOLS** Fundamentals of SCADA Communications – SCADA Systems, Remote terminal units, PLCs used as RTUs, Communication architectures, Communication philosophies, Basic standards – RS232 and RS485,SCADA protocols, open SCADA protocols DNP3 and IEC 60870, Preview of DNP3.	9
III	**DISTRIBUTED NETWORK PROTOCOL** Fundamentals concepts, physical layer, data link layer, transport layer, application layer message handling and functions, data object library. Fundamental of IEC 60870-5: standard, protocol architecture, information elements, application functions.	9
IV	**M2M to INTERNET OF THINGS** M2M communication, M2M towards IoT, M2M and IoT value chains, M2M to IoT architecture overview, devices and gateways, local and wide area networking, data management, M2M to IoT analytics. Human-Machine interface.	9

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V	**MODERN INDUSTRIAL AUTOMATION** Virtual instrumentation, programming platforms, hardware and software design, graphical user interface design, software testing –strategies, processes and steps, software performance testing, real world applications- RSFIMC architecture, functions.	9
	Total Instructional Hours	**45**

Course Outcome	CO1: Emphasize the signals from automation components and machine elements. CO2: Explain the concepts of SCADA Communication and protocols CO3: Familiarize the concept of Distribution Network Protocol and IEC standard. CO4: Explain the need for M2M to Internet of Things.

TEXT BOOKS:

T1- Frank Lamb," Industrial Automation Hands-on", - The McGraw Hill Education.(Unit -1)

T2- Gordon Clarke, "Practical Modern SCADA Protocols:DNP3, 60870.5 and Related Systems", - Academic Press is an imprint of Elsevier, 2004.(Unit – 2,3)

REFERENCE BOOKS:

R1 - Jan Holler, "From Machine-to-Machineto the Internet of Things", - Academic Press is an imprint of Elsevier, 2014 (Unit - 4)

R2 - Lingfeng Wang, "Modern Industrial Automation Software Design- Principles and Real- World Applications", - A John Wiley & Sons, Inc., Publication. (Unit - 5)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO
CO1	3	3	3	2	2		-	-	-	-	1	2	3
CO2	3	3	2	2	2		-	-	-	-	1	2	3
CO3	3	2	3	2	2		-	-	-	-	1	2	2
CO4	3	3	3	2	2		-	-	-	-	1	2	3
CO5	3	3	3	2	2		-	-	-	-	1	2	3
AVG	3	3	3	2	2		-	-	-	-	1	2	3

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Programme	Course Code	Name of the Course	L	T	P	C
BE	21EC6303	Mobile Communications	3	0	0	3

Course Objective	The student should be able to 1. To understand the design aspects of a cellular system 2. To illustrate the behavior of the wireless channel and its impact on system design 3. To interpret the mathematical modelsof propagation in wireless communications. 4. To understand the wireless systems and standards in wireless communication. 5. To understand the relevance of multiple layers and their functionalities.

Unit	Description	Instructional Hours
I	**Introduction to Wireless Communication Systems** Evolution and Fundamentals, Examples of Wireless Communication Systems, Cellular Telephone Systems, Trends in Cellular Radio and Personal Communication Systems	9
II	**Cellular Concepts** Frequency for Radio Transmission, Frequency Reuse, Channel Assignment Strategies, Handoff Strategies, Interference and System Capacity, Improving the Coverage and Capacity of Cellular Systems.Multiple Access System , TDMA, FDMA, CDMA	9
III	**Medium Access Control** Hidden and Exposed, Far and Near Problem, Protocol for MAC . **Mobile Radio Propagation**: Large Scale Path Loss, Free Space Propagation Model, Ground Reflection Model, Diffraction, Scattering, Practical Link Budget Design using Path Loss Models, Outdoor Propagation Models, Indoor Propagation Models, Signal Penetration through Buildings. Small Scale Fading and Multipath Propagation, Impulse Response Model, Multipath Measurements, Parameters of Multipath Measurements, Types of Small Scale Fading: Time Delay Spread, Doppler Spread; Raleigh and Ricean Distributions.	9
IV	**Wireless Systems and Standards** AMPS, ETACS, USDC, GSM – System Architecture, Radio Subsystem, Channel Types, Frame Structure, Signal Processing in GSM; GPRS, CDMA Digital Cellular Standards, PACS ,Wireless LANs ,Future advancement in Mobile Network	9
V	Mobile Network Layer , Mobile Transport Layer, Mobile Application Layer	9
	Total Instructional Hours	45

Course Outcome	After completion of the course the learner will be able to CO1: Describe the cellular concept of wireless communication system. CO2: Illustrate the behavior of the wireless channel and its impact on system design CO3: Interpret the mathematical modelsof propagation in wireless communications. CO4: Understand the wireless systems and standards in wireless communication. CO5: Explore relevance of multiple layers and their functionalities

TEXT BOOKS:

T1-Rappaport,T.S., "Wireless communications", Second Edition, Pearson Education, 2010.

T2-Kamilo Feher, Wireless Digital Communications, Modulation and Spread Spectrum Applications, Eastern Economy Edition.

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REFERENCE BOOKS:

R1-Lee, Mobile Communications Engineering: Theory and applications,Second Edition,,McGraw- Hill International, 1998.

R2 Jochen H Schiller, Mobile Communication,2e, Addison-WesleyPublishers,2003.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	2		-	-	-	-	1	2	3	3
CO2	3	3	2	2	2		-	-	-	-	1	2	3	2
CO3	3	2	3	2	2		-	-	-	-	1	2	2	2
CO4	3	3	3	2	2		-	-	-	-	1	2	3	2
CO5	3	3	3	2	2		-	-	-	-	1	2	3	3
AVG	3	3	3	2	2		-	-	-	-	1	2	3	2.6

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Programme	Course Code	Name of the Course	L	T	P	C
BE	21EC6304	High Speed Networks	3	0	0	3

Course Objective	1. To impart knowledge on Frame relay networks and ATM networks 2. To understand the concepts of congestion and traffic management 3. To gain knowledge on Graph Theory and Internet Routing 4. To know more about Quality of Service in IP Networks 5. To study the importance of Compression in High Speed Networks

Unit	Description	Instructional Hours
I	**HIGH SPEED NETWORKS** Protocols and TCP/IP Suite-TCP and IP-Frame Relay –Asynchronous Transfer Mode-High Speed LANs	9
II	**CONGESTION AND TRAFFIC MANAGEMENT** Congestion Control in Data Networks and Internets- Link-level Flow and Error Control-TCP Traffic Control-Traffic and Congestion Controls in ATM Networks	9
III	**INTERNET ROUTING** Overview of Graph Theory and Least-Cost Paths-Internet Routing Protocols-Exterior Routing Protocols and Multicast	9
IV	QOS IN IP NETWORKS Integrated and Differentiated Services-Protocols for QoS Support: Resource ReservationRSVP- Multiprotocol Label Switching - Real Time Transport Protocol	9
V	**COMPRESSION** Overview of Information Theory: Information and Entropy, Coding-Lossless Compression- Lossy Compression	9
	Total Instructional Hours	**45**

Course Outcome	CO1: Interpret ATM and Frame relay networks CO2: Describe the concepts of congestion and traffic management CO3: Analyze the Quality of service in IP Networks. CO4: Infer the Principle of wireless network operation and compression CO5:Summarize the Network management and application

TEXT BOOKS:

T1- William Stallings, "High-Speed Networks and Internets: Performance and Quality of Service", Pearson Education, Second Edition, 2002

T2- Jean WarlandandPravinVaraiya, "High Performance Communication Networks", Jean Harcourt Asia Pvt. Ltd., Second Edition, 2001

REFERENCE BOOKS:

R1-Behrouz A. Forouzan, "Data Communication and Computer Networking", Fourth Edition,

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	2		-	-	-	-	1	2	3	3
CO2	3	3	2	2	2		-	-	-	-	1	2	3	2
CO3	3	2	3	2	2		-	-	-	-	1	2	2	2
CO4	3	3	3	2	2		-	-	-	-	1	2	3	2
CO5	3	3	3	2	2		-	-	-	-	1	2	3	3
AVG	3	3	3	2	2		-	-	-	-	1	2	3	2.6

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Programme	Course Code	Name of the Course	L	T	P	C
BE	21EC6182	E-Commerce Technology	3	0	0	3

Course Objective	The student should be conversant with 1. Discuss fundamentals of e-commerce, types and applications. 2. Understand and apply relevant problem-solving methodologies 3. Identify components, systems and/or processes to meet required specifications 4. Understand the concept of Marketing and advertising 5. Identify research skills

Unit	Description	Instructional Hours
I	UNIT – I INTODUCTION Electronic Commerce-Frame work, the anatomy of E-Commerce applications, E-Commerce Consumer applications, E-Commerce organization applications. Consumer Oriented Electronic commerce – Mercantile Process models.	9
II	UNIT – II ELECTRONIC PAYMENT SYSTEMS & INTERORGANIZATIONAL COMMERCE Electronic payment systems – Digital Token-Based, Smart Cards, Credit Cards, Risks in Electronic Payment systems. Inter-Organizational Commerce – EDI, EDI Implementation, Value-added networks.	9
III	UNIT – III INTRA ORGANIZATIONAL COMMERCE Intra Organizational Commerce – work Flow, Automation Customization and internal Commerce, Supply chain Management.	9
IV	UNIT – IV THE CORPORATE DIGITAL LIBRARY Corporate Digital Library – Document Library, digital Document types, corporate Data Warehouses. Advertising and Marketing – Information based marketing, Advertising on Internet, on-line marketing process, market research	9
V	UNIT – V COSUMER SEARCH AND RESOURCE DISCOVERY AND MULTIMEDIA AND DIGITAL VIDEOConsumer Search and Resource Discovery – Information search and Retrieval, Commerce Catalogues, Information Filtering.**Multimedia** – key multimedia concepts, Digital Video and electronic Commerce, Desktop video processing, Desktop video conferencing.	9
	Total Instructional Hours	45

Course Outcome	After the completion of the course, the learner will be able to CO1: Understand the basic concepts and technologies used in the field of management information systems CO2: Identify and apply relevant problem-solving methodologies CO3: Design components, systems and/or processes to meet required specifications CO4: Evaluate the Internet marketing Strategies CO5: Demonstrate research skills

TEXT BOOKS:

T1- Ravi Kalakota, Andrew Winston, "Frontiers of Electronic Commerce", Addison Wesley.

T2 – Pete Lohsin , John Vacca "Electronic Commerce", New Age International

REFERENCE BOOKS:

R1 – Goel, Ritendra "E-commerce", New Age International

R2-Laudon, "E-Commerce: Business, Technology, Society", Pearson Education

R3-Bajaj and Nag, "E-Commerce the cutting edge of Business", TMH

R4-Turban, "Electronic Commerce 2004: A Managerial Perspective", Pearson Education

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	2		-	-	-	-	1	2	3	3
CO2	3	3	2	2	2		-	-	-	-	1	2	3	2
CO3	3	2	3	2	2		-	-	-	-	1	2	2	2
CO4	3	3	3	2	2		-	-	-	-	1	2	3	2
CO5	3	3	3	2	2		-	-	-	-	1	2	3	3
AVG	3	3	3	2	2		-	-	-	-	1	2	3	2.6

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Programme	Course Code	Name of the Course	L	T	P	C
BE	21EC6401	**Consumer Electronics**	3	0	0	3

Course Objective	The student should be able to 1. Sketch and describe operating principles of different types of microphones. 2. Learn various components of video system and displays. 3. Describe working of Washing machine, Microwave ovens, Refrigerators. 4. Understand the working principles of power supplies. 5. Learn various standards in product compliances.

Unit	Description	Instructional Hours
I	**AUDIO SYSTEMS** Microphones, loudspeakers baffle and enclosure, Acoustics, mono, stereo, Quad, Amplifying System, Equalizers and Mixers, Synthesizers, Commercial Sound, Theater Sound System.	9
II	**VIDEO SYSTEMS AND DISPLAYS** Monochrome, Color TV standards, TFT, Plasma, HDTV, LCD, LED TV, Direct-To Home (DTH- Set Top Box), Video Telephone and Video Conferencing.	9
III	**DOMESTIC AND CONSUMER APPLIANCES** Washing machines, Microwave ovens, Air-conditioners and Refrigerators, Computers office System, Telephone & Mobile Radio System.	9
IV	**POWER SUPPLIES** SMPS/UPS and Preventive Maintenance and others systems such as Remote controls, Bar codes, RFID.	9
V	**PRODUCT COMPLIANCE** Product safety and liability issues; standards related to electrical safety and fire hazards, EMI/EMC requirements, design techniques for ESD, RF interference and immunity, line current harmonics and mains voltage surge.	9
	Total Instructional Hours	**45**

Course Outcome	After completion of the course the learner will be able to 1. Understand electronics engineering concepts used in audio systems. 2. Identify and explain working of various colour TV and Display blocks. 3. Understand the basic functions of various domestic and consumer electronic goods. 4. Understand various types of power supplies, Remote and RFID. 5. Use different product safety, compliance standards and techniques associated with electronic products.

TEXT BOOKS:

T1 - SP Bali, "Consumer Electronics", Pearson Education, 2008

T2 - J.S. Chitode, "Consumer Electronics", Technical Publications, 2007

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REFERENCE BOOKS:
R1 - Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.
R2 - Marco Schwartz, "Internet of Things with the Arduino Yun", Packt Publishing, 2014.

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Programme	Course Code	Name of the Course	L	T	P	C
BE	21EC7401	Introduction to IOT (Common to all Branches)	3	0	0	3

Course Objective	The student should be able to 1. To understand the fundamentals of Internet of Things. 2. To build a small low cost embedded system using Arduino / Raspberry Pi or equivalent boards. 3. To apply the concept of Internet of Things in the real world scenario 4. To model an IoT based system with specifications and requirements. 5. To construct a web based system using IoT

Unit	Description	Instructional Hours
I	**The Internet of Things: An Overview** Introduction-Characteristics-Physical design - Protocols – Logical design – Enabling technologies – IoT Levels – Domain Specific IoTs: Home Automation. IoT vs M2M.	9
II	**IoT Design Methodology** IoT systems management – IoT Platforms Design Methodology – Specifications - Integration and Application Development.	9
III	**IoT with Raspberry PI** Physical device – Raspberry Pi Interfaces – Programming – Other IoT Devices	9
IV	**Building IoT With Galileo/Arduino** Intel Galileo Gen2 - Exploring the Linux Console - Arduino IDE – Programming - The Arduino Language Reference and APIs – Servo API.	9
V	**Advanced Topics and Case Studies** IoT Physical Servers & Cloud Offerings: WAMP – Django – Amazon Web Services, Case Studies: Smart Lighting – Weather Monitoring System – Smart Irrigation - IoT Printer.	9
	Total Instructional Hours	45

Course Outcome	After completion of the course the learner will be able to CO1:Describe IoT with various tools. CO2:Design a portable IoT using Arduino/ equivalent boards and relevant protocols. CO3:Develop web services to access/control IoT devices. CO4:Deploy an IoT application and connect to the cloud. CO5;Analyze applications of IoT in real time scenario

TEXT BOOKS:

T1- ArshdeepBahga, Vijay Madisetti, "Internet of Things – A hands-on approach", Universities Press, 2015. (Unit 1,2, 3 & 5)

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T2- Manoel Carlos Ramon, "Intel® Galileo and Intel® Galileo Gen 2: API Features and Arduino Projects for Linux Programmers", Apress, 2014. (Unit 4).
REFERENCE BOOKS:
R1 - Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.
R2 - Marco Schwartz, "Internet of Things with the Arduino Yun", Packt Publishing, 2014.

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Programme	Course Code	Course Title	L	T	P	C
BE/BTECH	21LS6401	General Studies for Competitive Examinations	2	1	0	3

Course Objectives:

1. To provide awareness to the students about higher education entrance exams and various types of jobs offered both in the Central and State Government.(CAT, GMAT, GRE, IBPS, IELTS, UPSC, SSC, RRB, TNPSC, GATE, IES, TNEB, AFCAT, DRDO, ISRO, INCOMETAX,LIC...)
2. To help the students to choose the area where they areinterested.
3. To develop competitive skills through various types of objectivetests.
4. To train them by conducting aptitude test based on verbal and quantitativeskills.

Unit	Description	Instructional Hours
I	**Numerical Ability** Simplification and Approximation – Algebra – Number System- Averages – Ratio and Proportion – Partnership – Allegation or Mixture – Problem on Ages - Percentages - Profit and Loss – Time and Work – Pipes and Cisterns – Time, Speed and Distance – Problems on Trains ,Boats and Streams - Permutation and Combination- Probability- Data Interpretation- Simple Interest and Compound Interest – Geometry , Trigonometry and Mensuration –Progressions.	18
II	**Reasoning Ability** Alphanumeric series - Reasoning Analogies – Coding-Decoding – Blood Relations - Directions – Calendars –Clocks – Data Sufficiency – Deductive Reasoning - Input-Output – Order & Ranking – Seating Arrangements –Visual Reasoning – Cubes and cuboids - Critical Reasoning – Syllogism – Venn Diagram – Puzzles	10
III	**Language Competency** Reading Comprehensions – Cloze Test – Sentence Completion – Match the Columns – Error Detection – Jumbled word/Paragraphs – Vocabulary & Grammar – One Word Substitution – Idioms and Phrases – Antonyms and Synonyms – Sentence Correction – Misfit/Out of Contextsentence.	10
IV	**ComputerAcquaintanceship** Internet – Memory – Keyboard Shortcuts – Computer Abbreviation – Microsoft Office – Computer Hardware – Computer Software – Operating System – Networking – Computer Fundamentals/Terminologies.	3
V	**General Awareness** Geography – Culture – History – Economic Science – Scientific Research – General Policy – Awards and Honours – Books and Authors – Static GK - Current Affairs.	4
Total Instructional Hours		45

CO1:

Thinking critically and applying basic mathematics skills to interpret data, draw conclusions,andsolveproblems;developingproficiencyinnumericalreasoning; Application of quantitative reasoning in aptitude tests.

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Course Outcomes	CO2: The ability to identify and define problems/issues, recognizing their complexity, and considering alternative viewpoints and solutions to use the critical skills of observation, analysis, evaluation.
	CO3: Understanding and reasoning using concepts framed in words; Critical verbal reasoning; Reading Comprehension; Application of verbal reasoning in aptitude tests.
	CO4: Students will possess the basic understanding of computer hardware and software, utilizing web technologies, basic understanding of network principles, Keyboard Shortcuts and various Operating System.
	CO5: Students will be updated with awareness and knowledge regarding the occurrences around the world.

R1:	Quantitative Aptitude for Competitive Examinations – AbhijithGuptha
R2:	The Pearson Guide to Quantitative Aptitude - Dinesh Khattar
R3:	Analytical Reasoning and Logical Reasoning- Peeyush Bharadwaj
R4:	A New Approach to Reasoning - B.S. Sijwali& S. SijwaliArihant
R5:	Word Power made easy - Norman Lewis
R6:	Verbal Ability & Reading Comprehension for the CAT – Arun Sharma, Meenakshi Upadhyay - Mcgraw-hill Education
R7:	Computer Awareness - Arihant Publication
R8:	General Knowledge and General Awareness - ArihantManhar Pandey

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Unit	Description	Instructional Hours

Programme	Course Code	Name of the Course	L	T	P	C
BE/BTech	21LS6402	Human rights, Women rights and Gender equality	3	0	0	3

COURSE OBJECTIVES	• To sensitize the Engineering students to various aspects of Human Rights • To make them understand the world level perspective related to Human Rights • To identify the constitutional rights of women • To understand the various political rights and laws related to women • To understand the gender equality concepts

I	**Introduction** Human Rights – Evolution of the concept of Human Rights - Meaning, origin and Development. Notion and Classification of Rights – Natural, Moral and Legal Rights, Civil and Political rights. Economic, Social and Cultural Rights - Theories of Human Rights - Philosophical foundations of Human Rights	9
II	**Human Rights national and international perspective** Human Rights in India – Constitutional Provisions / Guarantees – Redressal Mechanisms at National and International levels – Constitutional Remedies and Directions of state policy - Geneva Convention of 1864. Universal declaration of Human Rights, 1948. UN agencies to monitor and compliance – UNHRC (United Nations Human Rights Commission)	9
III	**CONSTITUTIONAL RIGHTS OF WOMEN IN INDIA** Indian constitution relating to women - Fundamental rights - Directive principles of state policy - right to equality - rights against exploitation, the right to constitutional remedy - University Declaration of Human Rights - Enforcement of Human Rights for Women and Children - Role of Cells and Counseling Centers - Legal AID cells, Help line, State and National level Commission	9
IV	**POLITICAL RIGHTS OF WOMEN IN INDIA AND LAWS** Political Rights of Women in India - Electoral process - women as voters - candidates and leader - pressure group, Representation of women in local self government – women in Rural and urban local bodies – Reservation of women – Laws against violence & Sexual crimes: eve teasing – rape - indecent representation of women - immoral trafficking	9
V	**GENDER EQUALITY** Gender roles: Biological vs cultural determinism – Private vs public dichotomy – Gender division of labour and asymmetric role structure Gender role socialization and formation of identity –Occupational segregation and wage discrimination – Gender stereotyping in work place – Human development indicators and gender disparity	9
Course Outcome	After completion of the course the learner will be able to CO1:Describe IoT with various tools. CO2:Design a portable IoT using Arduino/ equivalent boards and relevant protocols. CO3:Develop web services to access/control IoT devices. CO4:Deploy an IoT application and connect to the cloud.	

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	CO5;Analyze applications of IoT in real time scenario

TEXT BOOKS

1. Kapoor S.K, "Human Rights under International Law and Indian Laws", Central Agency, Allahabad 2014
2. ArunaGoel. (2004). "Violence and Protective Measures for Women Development and Empowerment". Deep & Deep, New Delhi.

REFERENCES

1. Chandra U "Human Rights" Allahabad Law Agency, Allahabad 2014
2. UpandraBaxi "The Future of Human Rights, Oxford Univeristy Press, New Delhi
3. Menonnivedita (2004). "Recovering Subversion: Feminist Politics beyond the Law". Permanent Black, Delhi.
4. Cornick, J.C. and Meyers, M.K. (2009) *Gender Equality: Transforming Family Divisions of Labor*. New York: Verso.

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Programme	Course Code	Name of the Course	L	T	P	C
BE/BTech	21LS6404	Indian Ethos and Human Values	3	0	0	3

Course Objective	1. To learn about Indian ethos and its importance today 2. To know about business concepts and philosophies from various perspectives. 3. To know the Indian philosophical system of knowing oneself. 4. To understand values and its significance. 5. To know ethics from western and Indian perspective.

Unit	Description	Instructional Hours
I	**INDIAN ETHOS** Indian Ethos – Models of management in Indian socio-political environment. Indian work ethos and principles of Indian Management – Goals of Life- Teachings of important Indian Spiritual leaders..	9
II	**BUSINESS CONCEPTS AND PHILOSOPHIES** Economics of giving - Western economic system. Developing and implementing gross national happiness - Sabbath economics - Islamic economics and Banking	9
III	**INDIAN PHILOSOPHICAL SYSTEM** Indian Philosophical system - Nature of mind - Personality attributes based on Gunas - Human values and five sheaths - Bagavad Gita for human perfection	9
IV	**VALUES** Meaning - Significance - Formation of values- Science and values. – Application of values in Management - Values for managers - Chanakya neethi on leadership	9
V	**ETHICS** Introduction to Greek philosophers - Perspectives on ethics - Indian constitution and Unity in diversity - Thirukural on ethics	9
	Total Instructional Hours	**45**

Course Outcome	CO1: To impart knowledge on Indian Ethos for inspirational life CO2: To apply Business concepts and philosophies for broader perspective in society CO3: To familiarize students about Indian philosophy system to handle life efficiently CO4: To apply values in day to day functioning for better standard of life. CO5: To conceptualize ethics from western and Indian perspective

TEXT BOOKS:

T1- Nandagopal.R and Ajith Sankar R.N. Indian Ethos and Values in Management, ISBN – 978-0-07-106779-9. Tata McGraw Hill Education Private Ltd, 2011.

T2-Khandelwal.N.M, Indian Ethos and Values for Managers, ISBN 978-93-5024-452-4, 3rd Edition, Himalaya Publishing House, 2011.

REFERENCE BOOKS:

R1-Management Thoughts in Thirukkural by K. Nagarajan – ANMOL Publications PVT Ltd 4374/4B Ansari Road, New Delhi 110 002. 2010

R2-Dr. Radhakrishnan Pillai, Corporate Chanakya, ISBN 978-81-8495-133-2, Jaico Publishing House, 2016

R3-Soham, LEEP (Life Empowerment and Enrichment Program), ISBN 9788175977259 Central Chinmaya Mission Trust, 2017.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech.	19LS6403	**INDIAN CONSTITUTION and POLITICAL SYSTEM**	3	0	0	3

Course Objective	OBJECTIVES: • Teach history and philosophy of Political Science. • Describe the Indian Constitution and fundamental rights. • Summarize powers and functions and Emergency rule of Indian government. • Explain Local Governance. • Converse the challenges to Indian Democracy

Unit	Description	Instructional Hours
I	**INTRODUCTION** Meaning, Nature and Scope of Political Science – Significance of Political Science as a Discipline - Approaches to the study of Political Science – Key Concepts: State, Nation and Sovereignty - Political Science as a Science or an Art .	9
II	**CONSTITUTION OF INDIA &FUNDAMENTAL RIGHTS** Meaning of the constitution law and constitutionalism – Historical perspective of the constitution of India – salient features and characteristics of the constitution of India. Scheme of the fundamental rights – fundamental duties and its legislative status – The directive principles of state policy –Rights of women and Children -Constitutional Remedies for citizens	9
III	**PARLIAMENTARY FORM OF GOVERNMENT AND EMERGENCY PROVISIONS** The constitution powers and the status of the president in India. – Amendment of the constitutional powers and procedures – Emergency provisions: National emergency, President rule, Financial emergency.	9
IV	**LOCAL GOVERNANCE** Panchayati Raj and Municipal Government; Structure, Power & Functions; Significance of 73rd and 74th Amendments; Changes in Rural Power structure and empowerment of the marginalized groups such as SCs/STs and Women	9
V	**CHALLENGES TO INDIAN DEMOCRACY** Caste, class, ethnicity and gender in Indian politics; Criminalization and corruption, politics of regionalism, communalism, backward class and Dalit movements, Tribal people movements, struggle for gender justice	9
	Total Instructional Hours	45

Course Outcome	Upon completion of the course, students will be able to CO1: Understand the history of Indian Constitution CO2: Understand fundamental rights and fundamental duties. CO3: Understand the Parliamentary form of Governmentand Challenges to Indian Demorcracy

TEXT BOOKS:

T1 - Durga Das Basu, "Introduction to the Constitution of India ", Prentice Hall of India, New Delhi, 1997.
T2 -Agarwal R C., "Indian Political System",S.Chand and Company, New Delhi, 1997.
T3 - Johari,J.C. Principles of Modern Political Science. New Delhi: Sterling, 1989.
T4 - Sharma K L., "Social Stratification in India: Issues and Themes", Jawaharlal Nehru University, New Delhi, 1997.

REFERENCE BOOKS:

R1 - Sharma, Brij Kishore, " Introduction to the Constitution of India:, Prentice Hall of India, New Delhi.
R2 - Gahai U R., "Indian Political System ", New Academic Publishing House, Jalaendhar.
R3 -Sharma R N., "Indian Social Problems", Media Promoters and Publishers Pvt. Ltd.

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Programme	Course Code	Course Title	L	T	P	C
BE/BTECH	21LS6405	YOGA FOR HUMAN EXCELLENCE	2	0	1	3

Course Objectives:	Understanding of 1.Structure and functions of Human Body, 2.Importance of Physical Exercises and various Medical systems 3.Life- force and Philosophy of Kaya Kalpa 4. Mind and its functions and 5.Meditation Practices.

Unit	Description	Instructional Hours
I	**PHYSICAL STRUCTURE** Purpose of life - life — yoga — modern life style - importance of physical health,Physicalstructure—combinationoffiveelements-threeformsof body,Blood circulation system - Respiratorysystem. Nervous system - Digestingsystem	9
II	**FUNCTIONS OF PHYSICAL BODY** Three circulations - disease, pain and death - causes fordisease, Limitandmethodinfiveaspects—food,work,sleep,sensualpleasureand thought, Importance of physical exercises - Simplified Physical Exercises-Rulesandregulations, Food and Medicine — yogic food habits — natural food - naturopathy-Medicalsystems: Allopathy, Siddha, Ayurvedha,Unaniand Homeopathy.	9
III	**REJUVENATION OF LIFE-FORCE** Philosophy of Kaya kalpa - Physical body - Sexual vital fluid - Life force- Bio-Magnetism - Mind,Anti-ageingandpostponingdeath-Kayakalpa Practical-benefits,Sexandspirituality - valueofsexualvitalfluid-married life-chastity,Functional Relationships of body, life force andmind.	9
IV	MIND Bio-magnetic wave - Mind - imprinting and magnifying - Eight essential factors of livingbeings, Mental Frequency - functions of mind — fivelayers, Ten stages of mindBenefits of meditation -habitual imprints- understandableimprints, Importance of meditation - benefits ofmeditation.	9
V	**MEDITATION** SimplifiedKundaliniYoga-greatnessofguru-typesofmeditation,Agna meditation - explanation - benefits,Santhi meditation - explanation - benefits - clearance of spinal cord - benefits,Thuriammeditation-explanation-benefits-Thuriyatheethammeditation- explanation - benefits.	9
	Total Instructional Hours	45
Text Book:	1.YogicLife- VISION, VethathiriPublications.	
Reference Books:	1VethathiriMaharishi,YogaforModernage,2017,VethathiriPublications, Erode. 2Vethathiri Maharishi, Mind, 2017, Vethathiri Publications,Erode. 3Dr.Mathuram Sekar, Medicine and Health, NarmadhaPublications. 4Vethathiri Maharishi, Simplified Physical Exercises. 2013. VethathiriPublications, Erode 5WCSC-VISION for Wisdom, Yogasanas. 2012. Vethathiri Publications. Erode.	

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Course code	Course title	L	T	P	C
21HE4072	**Career Guidance – Level IV** Personality, Aptitude and Career Development	2	0	0	0
Pre-requisite	**None**	**Syllabus version** 1			

Course Objectives:

- Solve Logical Reasoning questions of easy to intermediate level [SLO 6]
- Solve Quantitative Aptitude questions of easy to intermediate level [SLO 7]
- Solve Verbal Ability questions of easy to intermediate level [SLO 8]
- Crack mock interviews with ease [SLO 13]
- Be introduced to problem-solving techniques and algorithms [SLO 14]

Expected Course Outcome:

Enable students to solve Aptitude questions of placement level with ease, as well as write effective essays.

Student Learning Outcomes (SLO): 6, 7, 8, 13, 14

Module:1 Logical Reasoning **3 hours** **SLO:6**

Logical connectives, Syllogism and Venn diagrams

- Logical Connectives
- Syllogisms
- Venn Diagrams – Interpretation
- Venn Diagrams - Solving

Module:2 Quantitative Aptitude **6 hours** **SLO: 7**

Logarithms, Progressions, Geometry and Quadratic equations

- Logarithm
- Arithmetic Progression
- Geometric Progression
- Geometry
- Mensuration
- Coded inequalities
- Quadratic Equations

Permutation, Combination and Probability

- Fundamental Counting Principle
- Permutation and Combination
- Computation of Permutation
- Circular Permutations
- Computation of Combination
- Probability

Module:3 Verbal Ability **2 hours** **SLO: 8**

Programme	Course Code	Name of the Course	L	T	P	C
BE/BTECH	21HE3073	**Leadership Management Skills**	1	0	0	0

Course Objective

1. To know about the leadership skills that is to be acquired for success.
2. To become a teamwork expert, real world problem solver, your views will be challenged
3. To gain global perspective and becoming an effective communicator
4. To understand about learning, negotiation and decision making
5: To get first hand information about the skills we possess and to work on improvement.

Module	Description	Instructional Hours
1.	Strategic thinking skills	
2.	Planning and Delivery skills	
3.	People management skills (Delegation)	
4.	Change management and Innovation skills	
5.	Communication skills	
6.	Persuasion and influencing skills	
7.	Learning Agility	
8.	Motivation	
9.	Personality	
10.	Emotions	
11.	Perception	
12.	Negotiation	
13.	Decision making	
14.	Problem solving	
15.	Building trust	
	Total Instructional Hours	**15**

Course Outcome

CO1: To practice essential leadership skills in day to day operations
CO2: To work on leadership skills in the study environment
CO3: To understand and develop the skills consciously.
CO4: To know about the real worth of all the skills for success
CO5: To Analyze the real worth of the person and suggestion for improvement

TEXT BOOKS

T1: A REVIEW OF LEADERSHIP THEORY AND COMPETENCY FRAMEWORKS, Bolden, R., Gosling, J., Marturano, A. and Dennison, P.June 2003
T2: LEADING FROM WITHIN: Building Organizational Leadership Capacity-David R. Kolzow, PhD, 2014

REFERENCE BOOKS

R1: Seven habits of highly effective people – Stephen R.Covey
R2: The Art of Business Leadership: Indian Experiences – G.Balasubramaniam
R3: DEVELOPING the LEADER WITHIN YOU-JOHN C. MAXWELL

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Profit and loss, Partnerships and averages

- Basic terminologies in profit and loss
- Partnership
- Averages
- Weighted average

Module:3 Verbal Ability **5 hours** **SLO:** 8

Sentence Correction

- Subject-Verb Agreement
- Modifiers
- Parallelism
- Pronoun-Antecedent Agreement
- Verb Time Sequences
- Comparisons
- Prepositions
- Determiners

Sentence Completion and Para-jumbles

- Pro-active thinking
- Reactive thinking (signpost words, root words, prefix suffix, sentence structure clues)
- Fixed jumbles
- Anchored jumbles

Module:4 Writing skills for placements **2 hours** **SLO:** 12

Essay writing

- Idea generation for topics
- Best practices
- Practice and feedback

Total Lecture hours: 20 hours

Mode of Evaluation: Assignments, 3 Assessments with End Semester (Computer Based Test)

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Course code	Course title	L T P C
21HE3072	**Career Guidance – Level III** Personality, Aptitude and Career Development	2 0 0 0
Pre-requisite	**None**	**Syllabus version** 1

Course Objectives:

- Solve Logical Reasoning questions of easy to intermediate level [SLO 6]
- Solve Quantitative Aptitude questions of easy to intermediate level [SLO 7]
- Solve Verbal Ability questions of easy to intermediate level [SLO 8]
- Display good writing skills while dealing with essays [SLO 12]

Expected Course Outcome:

Enable students to solve Aptitude questions of placement level with ease, as well as write effective essays.

Student Learning Outcomes (SLO): 6, 7, 8, 12

Module:1 Logical Reasoning **6 hours** **SLO:6**

Clocks, calendars, Direction sense and Cubes

- Clocks
- Calendars
- Direction Sense
- Cubes

Data interpretation and Data sufficiency

- Data Interpretation – Tables
- Data Interpretation - Pie Chart
- Data Interpretation - Bar Graph
- Data Sufficiency

Module:2 Quantitative Aptitude **7 hours** **SLO: 7**

Time and work

- Work with different efficiencies
- Pipes and cisterns
- Work equivalence
- Division of wages

Time, Speed and Distance

- Basics of time, speed and distance
- Relative speed
- Problems based on trains
- Problems based on boats and streams
- Problems based on races

TEXT BOOKS

T1: Arya Kumar "Entrepreneurship – Creating and leading an Entrepreneurial Organization", Pearson, Second Edition (2012).

T2: EmrahYayici "Design Thinking Methodology", Artbiztech, First Edition(2016).

REFERENCE BOOKS

R1: Christopher Golis "Enterprise & Venture Capital", Allen & Unwin Publication, Fourth Edition (2007).

R2: Thomas Lock Wood & Edger Papke "Innovation by Design", Career Press.com, Second Edition (2017).

R3: Jonathan Wilson "Essentials of Business Research", Sage Publication, First Edition (2010).

WEB RESOURCES

W1: https://blof.forgeforward.in/tagged/startup-lessons

W2: https://blof.forgeforward.in/tagged/entrepreurship

W3: https://blof.forgeforward.in/tagged/minimum-viable-product

W4: https://blof.forgeforward.in/tagged/minimum-viable-product

W5: https://blof.forgeforward.in/tagged/innovation

W6:https://www.youtube.com/watch?v=8vEyL7uKXs&list=PLmP9QrmTNPqBEvKbMSXvwlwn7fdnXe6Lw

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Programme	Course Code	Name of the Course	L	T	P	C
BE/BTECH	21HE2073	Entrepreneurship & Innovation	1	0	0	0

Course Objective

1. To acquire the knowledge and skills needed to manage the development of innovation.
2. To recognize and evaluate potential opportunities to monetize these innovations.
3. To plan specific and detailed method to exploit these opportunities.
4. To acquire the resources necessary to implement these plans.
5: To make students understand organizational performance and its importance.

Module	Description	Instructional Hours
1.	Entrepreneurial Thinking	
2.	Innovation Management	
3.	Design Thinking	
4.	Opportunity Spotting / Opportunity Evaluation	
5.	Industry and Market Research	
6.	Innovation Strategy and Business Models	
7.	Financial Forecasting	
8.	Business Plans/ Business Model Canvas	
9.	Entrepreneurial Finance	
10.	Pitching to Resources Providers / Pitch Deck	
11.	Negotiating Deals	
12.	New Venture Creation	
13.	Lean Start-ups	
14.	Entrepreneurial Ecosystem	
15.	Velocity Venture	
	Total Instructional Hours	**15**

Course Outcome

CO1: Understand the nature of business opportunities, resources, and industries in critical and creative aspects.
CO2: Understand the processes by which innovation is fostered, managed, and commercialized.
CO3: Remember effectively and efficiently the potential of new business opportunities.
CO4: Assess the market potential for a new venture, including customer need, competitors, and industry attractiveness..
CO5: Develop a business model for a new venture, including revenue. Margins, operations, working capital, and investment.

- Number system
- Power cycle
- Remainder cycle
- Factors, Multiples
- HCF and LCM

Module:3 Verbal Ability **7 hours** **SLO:** 8

Essential grammar for placements

- Prepositions
- Adjectives and Adverbs
- Tenses
- Forms and Speech and Voice
- Idioms and Phrasal Verbs
- Collocations, Gerund and Infinitives

Reading Comprehension for placements

- Types of questions
- Comprehension strategies
- Practice exercises

Articles, Prepositions and Interrogatives

- Definite and Indefinite Articles
- Omission of Articles
- Prepositions
- Compound Prepositions and Prepositional Phrases
- Interrogatives

Vocabulary for placements

- Exposure to solving questions of
- Synonyms
- Antonyms
- Analogy
- Confusing words
- Spelling correctness

Total Lecture hours: 20 hours

Mode of Evaluation: Assignments, 3 Assessments with End Semester (Computer Based Test)

Recommended by Board of Studies

Approved by Academic Council Date

Course code	Course title	L T P C
21HE2072	**Career Guidance – Level II** Personality, Aptitude and Career Development	2 0 0 0
Pre-requisite	**None**	**Syllabus version** 1

Course Objectives:

- Solve Logical Reasoning questions of easy to intermediate level [SLO 6]
- Solve Quantitative Aptitude questions of easy to intermediate level [SLO 7]
- Solve Verbal Ability questions of easy to intermediate level [SLO 8]

Expected Course Outcome:

Enable students to solve questions on Verbal, Logical and Quantitative Aptitude of placement level

Student Learning Outcomes (SLO): 6, 7, 8

Module:1 Logical Reasoning **5 hours** **SLO:** 6

Word group categorization questions

Puzzle type class involving students grouping words into right group orders of logical sense

Cryptarithmetic

Data arrangements and Blood relations

- Linear Arrangement
- Circular Arrangement
- Multi-dimensional Arrangement
- Blood Relations

Module:2 Quantitative Aptitude **8 hours** **SLO:** 7

Ratio and Proportion

- Ratio
- Proportion
- Variation
- Simple equations
- Problems on Ages
- Mixtures and alligations

Percentages, Simple and Compound Interest

- Percentages as Fractions and Decimals
- Percentage Increase / Decrease
- Simple Interest
- Compound Interest
- Relation Between Simple and Compound Interest

Number System

Algebra and functions

Module:4 Recruitment Essentials **1 hour** **SLO:** 4

Looking at an engineering career through the prism of an effective resume

- Importance of a resume - the footprint of a person's career achievements
- How a resume looks like?
- An effective resume vs. a poor resume: what skills you must build starting today and how?

Impression Management

Getting it right for the interview:

- Grooming, dressing
- Body Language and other non-verbal signs
- Displaying the right behaviour

Module:5 Verbal Ability **3 hours** **SLO:** 2

Essential grammar for placements:

- Nouns and Pronouns
- Verbs
- Subject-Verb Agreement
- Pronoun-Antecedent Agreement
- Punctuations

Verbal Reasoning

Total Lecture hours: 20 hours

Mode of Evaluation: Assignments, 3 Assessments with End Semester (Computer Based Test)

Recommended by Board of Studies

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Course code	Course title	L	T	P	C
21HE1072	**Career Guidance – Level I** Personality, Aptitude and Career Development	2	0	0	0
Pre-requisite	**None**	**Syllabus version** 1			

Course Objectives:

- Introduce students to building blocks of Logical reasoning and Quantitative Aptitude [SLO 1]
- Train students on essential grammar for placements [SLO 2]
- Introduce students on scientific techniques to pick up skills [SLO 3]
- Provide an orientation for recruiter expectation in terms of non-verbal skills, and for how to build one's career with placements in mind [SLO 4]

Expected Course Outcome:

Enable students to approach learning Aptitude with ease, and understand recruiter expectation.

Student Learning Outcomes (SLO): 1, 2, 3 and 4

Module:1 Lessons on excellence **1 hour** **SLO:** 3

Skill introspection, Skill acquisition, consistent practice

Module:2 Logical Reasoning **7 hours** **SLO:** 1

Thinking Skill

- Problem Solving
- Critical Thinking
- Lateral Thinking

Taught through thought-provoking word and rebus puzzles, and word-link builder questions

Coding & decoding, Series, Analogy, Odd man out and Visual reasoning

- Coding and Decoding
- Series
- Analogy
- Odd Man Out
- Visual Reasoning

Sudoku puzzles

Solving introductory to moderate level sudoku puzzles to boost logical thinking and comfort with numbers

Attention to detail

Picture and word driven Qs to develop attention to detail as a skill

Module:3 Quantitative Aptitude **8 hours** **SLO:** 1

Speed Maths

- Addition and Subtraction of bigger numbers
- Square and square roots
- Cubes and cube roots
- Vedic maths techniques
- Multiplication Shortcuts
- Multiplication of 3 and higher digit numbers
- Simplifications
- Comparing fractions
- Shortcuts to find HCF and LCM
- Divisibility tests shortcuts

Critical Reasoning

- Argument – Identifying the Different Parts (Premise, assumption, conclusion)
- Strengthening statement
- Weakening statement
- Mimic the pattern

Module:4 Recruitment Essentials **1 hour** **SLO:** 12

Cracking interviews - demonstration through a few mocks

Sample mock interviews to demonstrate how to crack the:

- HR interview
- MR interview
- Technical interview

Cracking other kinds of interviews

- Skype/ Telephonic interviews
- Panel interviews
- Stress interviews

Resume building – workshop

A workshop to make students write an accurate resume

Module:5 Problem solving and Algorithmic skills **8 hours** **SLO:** 12

- Logical methods to solve problem statements in Programming
- Basic algorithms introduced

Total Lecture hours: 20 hours

Mode of Evaluation: Assignments, Mock interviews, 3 Assessments with End Semester (Computer Based Test)

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	21HE4073	IDEATION SKILLS	1	0	0	0

Course Objective

- To study the importance of ideation.
- To learn about the various tools for Ideation.
- To provide an insight in Prototyping and its significance.

Unit	Description	Instructional Hours
	IDEATION: INTRODUCTION TO DESIGN THINKING METHODOLOGY	
I	Design Thinking Methodology and how it can be used as a powerful tool for developing new and innovative solutions - Inspiration – Implementation - Disruptive technology.	4
	IDEATION: TOOLS FOR IDEATION	
II	Various resources to kindle new ideas for innovation. Explore the types of ideas in the past – Effect of the ideas and innovation of past on the world – Innovation Thinking – Case studies.	4
	IDEATION: INTRODUCTION TO CUSTOMER DISCOVERY	
III	Intro to Customer Discovery - development of customer discovery plan that can lead to powerful business innovation - Customer Discovery Plan	4
	PROTOTYPING AND PRODUCT IDEATION	
IV	Introduction to Prototyping - minimum viable product - High fidelity prototype vs low fidelity prototype – Prototyping tools	3
	Total Instructional Hours	15

Course Outcome

Upon completion of the course, students will be able to
CO1: Develop a strong understanding and importance of ideation
CO2: Learn about the different kinds of tools for Ideation.
CO3: Learn the need and significance of prototyping and its significance.

TEXT BOOKS:

T1 - Mark Baskinger and William Bardel, "Drawing Ideas: A Hand-Drawn Approach for Better Design",2013
T2 - Nigel Cross, "Design Thinking", Kindle Edition

REFERENCE BOOKS:

R1 - Kurt Hanks and Larry Belliston, "Rapid Viz : A New Method for the Rapid Visualitzation of Ideas", 2008.
R2 - Kathryn McElroy , "Prototyping for Designers: Developing the Best Digital and Physical Products", 2017.

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Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC7201	Digital Image Processing	3	0	0	3

Course Objective

1. To study the formation of an image and its acquisition.
2. To know about image enhancement in both time and frequency domains.
3. To be familiar with and restoration and segmentation techniques.
4. To know the widely used image compression algorithms.
5. To understand the image recognition concepts and image representation in the form of features.

Unit	Description	Instructional Hours
I	**DIGITAL IMAGE FUNDAMENTALS** Introduction – Fundamental Steps in Digital Image Processing –Components of an Image Processing System, Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – RGB and HSI color models.	9
II	**IMAGE ENHANCEMENT** **Spatial Domain**: Gray level transformations – Histogram processing: Histogram equalization – Basics of Spatial Filtering –Smoothing and Sharpening Spatial Filtering -Homomorphic filtering, Color image enhancement **Frequency Domain**: Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters.	9
III	**IMAGE RESTORATION AND SEGMENTATION** **Restoration** :Image Restoration degradation model– Mean Filters – Inverse Filtering – Wiener filtering- Geometric transformations-spatial transformations. **Segmentation** : point, line,edge detection-Edge Linking via Hough transformation – Region based segmentation: Region Growing, Region splitting and merging - Practical applications – process an image using various segmentation techniques.	9
IV	**MORPHOLOGICAL PROCESSING AND IMAGE COMPRESSION** **Morphological processing**- Dilation and Erosion-Segmentation by morphological watersheds.**Compression**: Fundamentals – Error Free Compression – Variable Length Coding: Huffman coding, Arithmetic Coding – Compression Standards: JPEG and MPEG.	9
V	**PATTERN CLASSIFICATION** Feature extraction-Boundary representation – Chain Code ,Signature, skeleton –boundary descriptor-shape number- Patterns classification methods- supervised and unsupervised neural networks in Pattern recognition.	9
	Total Instructional Hours	**45**

Course Outcome

After completion of the course the learner will be able to
CO1-Explain and relate the concepts of digital image fundamentals.
CO2-Choose appropriate technique for image enhancement both in spatial and frequency domains.
CO3-Restore good quality images from the degraded one and Segment different aspects of the image
CO4-Categorize various compression techniques and interpret image compression standards.
CO5-Represent the image with various features and recognize an image from its features.

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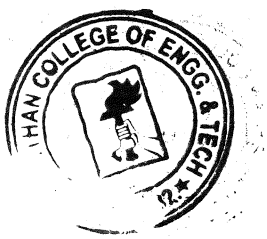
PRINCIPAL



TEXT BOOKS:

T1- Rafael C Gonzalez, Richard E Woods, "Digital Image Processing", Pearson Education Inc, Fourth Edition, 2018.

T2- Anil K- Jain, "Fundamentals of Digital Image Processing", Pearson/Prentice Hall of India,2002.

REFERENCE BOOKS:

R1- Annadurai and Shanmughalakshmi, "Fundamentals of Digital Image Processing',Pearson India,2006.

R2 - S.Jayaraman, S.Esakkirajan, T.Veerakumar, "Digital Image Processing", TMH New Delhi ,2009

R3 - Kenneth R. Castleman, "Digital Image Processing", Pearson, 2006

R4- Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, "Digital Image Processing using MATLAB ", Pearson Education, Inc., 2004.

R5- William K. Pratt, "Digital Image Processing", John Wiley, New York, 2002.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	2	2	3	-	-	-	2	-	-	2	3	2
CO2	3	3	2	2	3	-	-	-	2	-	-	2	3	2
CO3	3	2	2	2	3	-	-	-	2	-	-	2	3	2
CO4	3	3	2	2	3	-	-	-	2	-	-	2	3	2
CO5	3	2	2	2	3	-	-	-	2	-	-	2	3	2
AVG	3	2.5	2	2	3	-	-	-	2	-	-	2	3	2

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PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC7202	Optical and Microwave Engineering	3	0	0	3

Course Objective	The student should be able to 1. To facilitate the knowledge about optical fiber sources and transmission techniques 2. To understand the concepts of signal degradation in optical fibers. 3. To inculcate understanding of the fiber optical sources, receivers and coupling. 4. To understand the functional behavior of microwave semiconductor devices and microwave tubes 5. To enhance the knowledge in various Measurements of Microwave network

Unit	Description	Instructional Hours
I	**INTRODUCTION TO OPTICAL FIBERS** Elements of an Optical fiber communication system- Optical laws and definitions- optical modes and configurations -mode analysis for optical propagation through fibers modes in planar wave guide-modes in cylindrical optical fiber - Fiber materials--single mode fiber – multimode fiber-graded index fiber.	9
II	**TRANSMISSION CHARACTERISTIC OF OPTICAL FIBER** Attenuation-absorption --scattering losses-bending losses-core and cladding losses-signal dispersion –Inter symbol interference and bandwidth-Intra model dispersion-Material dispersion- Waveguide dispersion-Polarization mode dispersion-Intermodal dispersion-Dispersion optimization of single mode fiber-characteristics of single mode fiber-R-I Profile-cutoff wave length-dispersion calculation-mode field diameter.	9
III	**OPTICAL SOURCES, DETECTORS,RECEIVER AND COUPLING** Sources: - surface emitting LED-Edge emitting LED-quantum efficiency and power-modulation of LED –LASER diodes -modes and threshold conditions-Rate equations-external quantum efficiency- Detectors: PIN photo detector-Avalanche photo diodes- noise-SNR-detector response time-Avalanche multiplication noise-temperature effects - preamplifiers-digital receiver performance-probability of error and receiver sensitivity-quantum limit. -Lensing Schemes for Coupling Management- -LED Coupling to Single Mode Fibers	9
IV	**MICROWAVE PASSIVE COMPONENTS AND SEMICONDUCTOR DEVICES** Microwave Passive components: Directional Coupler, Power Divider, Magic Tee, attenuator, resonator, Principles of Microwave Semiconductor Devices: Gunn Diodes, IMPATT diodes, Schottky Barrier diodes, PIN diodes, Microwave tubes: Klystron, TWT, Magnetron.	9
V	**MICROWAVE MEASUREMENTS** Measuring Instruments – VSWR meter, Power meter, Spectrum Analyser, Network Analyser – Principles; Measurement of Impedance, Frequency, Power, VSWR, Q factor, Dielectric Constant, S Parameter- Hazards of microwaves	9
Total Instructional Hours		**45**

Course Outcome	After completion of the course the learner will be able to CO1-Realize basic elements in optical fibers, different modes and configurations CO2-Analyze the transmission characteristics associated with dispersion and polarization techniques. CO3-Design optical sources, detectors and coupling techniques with their use in optical communication system CO4-Analyze various microwave semiconductor devices. CO5-Analyze various waveguide components and performance of microwave tubes and Measurements

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T1. GerdKeiser,"OpticalFiber Communicationl, McGraw Hill Education (India) Private Limited. Fifth Edition, Reprint 2013.
T2 - Annapurna Das and Sisir K Das, "Microwave Engineering", Mc Graw Hill Inc., 2004.
REFERENCE BOOKS:
R1. John M.Senior, —Optical fiber communication, Pearson Education, second edition.2007.
R2 - D.M.Pozar, "Microwave Engineering.", John Wiley & sons, Inc., 2006. .
R3- Samuel Y Liao, "Microwave Devices & Circuits", Prentice Hall of India, 2006.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	-	-	-	-	3	3	-	3	3	2
CO2	3	3	3	3	3	-	-	-	-	3	-	3	3	3
CO3	3	3	3	3	3	-	-	-	-	-	-	3	3	3
CO4	3	3	3	3	-	-	-	-	3	-	-	-	3	3
CO5	3	3	3	3	3	-	-	-	3	3	-	3	3	2
AVG	3	3	3	3	3	-	-	-	3	3	-	3	3	2.6

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PRINCIPAL

Programme	Course Code	Name of the course	L	T	P	C
BE	19EC7251	Wireless Communication	2	0	2	3

Course Objective	1. To impart knowledge on Wireless communication. 2. To understand the performance of digital Modulation over wireless channel. 3. To interpret the various challenges in multi carrier modulation and design issues. 4. To provide an outline on cellular concepts and system design fundamentals. 5. To Study various Multiple Access techniques for wireless channels.	
Unit	Description	Instructional Hours
I	**Introduction to Wireless Communications** Overview of wireless systems –Wireless Spectrum –Path Loss and Shadowing –Radio wave propagation –Transmit and Receive signal Models –Free-Space path loss- ray tracing- Empirical Path Loss model path loss models- Shadow fading.	6
II	**Performance of Digital Modulation over Wireless Channel and Diversity** AWGN Channels--Fading– Outage Probability– Average Probability of Error — Combined Outage and Average Error Probability – Doppler Spread – Inter symbol Interference. Realization of Independent Fading Paths – Receiver Diversity – Selection and Threshold Combining–Transmitter Diversity – Channel known at Transmitter – Channel unknown at Transmitter – The Alamouti Scheme	6
III	**Multicarrier Modulation** Challenges in Multicarrier Systems-Data transmission using multiple carrier-Multicarrier modulation with Overlapping subchannels-Mitigation of subcarrier Fading- Discrete Implementation of Multicarrier Modulation-OFDM	6
IV	**Cellular Architecture-System Design Fundamentals** Cellular concepts, Frequency reuse, channel assignment strategies, handoff strategies, interference and system capacity, improving coverage and capacity in cellular systems.	6
V	**Multiple Access Techniques for Wireless Communication** Introduction to Multiple Access- Frequency Division Multiple Access (FDMA)-Time Division Multiple Access(TDMA)-Spread Spectrum Multiple Access-Code division Multiple Access (CDMA)-Space Division Multiple Access (SDMA)	6
	Total Hours	30
1.	**List of Experiments** **Study of wireless Communications using Communication Trainer Kits** To study the FHSS Modulation and Demodulation Techniques	

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2.	To study the DS spread spectrum Modulation and Demodulation Technique	
3.	To study the Code Division Multiple Access (CDMA) with Multiuser	
4.	To study Baseband Communication	
5.	To study and implement Adaptive Linear Equalizer	
	Wireless Path loss Computations - Study of Propagation Path loss Models (Using Mat lab Programming)	
6.	Free Space Propagation – Path Loss Model	
7.	Link Budget Equation for Satellite Communication	
	Total Instructional Hours	**15**
	Total Hours	**30+15=45**

Course Outcome	CO1-Demonstrate the signal propagation over wireless radio channel. CO2-Illustrate the performance of digital modulation technique over AWGN channels CO3-Infer the idea of multicarrier modulation in wireless system. Describe the cellular concepts for solving spectral congestion and user capacity. CO5-Summarize various Multiple Access Techniques for wireless channel.

TEXT BOOKS

T1. Andrea Goldmith, "Wireless Communication", Cambridge University Press, 2005.(Unit I ,II and III)

T2. T.S. Rappaport, "Wireless Communication, Principles and Practice", Pearson Education, Second Edition, 2002 (UNIT IV and UNIT V)

REFERENCE BOOKS:

R1. David Tse and Pramod Viswanath, "Fundamentals of Wireless Communication", Cambridge University Press, 2005.

R2. William C Y Lee, "Wireless and Cellular Communications", Tata McGraw Hill Publishing Company Limited, Third Edition, 2006..

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	2	-	-	-	-	-	-	-	3	3	2
CO2	3	2	3	2	-	-	-	-	-	-	-	3	3	2
CO3	3	2	3	2	-	-	-	-	-	-	-	3	3	2
CO4	3	2	3	2	-	-	-	-	-	-	-	3	3	2
CO5	3	2	3	2	-	-	-	-	-	-	-	3	3	2
AVG	3	2	3	2	-	-	-	-	-	-	-	3	3	2

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PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC7001	Digital Image Processing Lab	0	0	3	1.5

Course Objective	1. To manipulate the image parameters 2. To improve the quality of an image 3. To detect and segment the boundary in an image. 4. To compress image using coding techniques. 5. To classify different pattern classes.
S.NO	LIST OF EXPERIMENTS
Simulation using MATLAB / EQUIVALENT SOFTWARE PACKAGE	
1.	Program for extraction of color components from RGB color image.
2.	Program for an image enhancement using pixel operation.
3.	Program for image enhancement using histogram equalization.
4.	Program to filter an image using averaging low pass filter in spatial domain and median filter.
5.	Program to sharpen an image using 2-D laplacian high pass filter in spatial domain.
6.	Program to smooth an image using low pass filter and high pass filter in frequency domain (Butterworth LPF and HPF)
7.	Program for morphological image operations-erosion, dilation, opening & closing
8.	Program for image segmentations using region based segmentation technique
9.	Program for image compression using Huffman coding
10.	Program for Pattern classification methods.
Course Outcome	TOTAL HOURS 45 CO1-Analyze color image processing CO2-Enhance the visual quality of an image CO3-Detect the edges and boundary in an image CO4-Demonstrate the applications of segmentation algorithms CO5-Classify different pattern classes.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	2	3	-	-	-	3	2	-	3	3	3
CO2	3	2	3	2	3	-	-	-	3	2	-	3	3	3
CO3	2	3	3	2	3	-	-	-	3	2	-	3	3	3
CO4	3	3	3	2	3	-	-	-	3	3	-	3	3	3
CO5	3	3	3	2	3	-	-	-	3	3	-	3	3	3
AVG	2.8	2.6	3	2	3	-	-	-	3	2.4	-	3	3	3

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PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC7002	Optical Communication and Microwave Lab	0	0	3	1.5

S.NO	LIST OF EXPERIMENTS
OPTICAL EXPERIMENTS	
1.	DC Characteristics of LED and PIN Photo diode
2.	Coupling and bending losses of Fibers
3.	Fiber optic Analog and Digital Link
4.	Numerical Aperture determination for Fibers
5.	Attenuation Measurement in Fibers
MICROWAVE EXPERIMENTS	
6.	Characteristics of Gunn diode
7.	Characteristics of Reflex Klystron
8.	Directional Coupler Characteristics.
9.	S-parameter Measurement of the following microwave components (Isolator, Circulator, E plane Tee, H Plane Tee, Magic Tee)
10.	Radiation Pattern of Horn Antenna.
	TOTAL HOURS 45

Course Outcome	CO1-Analyze the performance of various microwave links. CO2-Evaluate the performance of various optical links. CO3-Interpret test microwave components CO4-Analyze the radiation of pattern of antenna. CO5-Understand & implement test optical components

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	-	-	-	-	3	3	2	3	3	2
CO2	3	3	3	3	-	-	-	-	3	3	2	3	3	2
CO3	3	3	3	3	-	-	-	-	3	3	2	3	3	2
CO4	3	3	3	3	-	-	-	-	3	3	2	3	3	2
CO5	3	3	3	3	-	-	-	-	3	3	2	3	3	2
AVG	3	3	3	3	-	-	-	-	3	3	2	3	3	2

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PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC7901	Project Work –Phase I	0	0	4	2

Course Objective

The student should be able to

1. Work in teams to propose, formulate, and solve a challenging open-ended design problem of significant scope, depth, and breadth.
2. Understand and incorporate engineering standards and multiple realistic constraints, within realistic design time, budget, and performance objectives.
3. Develop a prototype of the proposed design and demonstrate the prototype in accordance with the specifications.
4. Effectively communicate information relating to all aspects of the design process in written, oral, and graphical form.

S.No Guidelines

1. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
6. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Course Outcome

CO1-Understand a real-world problem, identify the requirement and develop the design solutions.
CO2-Identify technical ideas, strategies and methodologies.
CO3-Develop solutions using new tools & techniques, test and validate the results for betterment of mankind
CO4-Prepare report and present the oral demonstrations.
CO5-Identify the requirement and develop the design solutions.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3	3	3	3
AVG	3	3	3	3	3	3	3	3	3	3	3	3	3	3

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PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC8901	Project Work –Phase II	0	0	24	12

Course Objective

The student should be able to

1. Work in teams to propose, formulate, and solve a challenging open-ended design problem of significant scope, depth, and breadth.
2. Understand and incorporate engineering standards and multiple realistic constraints, within realistic design time, budget, and performance objectives.
3. Develop a extended prototype of the proposed design and demonstrate the prototype in accordance with the specifications.
4. Effectively communicate information relating to all aspects of the design process in written, oral,and graphical form.

S.No	Guidelines

1. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
6. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. Demonstrate knowledge and understanding of the engineering and management principles and apply these to ones own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Course Outcome

CO1-Understand a real-world problem, identify the requirement and develop the design solutions.
CO2-Identify technical ideas, strategies and methodologies.
CO3-Develop solutions using new tools & techniques, test and validate the results for betterment of mankind
CO4-Prepare report and present the oral demonstrations.
CO5-Identify the requirement and develop the design solutions.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	1	2	3	2	2	2	3	-	3	2	3
CO2	3	3	1	1	2	3	2	2	2	3	-	3	2	3
CO3	3	3	1	1	2	3	2	2	2	3	-	3	2	3
CO4	3	3	1	1	2	3	2	2	2	3	-	3	2	3
CO5	3	3	1	1	2	3	2	2	2	3	-	3	2	3
AVG	3	3	1	1	2	3	2	2	2	3	-	3	2	3

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PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC7301	Robotics	3	0	0	3

Course Objective	The student should be able to 1. To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues. 2. To introduce the electronics and software aspects in the design of robots. 3. To bring out the different languages for programming robot. 4. To specify robot requirements in the industry. 5. To introduce latest state of the art robots.

Unit	Description	Instructional Hours
I	**SCOPE OF ROBOTS** The scope of industrial Robots - Definition of an industrial robot - Need for industrial robots – Economic and Social Issues- applications.	9
II	**ROBOT COMPONENTS** Fundamentals of Robot Technology - Automation and Robotics - Robot anatomy - Work volume - Precision of movement - End effectors - Sensors.	9
III	**ROBOT PROGRAMMING** Robot Programming - Methods - interlocks textual languages. Characteristics of Robot level languages, characteristic of task level languages.	9
IV	**ROBOT WORK CELL** Robot Cell Design and Control - Remote Center compliance - Safety in Robotics.	9
V	**FUTURE TRENDS** Telepresence robot, Autonomous mobile robots, Walker Robots, Solar-ball Robot, Underwater bots, Aerobots, Advanced robotics in Space - Specific features of space robotics systems – long term technical developments, Next generation robots.	9
Total Instructional Hours		**45**

Course Outcome	After completion of the course the learner will be able to CO1: Ability to comprehend and appreciate the significance and role of this course in the present contemporary world. CO2: Ability to design and develop robotic based systems. CO3: Ability to develop system for industrial automation CO4: Ability to provide automatic solution for replacing humans in life threatening area. CO5: Ability to develop system for medical applications.

TEXT BOOKS:

T1 - Barry Leatham - Jones, "Elements of industrial Robotics", Pitman Publishing, 1987.

T2 - J. M. Selig, "Introductory Robotics", Prentice Hall, 1992.

REFERENCE BOOKS:

R1 - John Iovine, "Robots, Android and Animatronics", 2nd Edition, McGraw-Hill, 2012.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	3	2	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	2	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	2	3	3	3	3	3	3	3
AVG	3	3	3	3	3	3	2.4	3	3	3	3	3	3	3

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PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC7302	ASIC Design	3	0	0	3

Course Objective

1. To learn the fundamentals of ASIC and CMOS logic design
2. To familiarize with the various principles of programmable ASIC design
3. To impart knowledge on ASIC architecture and various logic synthesis techniques
4. To provide an insight on the concepts of delay models and logic simulation.
5. To familiarize with the concepts of floor planning and system partitioning

Unit	Description	Instructional Hours
I	**ASIC AND CMOS LOGIC DESIGN** Types of ASICs - Design flow - CMOS transistors - Combinational Logic Cell – Sequential logic cell - Data path logic cell - Transistors as Resistors - Transistor Parasitic Capacitance.	9
II	**PROGRAMMABLE ASIC** Anti fuse - static RAM - EPROM and EEPROM technology - Actel ACT - Xilinx LCA – Altera FLEX - Altera MAX DC & AC inputs and outputs - Clock & Power inputs - Xilinx I/O blocks.	9
III	**ASIC ARCHITECUTRE AND LOGIC SYNTHESIS** Architecture and configuration of Spartan and Virtex FPGAs- Logic Synthesis with an example-Finite State Machine Synthesis - Memory Synthesis.	9
IV	**LOGIC SIMULATION** Simulation-Logic Systems - Cell Models - Delay Models - StaticTimingAnalysis - Formal verification - Switch level and Transistor level simulation.	9
V	**ASIC CONSTRUCTION** System Partitioning – FPGA Partitioning, Partitioning Methods- Kernighan-Lin algorithm. Floor Planning - Placement-min cut & Eigen value algorithm - Routing-Global & Detailed routing.	9
	Total Instructional Hours	45

Course Outcome

After completion of the course, the student will be able to
CO1: Understand the basic ASIC and CMOS logic design.
CO2: Understand various types of Programmable ASICs.
CO3: Understand the ASIC architecture and logic synthesis.
CO4: Understand the various techniquesused in the logic simulation and delay models.
CO5: Understand the various methods system floor planning and partitioning.

TEXT BOOKS:

T1- M.J.S.Smith, " Application - Specific Integrated Circuits", Pearson, 2003. -UNIT I,II,III,IV,V

REFERENCE BOOKS:

R1.Steve Kilts, "Advanced FPGA Design," Wiley Inter-Science.

R2. Roger Woods, John McAllister, Dr. Ying Yi, Gaye Lightbod, "FPGA-based Implementation of Signal Processing Systems", Wiley, 2008.

R3. Mohammed Ismail and Terri Fiez, "Analog VLSI Signal and Information Processing ", McGraw Hill, 1994

R4. Douglas J. Smith, HDL Chip Design, Madison, AL, USA: Do one Publications, 1996.

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PRINCIPAL

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	3	2	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	2	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	2	3	3	3	3	3	3	3
AVG	3	3	3	3	3	3	2.4	3	3	3	3	3	3	3

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PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC7303	GLOBAL POSITIONING SYSTEM	3	0	0	3

Course Objective	The student should be able to 1. Acquire fundamental knowledge of GPS architectures 2. Extend the knowledge about GPS signal characteristics 3. Understand the receiver architecture and errors 4. Gain knowledge about Differential GPS 5. Study the applications of GPS

Unit	Description	Instructional Hours
I	**Introduction:** Basic concept, system architecture, GPS and GLONASS Overview, Satellite Navigation, Time and GPS, User position and velocity calculations, GPS, Satellite Constellation, Operation Segment, User receiving Equipment, Space Segment Phased development, GPS aided Geo augmented navigation (GAGAN) architecture.	6+6
II	**Signal Characteristics:** GPS signal components, purpose, properties and power level, signal acquisition and tracking, Navigation information extraction, pseud orange estimation, frequency estimation, GPS satellite position calculation, Signal structure, anti-spoofing (AS), selective availability, Difference between GPS and GALILEO satellite construction.	6+3
III	**GPS Receivers & Data Errors:** Receiver Architecture, receiver design options, Antenna design, GPS error sources, SA errors, propagation errors, ionospheric error, tropospheric error, multipath, ionospheric error, estimation using dual frequency GPS receiver, Methods of multipath mitigation, Ephemeris data errors, clock errors.	6
IV	**Differential GPS:** Introduction, LADGPS, WADGPS, Wide Area Augmentation systems, GEO Uplink subsystem, GEO downlink systems, Geo Orbit determination, Geometric analysis, covariance analysis, GPS /INS Integration Architectures	6
V	**GPS Applications:** GPS in surveying, Mapping and Geographical Information System, Precision approach Aircraft landing system, Military and Space application, intelligent transportation system. GPS orbital parameters, description of receiver independent exchange format (RINEX), Observation data and navigation message data parameters, GPS position determination, least squares method	6+6
	Total Instructional Hours	**30+15**

Course Outcome	After completion of the course the learner will be able to CO1: Understand the architecture of positioning systems CO2: Evaluate the position calculations CO3: Interpret the errors in GPS receiver data CO4: Illustrate the types of Differential GPS system CO5: understands the applications of GPS

TEXT BOOKS:

T1-Mohinder S.Grewal, Lawrence R.Weill, Angus P.Andrews, "Global positioning systems, Inertial Navigation and Integration", Wiley 2007.

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T2-B.Parkinson, J.Spilker, Jr.(Eds), "GPS: Theory and Applications", Vol.I&Vol.II, AIAA, 370 L'Enfant Promenade SW, Washington, DC 20024, 1996.

REFERENCE BOOKS:

R1 E.D.Kaplan, Christopher J. Hegarty, "Understanding GPS Principles and Applications", Artech House Boston 2005.

R2 - Ahmed El-Rabbany " Introduction to GPS:The Global Positioning System" Artech House BOSTON., 2002

R3 - A.Leick, "GPS Satellites Surveying", 2nd edition, John Wiley& Sons,NewYork,1995

R4 -B.Hoffman - Wellenhof, H.Lichtenegger and J.Collins, "GPS: Theory and Practice", 4th revised edition, Springer, Wein, New york, 1997.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	3	2	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	2	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	2	3	3	3	3	3	3	3
AVG	3	3	3	3	3	3	2.4	3	3	3	3	3	3	3

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PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC7304	Cloud Computing	3	0	0	3

Course Objective	• To understand the concept of cloud computing along with definition of organizational roles. • To Interpret the evolution of cloud from the existing technologies. • To understand the fundamental building block of cloud environment. • To have knowledge on foundational cloud architectural models • To be familiar with the security threats in cloud.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO CLOUD COMPUTING** Understanding Cloud Computing- Cloud concepts and Terminology-Goals and Benefits –Risks and Challenges Cloud Characteristics-Cloud Delivery Models –Cloud deployment Models.	9
II	**CLOUD ENALBLING TECHNOLOGY** Broadband Networks and Internet Architecture-ISPs-Technical and Business consideration Data Centre Technology-Virtualization Technology - Operating System Based Virtualization-Hardware Based Virtualization -Virtualization Management- Web and Service Technology-Web Services-REST Services-Service Agents and Middle ware.	9
III	**CLOUD COMPUTING AND SPECIALIZED MECHANISM** Logical Network Perimeter-Virtual Server –cloud storage Device-Cloud Usage Monitor –Automated scaling Listener-Load balancer-SLA Monitor-Hypervisor-Resource cluster-Multi Device Broker	9
IV	**CLOUD COMPUTING ARCHITECTURE** Fundamental cloud Architecture-Elastic Resource Capacity Architecture-Service load Balancing Architecture-Cloud Bursting Architecture –Advanced Cloud architecture-Hypervisor clustering Architecture –Cloud Balancing Architecture-specialized cloud Architecture- Direct I/O Access Architecture-Elastic Network Capacity Architecture.	9
V	**CLOUD MANAGEMENT AND SECURITY MECHANISM** Resource Management system-SLA Management system-Billing management system-Identity and Access Management(IAM) –Single Sign-On(SSO)-Cloud Based Security Groups	9
Total Instructional Hours		**45**

Course Outcome	CO1: Infer the concepts and Terminology of Cloud Computing CO2: Contrast the Cloud Technology with existing Technology CO3:Summrize the various Cloud Computing Mechanism CO4:Outline the Cloud Computing Architecture CO5: Demonstrate the threats and security issues

TEXT BOOKS

T1-Cloud Computing Concepts ,Technology and Architecture (UNIT I,UNIT II, UNIT III,UNIT IVAND UNIT5)

T2-Distributed and Cloud Computing. Kal Hwang. GeoffeiyC.Fox. Jack J.Dongarra. Elsevier. 2012.(UNIT III and UNITV)

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REFERENCE BOOKS:

R1-Cloud Computing: A Practical Approach. Anthony T.Velte. Toby J.VeFte, Robert Elsenpeter. Tata McGraw Hill. rp20ll.

R2-Enterprise Cloud Computing GautamShroif, Cambridge University Press. 2010.

R3-Cloud Computing: Implementation, Management and Security, John W. Rittinouse, James F Ransome. CRC Press, rp2012

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	3	2	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	2	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	2	3	3	3	3	3	3	3
AVG	3	3	3	3	3	3	2.4	3	3	3	3	3	3	3

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HINDUSTHAN COLLEGE OF ENGG. & TECH ★ CBE-32 ★

PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC7181	Entrepreneurship Development	3	0	0	3

Course Objective	The student should be able to 1. 1. To understand the concept of entrepreneurship. 2. To know the motivation factors for the entrepreneurs. 3. To analyze the business concepts and projects. 4. To impart knowledge about accounting and various taxes. 5. To understand the government policies towards partnerships.

Unit	Description	Instructional Hours
I	**ENTREPRENEURSHIP** Entrepreneur – Types of Entrepreneurs – Difference between Entrepreneur and Intrapreneur Entrepreneurship in Economic Growth, Factors Affecting Entrepreneurial Growth.	9
II	**MOTIVATION** Major Motives Influencing an Entrepreneur – Achievement Motivation Training, Self Rating, Business Games, Thematic Apperception Test – Stress Management, Entrepreneurship Development Programs – Need, Objectives.	9
III	**BUSINESS** Small Enterprises – Definition, Classification – Characteristics, Ownership Structures – Project Formulation – Steps involved in setting up a Business – identifying, selecting a Good Business opportunity, Market Survey and Research, Techno Economic Feasibility Assessment – Preparation of Preliminary Project Reports – Project Appraisal – Sources of Information – Classification of Needs and Agencies.	9
IV	**FINANCING AND ACCOUNTING** Need – Sources of Finance, Term Loans, Capital Structure, Financial Institution, Management of working Capital, Costing, Break Even Analysis, Taxation – Income Tax, Excise Duty – Sales Tax.	9
V	**SUPPORT TO ENTREPRENEURS** Sickness in small Business – Concept, Magnitude, Causes and Consequences, Corrective Measures - Business Incubators – Government Policy for Small Scale Enterprises – Growth Strategies in small industry – Expansion, Diversification, Joint Venture, Merger and Sub Contracting.	9
Total Instructional Hours		45

Course Outcome	After completion of the course the learner will be able to CO1 : Choose the entrepreneurial career. CO2 : Defend the motivation factors for the entrepreneurship. CO3 : Evaluate the effectiveness of a business plan and model. CO4 : Assess the taxes and the finance of a concern. CO5 : Relate the supports and partnerships with respect the given scenario.

TEXT BOOKS:

T1-S.S.Khanka, "Entrepreneurial Development" S.Chand& Co. Ltd., Ram Nagar, New Delhi, 2013

T2- Donald F Kuratko, " Entreprenuership – Theory, Process and Practice", 9th edition, Cengage Learning 2014.

REFERENCE BOOKS:

R1 - Mathew J Manimala, "Entrepreneurship Theory at Cross Roads: paradigms and Praxis", 2nd Edition Dream Tech, 2005.

R2 - Hisrich R D, Peters M P, "Entrepreneurship" 8th Edition, Tata McGraw-Hill, 2013.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	3	2	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	2	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	2	3	3	3	3	3	3	3
AVG	3	3	3	3	3	3	2.4	3	3	3	3	3	3	3

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PRINCIPAL

Programme	Course code	Name of the course	L	T	P	C
BE	19EC8301	Neural networks and Deep learning	3	0	0	3

Course Objective	1. To study the fundamental concepts neural networks and learning algorithms 2. To present the mathematical, statistical and computational challenges of building neural networks 3. To introduce radial basis function networks along with applications. 4. To enable the students to know deep learning techniques to support real-time applications 5. To examine the case studies of neural networks and deep learning.

Unit	Description	Instructional Hours
I	**BASIC LEARNING ALGORITHMS** Biological Neuron – Models of a Neuron – Network Architectures : Feed Forward and Feedback – Learning Process – Supervised and Unsupervised Learning - Learning Tasks - Pattern Recognition and Classification .	9
II	**PERCEPTRONS AND MULTILAYER PERCEPTRONS** Learning Algorithms - Perceptron Learning Algorithm–Perceptron Convergence Theorem – Perceptron learning and non separable sets – Multilayer Network Architectures.	9
III	**RADIAL BASIS FUNCTION NETWORKS** Cover's Theorem on the Separability of Patterns – The Interpolation problem –Generalized Radial Basis Function Networks –Hybrid Learning procedure for Radial Basis Function Networks – Computer Experiment: Pattern Classification	9
IV	**ATTRACTOR NEURAL NETWORKS** Associative Learning – Attractor Neural Network Associative Memory – Linear Associative Memory – Hopfield Network – Content Addressable Memory – Boltzmann Machine – Bidirectional Associative Memory – BAM Stability Analysis – Error Correction in BAMs.	9
V	**DEEP NETWORKS** Convolutional Neural Networks – Basic Structure: Padding, Strides, ReLU, Pooling, Fully Connected Layers, Interleaving, Local Response Normalization. Case studies :Alexnet, ZFNet, VGG, GoogleNet, ResNet.	9
Total Instructional Hours		45

Course Outcome	CO1: Understand basics of Neural Networks CO2: Implement various Neural Network models CO3: Realign high dimensional data using reduction techniques in NN CO4: Analyze optimization and generalization in NN CO5: Explore the deep learning applications

TEXT BOOKS:

T1:Simon Haykin, "Neural Networks and Learning machines". Pearson Education/PHI, 3rd Edition. 2009.
T2:Satish Kumar, "Neural Networks: A classroom approach". TMH education, 2nd Edition, 2013.
T3:Charu C Aggarwal, Neural Networks and Deep Learning, Springer, 2015

REFERENCES BOOKS:

R1 –James A. Freeman and David M. Skapura, "Neural Networks Algorithms, Applications and Programming Techniques", Pearson Education, 2003.
R2 - Martin T.Hagan, Howard B. Demuth and Mark Beale, "Neural Network Design", Thomson Learning, 2003.
R3 - Michael Nielsen, Neural Networks and Deep Learning, Determination Press, 2015.
R4 - Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2016.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	3	-	-	-	-	-	-	-	2	3	3
CO2	3	3	3	3	-	-	-	-	-	-	-	3	3	3
CO3	3	3	3	2	-	-	-	-	-	-	-	2	3	2
CO4	3	3	3	3	-	-	-	-	-	-	-	2	2	3
CO5	2	2	2	2	-	-	-	-	-	-	-	3	2	2
AVG	2.8	2.6	2.6	2.6	-	-	-	-	-	-	-	2.4	2.6	2.6

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HINDUSTHAN COLLEGE OF ENGG. & TECH. CBE-32

PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC8302	Embedded Controllers	3	0	0	3

Course Objective	The student should be able to 1. Introduce the concept of RISC and CISC microcontrollers. 2. Study the architecture of PIC and RL 78 family microcontrollers. 3. Gain knowledge about multi tasking and the real time operating system. 4. Learn the features and architecture of MSP430 microcontroller. 5. Understand the programming and peripheral interface using MSP430 microcontroller families.

Unit	Description	Instructional Hours
I	**RISC PROCESSORS** RISC Vs CISC, RISC properties and evolution, Advanced RISC microcontrollers, PIC18xx microcontroller family, Architecture, Instruction set, ROM, RAM, Timer programming, Serial port programming, Interrupt programming, ADC and DAC interfacing, CCP module and programming.	9
II	**CISC PROCESSORS** RL78 16 BIT Microcontroller architecture, addressing modes, on-Chip memory, ADC, interrupts, MAC unit, Barrel shifter, internal and external clock generation, memory CRC, on chip debug function and self programming.	9
III	**MULTITASKING AND THE REAL-TIME OPERATING SYSTEM** The challenge of multitasking and real time, multitasking with sequential programming, State machines, Real time operating system, RTOS services, synchronization and messaging tools, CCS PIC C Compiler RTOS. Design example: Voltmeter with RS232 serial output.	9
IV	**MSP430 16 - BIT MICROCONTROLLER** The MSP430 Architecture, CPU Registers, Instruction Set, addressing modes, the MSP430 family viz. MSP430x2x, MSP430x4x, MSP430x5x. Low power aspects of MSP430 : low power modes, active Vs standby current consumption, FRAM Vs Flash for low power and reliability.	9
V	**PROGRAMMING AND PERIPHERAL INTERFACE USING MSP430 FAMILIES** Memory mapped peripherals, I/O pin multiplexing, Timers, RTC, watchdog timer, PWM control, Analog interfacing and data acquisition, DMA, programming with above internal peripherals using optimal power consumption. Case study: Remote control of air conditioner and home appliances.	9
Total Instructional Hours		45

Course Outcome	After completion of the course the learner will be able to CO1: Discriminate RISC and CISC processors, and work with PIC microcontrollers. CO2: Work with the 16 bit microcontroller RL78 and design microcontroller based systems for a Real world application. CO3: Apply the concept of multitasking and RTOS in embedded system design. CO4: Gaining design knowledge and concepts on MSP430 family of Microcontroller. CO5: Ability to design and develop microcontroller based smart electronic system and home appliances.

TEXT BOOKS:

T1- Muhammad Ali Mazidi, Rolind D. Mckinlay and Danny Causey. "PIC Microcontroller and Embedded Systems", Pearson Education, 2008. (Unit I and III).
T2-John H. Davies, "MSP 430 Micro controller basics", Elsevier, 2008. (Unit IV and V).

REFERENCE BOOKS:

R1 - Alaxander G, James M. Conard, " Creating fast, Responsive and energy efficient Embedded systems using the Renesas RL78 microcontroller", Micrium press, USA, Reprinted by S.P Printers, 2011. (Unit II).

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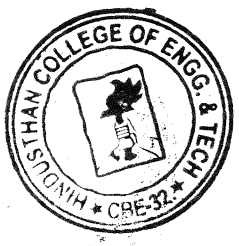

R2 - David. E. Simon, "An Embedded Software Primer", Addison-Wesley, Reprint 2015.

R3 - Tim Wilmshurst, "Designing Embedded Systems with PIC microcontrollers-Principles and Applications", Newnes Publications, 2007.

R4- Douglas V.Hall, "Microprocessor and Interfacing, Programming and Hardware", Tata Mc Graw Hill Revised, 2nd Edition 2016, 11th Reprint 2011.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	3	-	-	-	-	-	-	-	2	3	3
CO2	3	3	3	3	-	-	-	-	-	-	-	3	3	3
CO3	3	3	3	2	-	-	-	-	-	-	-	2	3	2
CO4	3	3	3	3	-	-	-	-	-	-	-	2	2	3
CO5	2	2	2	2	-	-	-	-	-	-	-	3	2	2
AVG	2.8	2.6	2.6	2.6	-	-	-	-	-	-	-	2.4	2.6	2.6

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HINDUSTHAN COLLEGE OF ENGG. & TECH CBE-32

PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
BE/B.Tech	19EC8303	Satellite Communication	3	0	0	3

Course Objective

The student should be conversant with

1. Basics of satellite communications and different satellite communication orbits
2. The effect of radio wave propagation in satellites
3. Understand the satellite segment and earth segment
4. In-depth treatment of satellite communication systems operation and planning, Link budgets & planning
5. The various methods of satellite access To understand various applications of satellite communications

Unit	Description	Instructional Hours
I	**INTRODUCTION TO SATELLITE COMMUNICATION** Historical background, Basic concepts of Satellite Communications, Communication Networks and Services, Comparison of Network Transmission technologies, Orbital and Spacecraft problems, Growth of Satellite communications. **Orbits and Launching Methods:** Introduction, Kepler's First Law, Kepler's Second Law, Kepler's Third Law, Definitions of Terms for Earth-Orbiting Satellites, Orbital Elements, Apogee and Perigee Heights, Orbit Per turbations, Effects of a non spherical earth, Atmospheric drag.	9
II	**RADIO WAVE PROPAGATION AND POLARIZATON** **Radio wave Propagation:** Introduction, Atmospheric Losses, Ionospheric Effects, Rain Attenuation, Other Propagation Impairments. **Polarization:** Introduction, Antenna Polarization, Polarization of Satellite Signals, Cross Polarization, Discrimination, Ionospheric Depolarization, Rain Depolarization, Ice Depolarization.	9
III	**THE SPACE SEGMENT AND THE EARTH SEGMENT** **The space segment:** Introduction, The Power Supply, Attitude Control, Spinning satellite stabilization, Momentum wheel stabilization, Station Keeping, Thermal Control, TT&C Subsystem, Transponders, The wideband receiver, The input demultiplexer, The power amplifier, The Antenna Subsystem **The Earth Segment:** Introduction, Receive-Only Home TV Systems, The outdoor unit, The indoor unit for analog (FM) TV, Master Antenna TV System, Community Antenna TV System, Transmit-Receive Earth Stations.	9
IV	**THE SPACE LINK** Introduction, Equivalent Isotropic Radiated Power, Transmission Losses, Free-space transmission, Feeder losses, Antenna misalignment losses, Fixed atmospheric and ionospheric losses, The Link-Power Budget Equation, System Noise, Carrier-to-Noise Ratio, The Uplink, Saturation flux density, Input backoff, Downlink, Output back-off, Combined Uplink and Downlink C/N Ratio	9
V	**SATELLITE ACCESS AND SPECIALIZED SERVICES** Introduction, Single Access, Preassigned FDMA, Demand-Assigned FDMA, Spade System, TDMA, Preassigned TDMA, Demand-assigned TDMA, Satellite-Switched TDMA, Code-Division Multiple Access **Satellite Mobile and Specialized Services:** Introduction, Satellite Mobile Services, VSATs, Radarsat, Global Positioning Satellite System (GPS), Orbcomm, Iridium.	9
	Total Instructional Hours	45

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Course Outcome	After the completion of the course, the learner will be able to CO1: Understand principle, working and operation of various sub systems of satellite as well as the earth station. CO2: Understand Effects of radio propagation in satellites CO3: Apply various communication techniques for satellite applications CO4: Analyze and design satellite communication link CO5: Learn advanced techniques and regulatory aspects of satellite communication and Understand role of satellite in various applications

TEXT BOOKS:

T1- Satellite Communications, by Dennis Roddy (Fourth edition),McGraw Hill

T2 – Satellite Communication Systems Engineering, by Wilbur L. Pritchard, Henri G. Suyderhoud, Robert A. Nelson (Second Edition), Pearson

REFERENCE BOOKS:

R1 – Satellite Communication, by Timothy Pratt, Charles Bostian, Jeremy Allnutt(Second Edition), John Wiley & Sons.

R2-Satellite Technology, Principles and Applications, by Anil K. Maini, VarshaAgarwal(Second Edition), Wiley.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	**3**	**2**	**2**	**3**	-	-	-	-	-	-	-	**2**	**3**	**3**
CO2	**3**	3	3	3	-	-	-	-	-	-	-	**3**	3	**3**
CO3	**3**	3	3	2	-	-	-	-	-	-	-	**2**	3	**2**
CO4	**3**	3	3	3	-	-	-	-	-	-	-	**2**	2	**3**
CO5	**2**	2	2	2	-	-	-	-	-	-	-	**3**	2	**2**
AVG	**2.8**	2.6	2.6	2.6	-	-	-	-	-	-	-	**2.4**	2.6	**2.6**

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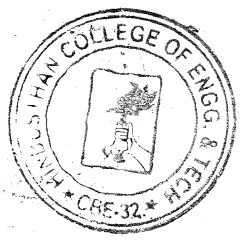

PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC8304	Wireless Sensor and Networks	3	0	0	3

Course Objective

1. To provide an outline on the characteristics and challenges of Wireless Sensor Networks
2. To discuss the network architecture of Wireless Sensor Networks
3. To understand various medium access control protocols for WSNs
4. To describe various time synchronization and topology control mechanisms for WSNs
5. To study various routing protocols and discuss the applications of WSNs

Unit	Description	Instructional Hours
I	**OVERVIEW OF WIRELESS SENSOR NETWORKS** Challenges for Wireless Sensor Networks-Characteristic Requirements, Required Mechanisms-Difference between MANETs and WSNs- Applications of WSN.	9
II	**ARCHITECTURES** Single-Node Architecture - Hardware Components-Energy Consumption of Sensor Nodes - Operating Systems and Execution Environments-Example of sensor Nodes. Network Architecture -Sensor Network Scenarios- Optimization Goals and Figures of Merit, Gateway Concepts.	9
III	**MEDIUM ACCESS CONTROL PROTOCOLS** Fundamentals of MAC protocols - Low duty cycle protocols and wakeup concepts -Contention-based protocols - Schedule-based protocols - SMAC - Traffic-adaptive medium access protocol (TRAMA) - The IEEE 802.15.4 MAC protocol. Naming and addressing: Fundamentals-Address and Name Management, Assignment of MAC Addresses.	9
IV	**TIME SYNCHRONIZATION AND TOPOLOGY CONTROL** Introduction to time synchronization problem-Protocols based on sender/receiver synchronization-localization and positioning-possible approaches-single – hop localization positioning in multi-hop environments- Topology control -Motivation and basic ideas controlling topology in flat network-hierarchal networks by dominating sets-hierarchal networks by clustering-combining hierarchal topologies and power control.	9
V	**ROUTING PROTOCOLS AND APPLICATIONS** Gossiping and agent-based unicast forwarding-Energy-efficient unicast-Broadcast and Multicast-Geographic routing -Mobile nodes, Application-Target detection and tracking-edge detection-Field sampling	9
Total Instructional Hours		45

Course Outcome

CO1: Outline the characteristics and challenges of Wireless Sensor Networks
CO2: Demonstrate the WSN network architecture and its operation
CO3: Summarize various medium access protocols used for WSN.
CO4: Illustrate the various mechanism for time synchronization and topology control in WSN
CO5: Infer the routing techniques used in WSN

TEXT BOOKS:

T1-Holger Karl & Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks", John Wiley, 2005.

T2- Feng Zhao & Leonidas J. Guibas, "Wireless Sensor Networks- An Information Processing Approach", Morgan Khaufmann Publishers'

REFERENCE BOOKS:

R1- KazemSohraby, Daniel Minoli, &TaiebZnati, "Wireless Sensor Networks-Technology, Protocols, And Applications", John Wiley, 2007.

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R2-Anna Hac, "Wireless Sensor Network Designs", John Wiley, 2003.

R3-Edgar H.Callaway,Jr. and Edgar H.Callaway, "Wireless Sensor Networks :Architectures and Protocols", CRC Press, August 2003.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	3	-	-	-	-	-	-	-	2	3	3
CO2	3	3	3	3	-	-	-	-	-	-	-	3	3	3
CO3	3	3	3	2	-	-	-	-	-	-	-	2	3	2
CO4	3	3	3	3	-	-	-	-	-	-	-	2	2	3
CO5	2	2	2	2	-	-	-	-	-	-	-	3	2	2
AVG	2.8	2.6	2.6	2.6	-	-	-	-	-	-	-	2.4	2.6	2.6

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Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC8181	Foundation Skills In Integrated Product Development	3	0	0	3

Course Objective	1. To introduce fundamental aspects of Integrated Product Development. 2. To understand the concept of selection and testing Methodologies. 3. To know the concepts of various layouts and architecture of product. 4. To study the various industrial process tool and design techniques. 5. To analyze estimation, planning and design for manufacturing and product development.

Unit	Description	Instructional Hours
I	**FUNDAMENTALS OF PRODUCT DEVELOPMENT** Global Trends Analysis and Product decision - Social Trends - Technical Trends- Economical Trends - Environmental Trends - Political/Policy Trends - Introduction to Product Development Methodologies and Management - Overview of Products and Services - Types of Product Development - Overview of Product Development methodologies - Product Life Cycle – Product Development Planning and Management.	9
II	**REQUIREMENTS AND SYSTEM DESIGN** Requirement Engineering - Types of Requirements - Requirement Engineering - traceability Matrix and Analysis - Requirement Management - System Design & Modeling - Introduction to System Modeling - System Optimization - System Specification - Sub-System Design - Interface Design.	9
III	**DESIGN AND TESTING Conceptualization** Industrial Design and User Interface Design - Introduction to Concept generation Techniques – Challenges in Integration of Engineering Disciplines - Concept Screening & Evaluation - Detailed Design - Component Design and Verification – Mechanical, Electronics and Software Subsystems - High Level Design/Low Level Design of S/W Program - Types of Prototypes, S/W Testing- Hardware Schematic, Component design, Layout and Hardware Testing – Prototyping - Introduction to Rapid Prototyping and Rapid Manufacturing - System Integration, Testing, Certification and Documentation	9
IV	**SUSTENANCE ENGINEERING AND END-OF-LIFE (EOL) SUPPORT** Introduction to Product verification processes and stages - Introduction to Product Validation processes and stages - Product Testing Standards and Certification - Product Documentation - **Sustenance** -Maintenance and Repair – Enhancements - **Product EoL** - Obsolescence Management – Configuration Management - EoL Disposal	9
V	**BUSINESS DYNAMICS – ENGINEERING SERVICES INDUSTRY The Industry –** Engineering Services Industry - Product Development in Industry versus Academia –**The IPD Essentials** - Introduction to Vertical Specific Product Development processes - Manufacturing/Purchase and Assembly of Systems - Integration of Mechanical, Embedded and Software Systems – Product Development Trade-offs - Intellectual Property Rights and Confidentiality – Security & Configuration	9
Total Instructional Hours		**45**

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Course Outcome	CO1: Define, formulate and analyze a problem CO2: Solve specific problems independently or as part of a team CO3: Gain knowledge of the Innovation & Product Development process in the Business Context CO4: Work independently as well as in teams CO5: Manage a project from start to finish

TEXT BOOKS:

T1-Product Design and Development, Karl T.Ulrich and Steven D.Eppinger, McGraw –Hill International Edns.1999

REFERENCE BOOKS:

R1-Concurrent Engg. /Integrated Product Development. Kemnneth Crow, DRM Associates, 6/3, ViaOlivera, Palos Verdes, CA 90274(310) 377-569, Workshop Book

R2-Effective Product Design and Development, Stephen Rosenthal, Business One Orwin, Homewood, 1992, ISBN,1-55623-603-4.

R3-Tool Design – Integrated Methods for successful Product Engineering, Stuart Pugh, Addison Wesley Publishing, mours, NY, 1991, ISBN 0-202-41639-5.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	**3**	**2**	**2**	**3**	-	-	-	-	-	-	-	**2**	**3**	**3**
CO2	**3**	3	3	3	-	-	-	-	-	-	-	**3**	3	**3**
CO3	**3**	3	3	2	-	-	-	-	-	-	-	**2**	3	**2**
CO4	**3**	3	3	3	-	-	-	-	-	-	-	**2**	2	**3**
CO5	**2**	2	2	2	-	-	-	-	-	-	-	**3**	2	**2**
AVG	**2.8**	2.6	2.6	2.6	-	-	-	-	-	-	-	**2.4**	2.6	**2.6**

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Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC8306	Artificial Intelligence	3	0	0	3

Course Objective

The student should be able to

1. Understand concept of AI & the various characteristics of Intelligent agents
2. Learn the different search strategies in AI
3. Learn to represent knowledge in solving AI problems
4. Understand the different ways of Learning
5. Know about the various applications of AI.

Unit	Description	Instructional Hours
I	**INTRODUCTION** AI–Definition – Foundation & History of Artificial Intelligence –Intelligent Agents– Agents & Environments, Concept of Rationality, Structure of Agents	9
II	**PROBLEM SOLVING METHODS** **Solving Problems by searching:** Uninformed – Informed (Heuristics) search strategies. **Beyond Classical search:** Local Search Algorithms and Optimization Problems - Searching with Partial Observations –**Adversarial Search**: Game Playing - Optimal Decisions in Games, Alpha - Beta Pruning - Stochastic Games. **Constraint Satisfaction Problems:** Constraint Propagation - Backtracking Search -	9
III	**KNOWLEDGE, REASONING & PLANNING** **First Order Logic**: Syntax and Semantics –Unification and Lifting – Forward Chaining-Backward Chaining – Resolution, **Classical Planning-** Algorithms, planning Graphs, Hierarchical & multi agent planning – **Knowledge Representation** - Ontological Engineering-Categories and Objects – Events - Mental Events and Mental Objects - Reasoning Systems for Categories - Reasoning with Default Information	9
IV	**LEARNING** Forms of Learning, Supervised Learning, Learning Decision trees, Artificial Neural networks, Support vector machines, Knowledge in Learning, Inductive Logic Programming, Statistical Learning, Active & passive Reinforcement Learning.	9
V	**AI APPLICATIONS** **Natural Language Processing**: – Language Models – Information Retrieval-Information Extraction – **Natural Language for communication**: Machine Translation – Speech Recognition – **Robotics:** Robot Hardware, Perception – Planning – Moving, Robotic software Architectures.	9
Total Instructional Hours		45

Course Outcome

After completion of the course the learner will be able to

CO1: Use appropriate search algorithms for any AI problem.

CO2:Represent a problem using first order and predicate logic Write Genetic Algorithm to solve the optimization problem

CO3:Provide the apt agent strategy to solve a given problem.

CO4:Use Learning methods for the different types of problem

CO5:Design applications for NLP that use Artificial Intelligence

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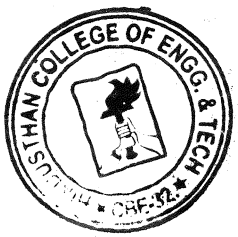

T1- S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach‖, Prentice Hall, Third Edition, 2009. (Unit I to V)
T2 - I. Bratko, —Prolog: Programming for Artificial Intelligence, Fourth edition, Addison-Wesley Educational Publishers Inc., 2011. (Unit I to V)

REFERENCE BOOKS:

R1-M. Tim Jones, —Artificial Intelligence: A Systems Approach(Computer Science)‖, Jones and Bartlett Publishers, Inc.; First Edition, 2008

R2-David L. Poole and Alan K. Mackworth, —Artificial Intelligence: Foundations of Computational Agents‖, Cambridge University Press, 2010.

R3-Gerhard Weiss, —Multi Agent Systems‖, Second Edition, MIT Press, 2013

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	**3**	3	3	3	-	-	-	-	-	-	-	**3**	3	2
CO2	**3**	3	3	2	-	-	-	-	-	-	-	**3**	3	2
CO3	**3**	3	3	2	-	-	-	-	-	-	-	**3**	3	**3**
CO4	**3**	3	3	1	-	-	-	-	-	-	-	**3**	3	**3**
CO5	**3**	**3**	**3**	**3**	-	-	-	-	-	-	-	**3**	**3**	**3**
AVG	**3**	**3**	**3**	**2.4**	-	-	-	-	-	-	-	**3**	**3**	**2.6**

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Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC8307	Low Power VLSI	3	0	0	3

Course Objective	The student should be able to 1. To gain knowledge about sources of power. 2. To throw light on the power optimization techniques. 3. To learn about the design of low power CMOS circuits. 4. To identify suitable techniques to estimate the power dissipation. 5. To explore memory circuits with low power dissipation.

Unit	Description	Instructional Hours
I	**POWER DISSIPATION IN CMOS** Hierarchy of limits of power – Sources of power consumption – Physics of power dissipation in CMOS FET devices – Basic principle of low power design.	9
II	**POWER OPTIMIZATION** Logic level power optimization – Circuit level low power design – circuit techniques for reducing power consumption in adders and multipliers.	9
III	**DESIGN OF LOW POWER CMOS CIRCUITS** Computer arithmetic techniques for low power system – reducing power consumption in memories – low power clock, Inter connect and layout design – Advanced techniques – Special techniques.	9
IV	**POWER ESTIMATION** Power Estimation techniques – logic power estimation – Simulation power analysis – Probabilistic power analysis.	9
V	**SYNTHESIS AND SOFTWARE DESIGN FOR LOW POWER** Synthesis for low power – Behavioral level transform – software design for low power.	9
Total Instructional Hours		45

Course Outcome	After completion of the course the learner will be able to CO1:Gain the knowledge to differentiate the various sources of power CO2:Toanalyze the different techniques in low power design. CO3: To identify the power reduction techniques based on technology independent and technology dependent Power dissipation mechanism in various MOS logic style. CO4: To analyze suitable techniques to estimate the power dissipation. CO5: To design memory circuits with low power dissipation.

TEXT BOOKS:

T1.Kaushik Roy and S.C.Prasad, "Low power CMOS VLSI circuit design", Wiley, 2000.
T2.Dimitrios Soudris, ChirstianPignet, Costas Goutis, "Designing CMOS Circuits for Low Power", Kluwer, 2002.

REFERENCE BOOKS:

R1.J.B.Kulo and J.H Lou, "Low voltage CMOS VLSI Circuits", Wiley 1999.
R2. A.P.Chandrasekaran and R.W.Broadersen, "Low power digital CMOS design", Kluwer, 1995.
R3.Gary Yeap, "Practical low power digital VLSI design", Kluwer, 1998.
R4. AbdelatifBelaouar, Mohamed.I.Elmasry, "Low power digital VLSI design", Kluwer, 1995.

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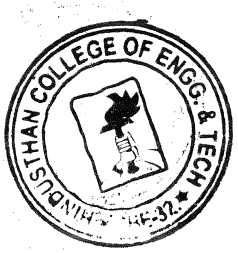

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	-	-	-	-	-	-	-	3	3	2
CO2	3	3	3	2	-	-	-	-	-	-	-	3	3	2
CO3	3	3	3	2	-	-	-	-	-	-	-	3	3	3
CO4	3	3	3	1	-	-	-	-	-	-	-	3	3	3
CO5	3	3	3	3	-	-			-	-		3	3	3
AVG	3	3	3	2.4	-	-			-	-		3	3	2.6

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Programme	Course code	Name of the course	L	T	P	C
BE	19EC8308	Software Defined Radio	3	0	0	3

Course Objective	1. To study about comprehensive knowledge of most technical aspects of SDR. 2. To understand the operations and applications of SDR 3. To know about up-to-date treatment of the latest technologies. 4. To study the system design implementations. 5. To know more about smart radio for future.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO SOFTWARE DEFINED RADIO** The Need for Software Defined Radios (SDR) - Definition, Characteristics and Benefits of a SDR- Architecture evolution of SDR – Foundations, technology tradeoffs and architecture implications - Antenna for Cognitive Radio - Design Principles of a Software Radio.	9
II	**FUNCTIONAL ARCHITECTURE OF SDR** Basics of SDR - Essential functions of SDR– Goals of architecture of SDR - Hardware and Software architecture of SDR - Computational properties of processing resources- Top level component topology- Interface topologies among plug and play modules - SDR as platform for cognitive radio.	9
III	**COGNITIVE RADIO** Introduction to Cognitive Radio - Motivation and Purpose - Marking radio self aware and cognitive techniques – Organization of Cognitive tasks - Enabling location and environment awareness in cognitive radios- Design Challenges associated with CR. - IEEE 802 Cognitive Radio related activities.	9
IV	**FUNCTIONAL ARCHITECTURE OF COGNITIVE RADIO** Cognitive Radio Capabilities-Cognitive Transceiver architecture - Radio Resource Allocation for Cognitive Radio - Spectrum Allocation in Cognitive Radio Networks -Spectrum Sensing – Spectrum Sharing – Spectrum Mobility – Spectrum Management – Regulatory issues – Emerging Cognitive Radio Applications in Cellular Networks.	9
V	**SMART RADIO FOR FUTURE** Dynamic Spectrum Access- Cognitive Cycle concept- Technologies supporting the Cognitive Radio concept-Spectrum Awareness- Radio Spectrum models- Spectrum measurement techniques – Concept and architecture of TV White Spaces.	9
TOTAL INSTRUCTIONAL HOURS		**45**

Course Outcome	After completion of the course the learner will be able to CO1: ToAnalyze technical aspects of SDR. CO2: To apply the concept of SDR. CO3:Toanalyze the latest technologies. CO4: To design architecture of cognitiveradio. CO5: To apply the smart radio concept.

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TEXT BOOKS:

T1- Andreas F. Molisch, "Wireless Communications", 2nd Edition, John Wiley & Sons Ltd, 2011.

T2- H. Venkataraman, G. Muntean (editores). Cognitive Radio and its Application for Next Generation Cellular and Wireless Networks. 2013. Spriger, ISBN 978-94-007-1826-5.

REFERENCE BOOKS:

R1- Markus Dillinger, "Software Defined Radio: Architectures, Systems and Functions", 2003.

R2- HuseyinArslan , "Cognitive Radio, Software Defined Radio and Adaptive wireless system,Springer, 1 edition ,September 24, 2007.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	**3**	3	3	3	-	-	-	-	-	-	-	**3**	3	**2**
CO2	**3**	3	3	2	-	-	-	-	-	-	-	**3**	3	**2**
CO3	**3**	3	3	2	-	-	-	-	-	-	-	**3**	3	**3**
CO4	**3**	3	3	1	-	-	-	-	-	-	-	**3**	3	**3**
CO5	**3**	**3**	**3**	**3**	-	-	-	-	-	-	-	**3**	**3**	**3**
AVG	**3**	**3**	**3**	**2.4**	-	-	-	-	-	-	-	**3**	**3**	**2.6**

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Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC8309	Photonic Networks	3	0	0	3

Course Objective

The student should be able

1. To understand the importance of the backbone infrastructure for our present and future communication needs.
2. To familiarize them with the architectures and the protocol stack in use.
3. To understand the differences in the design of data plane and the control plane and the routing, switching and the resource allocation methods and the network management and protection methods
4. To study the advances in networking and switching domains and the future trends.
5. To study the network management and protection methods.

Unit	Description	Instructional Hours
I	**OPTICAL SYSTEM COMPONENTS** Light Propagation in optical fibers – Loss & bandwidth, System limitations, Nonlinear effects; Solitons; Optical Network Components – Couplers, Isolators & Circulators, Multiplexers & Filters, Optical Amplifiers, Switches, Wavelength Converters..	9
II	**OPTICAL NETWORK ARCHITECTURES** Introduction to Optical Networks; SONET / SDH, Metropolitan-Area Networks, Layered Architecture; Broadcast and Select Networks – Topologies for Broadcast Networks, Media-Access Control Protocols, Wavelength Routing Architecture.	9
III	**WAVELENGTH ROUTING NETWORKS** The optical layer, Optical Network Nodes, Routing and wavelength assignment, Traffic Grooming in Optical Networks, Architectural variations- Linear Light wave networks.	9
IV	**PACKET SWITCHING AND ACCESS NETWORKS** Photonic Packet Switching – OTDM, Multiplexing and Demultiplexing, Synchronization, Broadcast OTDM networks, Switch-based networks, Contention Resolution Access Networks – Network Architecture overview, Optical Access Network Architectures and OTDM networks..	9
V	**NETWORK DESIGN AND MANAGEMENT** Transmission System Engineering – System model, Power penalty - transmitter, receiver, crosstalk, dispersion, Wavelength stabilization, Overall design considerations, Control and Management – Network management functions, Configuration management, Performance management, Fault management, Optical safety, Service interface.	9
Total Instructional Hours		45

Course Outcome

After completion of the course the learner will be able to

CO1: To gain knowledge on Photonic components in optical communication systems.
CO2:To know concept of Optical modulation and demodulation techniques.
CO3: To understand the basic aspects of routing networks .
CO4: To Analyze the architectures and the protocol stack.
CO5: To Compare the differences in the design of data plane, control plane, routing, switching, resource allocation methods, network management and protection methods.

TEXT BOOKS:

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T1- . Rajiv Ramaswami and Kumar N. Sivarajan, —Optical Networks: A Practical Perspectivel, Harcourt Asia Pte Ltd., Second Edition 2004.-UNIT 1 , UNIT II , UNIT III , UNIT IV , UNIT V

T2-C. Siva Ram Moorthy and Mohan Gurusamy, —WDM Optical Networks: Concept, Design and Algorithmsl, Prentice Hall of India, Ist Edition, 2002.. UNIT III

REFERENCE BOOKS:

R1 - Gerd Keiser – Optical Fiber : Third edition 2000

R2 - P.E. Green, Jr., —Fiber Optic Networksl, Prentice Hall, NJ, 1993.

R3 - Biswanath Mukherjee, —Optical WDM Networksl, Springer Series, 2006.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	-	-	-	-	-	-	-	3	3	2
CO2	3	3	3	2	-	-	-	-	-	-	-	3	3	2
CO3	3	3	3	2	-	-	-	-	-	-	-	3	3	3
CO4	3	3	3	1	-	-	-	-	-	-	-	3	3	3
CO5	3	3	3	3	-	-	-	-	-	-	-	3	3	3
AVG	3	3	3	2.4	-	-	-	-	-	-	-	3	3	2.6

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Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC8182	Intellectual Property Rights and Innovations	3	0	0	3

Course Objective

The student should be able

1. To introduce fundamental aspects of Intellectual property Rights
2. To understand the concept of Patents and copyrights.
3. To know the concepts of WIPO and GATT.
4. To study the Strategies and legislations of IPR.
5. To analyze Patents, Copyright and related rights by case studies

Unit	Description	Instructional Hours
I	**INTRODUCTION** Invention and Creativity – Intellectual Property (IP) – Importance –Protection of IPR – Basic types of property (i. Movable Property ii. Immovable Property and iii. Intellectual Property).	9
II	**PATENTS & COPYRIGHTS** IP – Patents – Copyrights and related rights – Trade Marks and rights arising from Trademark registration – Definitions – Industrial Designs and Integrated circuits – Protection of Geographical Indications at national and international levels – Application Procedures.	9
III	**INTRODUCTION TO WIPO & GATT** International convention relating to Intellectual Property – Establishment of WIPO –Mission and Activities – History – General Agreement on Trade and Tariff (GATT).	9
IV	**WTO AND STRATEGIES** Indian Position Vs WTO and Strategies – Indian IPR legislations – commitments to WTO-Patent Ordinance and the Bill – Draft of a national Intellectual Property Policy –Present against unfair competition.	9
V	**CASE STUDIES** Case Studies on – Patents (Basmati rice, turmeric, Neem, etc.) – Copyright and related rights – Trade Marks – Industrial design and Integrated circuits – Geographic indications – Protection against unfair competition	9
Total Instructional Hours		45

Course Outcome

After completion of the course the learner will be able to

CO1: To gain knowledge on IPR.
CO2:To know concept of Patents and copyrights.
CO3: To understand the concepts of WIPO and GATT.
CO4: To infer the Strategies and legislations of IPR
CO5: To analyze Patents, Copyright and related rights by various case studies.

TEXT BOOKS:

T1- WIPO Intellectual Property Handbook: Policy, Law and Use WIPO PUBLICATION NO. 489 (E) ISBN 92-805-1291-7 WIPO 2004 Second Edition

T2-. Intellectual Property Rights and Global Capitalism: The Political Economy of the Trips Agreement Donald G. Richards M E Sharpe Inc publisher , 2004 UNIT IV

REFERENCE BOOKS:

R1 - Intellectual Property Today : Volume 8, No. 5, May 2001, [www.iptoday.com].
- Using the Internet for non-patent prior art searches, Derwent IP Matters, July 2000.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	-	-	-	-	-	-	-	3	3	2
CO2	3	3	3	2	-	-	-	-	-	-	-	3	3	2
CO3	3	3	3	2	-	-	-	-	-	-	-	3	3	3
CO4	3	3	3	1	-	-	-	-	-	-	-	3	3	3
CO5	3	3	3	3	-	-	-	-	-	-	-	3	3	3
AVG	3	3	3	2.4	-	-	-	-	-	-	-	3	3	2.6

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PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC6401	Consumer Electronics	3	0	0	3

Course Objective	The student should be able to 1. Sketch and describe operating principles of different types of microphones. 2. Learn various components of video system and displays. 3. Describe working of Washing machine, Microwave ovens, Refrigerators. 4. Understand the working principles of power supplies. 5. Learn various standards in product compliances.

Unit	Description	Instructional Hours
I	**AUDIO SYSTEMS** Microphones, loudspeakers baffle and enclosure, Acoustics, mono, stereo, Quad, Amplifying System, Equalizers and Mixers, Synthesizers, Commercial Sound, Theater Sound System.	9
II	**VIDEO SYSTEMS AND DISPLAYS** Monochrome, Color TV standards, TFT, Plasma, HDTV, LCD, LED TV, Direct-To Home (DTH- Set Top Box), Video Telephone and Video Conferencing.	9
III	**DOMESTIC AND CONSUMER APPLIANCES** Washing machines, Microwave ovens, Air-conditioners and Refrigerators, Computers, office System, Telephone & Mobile Radio System.	9
IV	**POWER SUPPLIES** SMPS/UPS and Preventive Maintenance and others systems such as Remote controls, Bar codes, RFID.	9
V	**PRODUCT COMPLIANCE** Product safety and liability issues; standards related to electrical safety and fire hazards, EMI/EMC requirements, design techniques for ESD, RF interference and immunity, line current harmonics and mains voltage surge.	9
Total Instructional Hours		**45**

Course Outcome	After completion of the course the learner will be able to 1. Understand electronics engineering concepts used in audio systems. 2. Identify and explain working of various colour TV and Display blocks. 3. Understand the basic functions of various domestic and consumer electronic goods. 4. Understand various types of power supplies, Remote and RFID. 5. Use different product safety, compliance standards and techniques associated with electronic products.

TEXT BOOKS:

T1 - SP Bali, "Consumer Electronics", Pearson Education, 2008

T2 - J.S. Chitode, "Consumer Electronics", Technical Publications, 2007

REFERENCE BOOKS:

R1 - Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.

R2 - Marco Schwartz, "Internet of Things with the Arduino Yun", Packt Publishing, 2014.

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PRINCIPAL

Programme	Course Code	Name of the Course	L	T	P	C
BE	19EC7401	Introduction to IOT (Common to all Branches)	3	0	0	3

Course Objective	The student should be able to 1. To understand the fundamentals of Internet of Things. 2. To build a small low cost embedded system using Arduino / Raspberry Pi or equivalent boards. 3. To apply the concept of Internet of Things in the real world scenario 4. To model an IoT based system with specifications and requirements. 5. To construct a web based system using IoT

Unit	Description	Instructional Hours
I	**The Internet of Things: An Overview** Introduction-Characteristics-Physical design - Protocols – Logical design – Enabling technologies – IoT Levels – Domain Specific IoTs: Home Automation. IoT vs M2M.	9
II	**IoT Design Methodology** IoT systems management – IoT Platforms Design Methodology – Specifications - Integration and Application Development.	9
III	**IoT with Raspberry PI** Physical device – Raspberry Pi Interfaces – Programming – Other IoT Devices	9
IV	**Building IoT With Galileo/Arduino** Intel Galileo Gen2 - Exploring the Linux Console - Arduino IDE – Programming - The Arduino Language Reference and APIs – Servo API.	9
V	**Advanced Topics and Case Studies** IoT Physical Servers & Cloud Offerings: WAMP – Django – Amazon Web Services, Case Studies: Smart Lighting – Weather Monitoring System – Smart Irrigation - IoT Printer.	9
Total Instructional Hours		**45**

Course Outcome	After completion of the course the learner will be able to CO1:Describe IoT with various tools. CO2:Design a portable IoT using Arduino/ equivalent boards and relevant protocols. CO3:Develop web services to access/control IoT devices. CO4:Deploy an IoT application and connect to the cloud. CO5;Analyze applications of IoT in real time scenario

TEXT BOOKS:

T1- ArshdeepBahga, Vijay Madisetti, "Internet of Things – A hands-on approach", Universities Press, 2015. (Unit 1,2, 3 & 5)

T2- Manoel Carlos Ramon, "Intel® Galileo and Intel® Galileo Gen 2: API Features and Arduino Projects for Linux Programmers", Apress, 2014. (Unit 4).

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REFERENCE BOOKS:
R1 - Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.
R2 - Marco Schwartz, "Internet of Things with the Arduino Yun", Packt Publishing, 2014.

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Programme	Course Code	Course Title	L	T	P	C
BE/BTECH	19LS6401	General Studies for Competitive Examinations	2	1	0	3

Course Objectives:

1. To provide awareness to the students about higher education entrance exams and various types of jobs offered both in the Central and State Government.(CAT, GMAT, GRE, IBPS, IELTS, UPSC, SSC, RRB, TNPSC, GATE, IES, TNEB, AFCAT, DRDO, ISRO, INCOME TAX,LIC...)
2. To help the students to choose the area where they are interested.
3. To develop competitive skills through various types of objective tests.
4. To train them by conducting aptitude test based on verbal and quantitative skills.

Unit	Description	Instructional Hours
I	**Numerical Ability** Simplification and Approximation – Algebra – Number System- Averages – Ratio and Proportion – Partnership – Allegation or Mixture – Problem on Ages - Percentages - Profit and Loss – Time and Work – Pipes and Cisterns – Time, Speed and Distance – Problems on Trains ,Boats and Streams - Permutation and Combination- Probability- Data Interpretation- Simple Interest and Compound Interest – Geometry , Trigonometry and Mensuration – Progressions.	18
II	**Reasoning Ability** Alphanumeric series - Reasoning Analogies – Coding-Decoding – Blood Relations - Directions – Calendars –Clocks – Data Sufficiency – Deductive Reasoning - Input-Output – Order & Ranking – Seating Arrangements –Visual Reasoning – Cubes and cuboids - Critical Reasoning – Syllogism – Venn Diagram – Puzzles	10
III	**Language Competency** Reading Comprehensions – Cloze Test – Sentence Completion – Match the Columns – Error Detection – Jumbled word/Paragraphs – Vocabulary & Grammar – One Word Substitution – Idioms and Phrases – Antonyms and Synonyms – Sentence Correction – Misfit/Out of Context sentence.	10
IV	**Computer Acquaintanceship** Internet – Memory – Keyboard Shortcuts – Computer Abbreviation – Microsoft Office – Computer Hardware – Computer Software – Operating System – Networking – Computer Fundamentals /Terminologies.	3
V	**General Awareness** Geography – Culture – History – Economic Science – Scientific Research – General Policy – Awards and Honours – Books and Authors – Static GK - Current Affairs.	4
	Total Instructional Hours	45

Course Outcomes

CO1:
Thinking critically and applying basic mathematics skills to interpret data, draw conclusions, and solve problems; developing proficiency in numerical reasoning;
Application of quantitative reasoning in aptitude tests.

CO2:
The ability to identify and define problems/issues, recognizing their complexity, and considering alternative viewpoints and solutions to use the critical skills of observation, analysis, evaluation.

CO3:

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	Understanding and reasoning using concepts framed in words; Critical verbal reasoning; Reading Comprehension; Application of verbal reasoning in aptitude tests.
	CO4: Students will possess the basic understanding of computer hardware and software, utilizing web technologies, basic understanding of network principles, Keyboard Shortcuts and various Operating System.
	CO5: Students will be updated with awareness and knowledge regarding the occurrences around the world.
R1:	Quantitative Aptitude for Competitive Examinations – Abhijith Guptha
R2:	The Pearson Guide to Quantitative Aptitude - Dinesh Khattar
R3:	Analytical Reasoning and Logical Reasoning- Peeyush Bharadwaj
R4:	A New Approach to Reasoning - B.S. Sijwali & S. Sijwali Arihant
R5:	Word Power made easy - Norman Lewis
R6:	Verbal Ability & Reading Comprehension for the CAT – Arun Sharma, Meenakshi Upadhyay - Mcgraw-hill Education
R7:	Computer Awareness - Arihant Publication
R8:	General Knowledge and General Awareness - Arihant Manhar Pandey

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Programme	Course Code	Name of the Course	L	T	P	C
BE/BTech	19LS6402	Human rights, Women rights and Gender equality	3	0	0	3

COURSE OBJECTIVES

- To sensitize the Engineering students to various aspects of Human Rights
- To make them understand the world level perspective related to Human Rights
- To identify the constitutional rights of women
- To understand the various political rights and laws related to women
- To understand the gender equality concepts

Unit	Description	Instructional Hours
I	**Introduction** Human Rights – Evolution of the concept of Human Rights - Meaning, origin and Development. Notion and Classification of Rights – Natural, Moral and Legal Rights, Civil and Political rights. Economic, Social and Cultural Rights - Theories of Human Rights - Philosophical foundations of Human Rights	9
II	**Human Rights national and international perspective** Human Rights in India – Constitutional Provisions / Guarantees – Redressal Mechanisms at National and International levels – Constitutional Remedies and Directions of state policy - Geneva Convention of 1864. Universal declaration of Human Rights, 1948. UN agencies to monitor and compliance – UNHRC (United Nations Human Rights Commission)	9
III	**CONSTITUTIONAL RIGHTS OF WOMEN IN INDIA** Indian constitution relating to women - Fundamental rights - Directive principles of state policy - right to equality - rights against exploitation, the right to constitutional remedy - University Declaration of Human Rights - Enforcement of Human Rights for Women and Children - Role of Cells and Counseling Centers - Legal AID cells, Help line, State and National level Commission	9
IV	**POLITICAL RIGHTS OF WOMEN IN INDIA AND LAWS** Political Rights of Women in India - Electoral process - women as voters - candidates and leader - pressure group, Representation of women in local self government – women in Rural and urban local bodies – Reservation of women – Laws against violence & Sexual crimes: eve teasing – rape - indecent representation of women - immoral trafficking	9
V	**GENDER EQUALITY** Gender roles: Biological vs cultural determinism – Private vs public dichotomy – Gender division of labour and asymmetric role structure Gender role socialization and formation of identity –Occupational segregation and wage discrimination – Gender stereotyping in work place – Human development indicators and gender disparity	9
Course Outcome	After completion of the course the learner will be able to CO1:Describe IoT with various tools. CO2:Design a portable IoT using Arduino/ equivalent boards and relevant protocols. CO3:Develop web services to access/control IoT devices. CO4:Deploy an IoT application and connect to the cloud. CO5;Analyze applications of IoT in real time scenario	

TEXT BOOKS:

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Kapoor S.K, "Human Rights under International Law and Indian Laws", Central Agency, Allahabad 2014.
ArunaGoel. (2004). "Violence and Protective Measures for Women Development and Empowerment". Deep & Deep, New Delhi.

REFERENCES:

Chandra U "Human Rights" Allahabad Law Agency, Allahabad 2014.
Upandra Baxi "The Future of Human Rights, Oxford Univeristy Press, New Delhi.
Menonnivedita (2004). "Recovering Subversion: Feminist Politics beyond the Law". Permanent Black, Delhi.
Cornick, J.C. and Meyers, M.K. (2009) *Gender Equality: Transforming Family Divisions of Labor*. New York: Verso.

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Programme	Course Code	Name of the Course	L	T	P	C
BE/BTech	19LS6404	Indian Ethos and Human Values	3	0	0	3

Course Objective	1. To learn about Indian ethos and its importance today 2. To know about business concepts and philosophies from various perspectives. 3. To know the Indian philosophical system of knowing oneself. 4. To understand values and its significance. 5. To know ethics from western and Indian perspective.

Unit	Description	Instructional Hours
I	**INDIAN ETHOS** Indian Ethos – Models of management in Indian socio-political environment. Indian work ethos and principles of Indian Management – Goals of Life- Teachings of important Indian Spiritual leaders..	9
II	**BUSINESS CONCEPTS AND PHILOSOPHIES** Economics of giving - Western economic system. Developing and implementing gross national happiness - Sabbath economics - Islamic economics and Banking	9
III	**INDIAN PHILOSOPHICAL SYSTEM** Indian Philosophical system - Nature of mind - Personality attributes based on Gunas - Human values and five sheaths - Bagavad Gita for human perfection	9
IV	**VALUES** Meaning - Significance - Formation of values- Science and values. – Application of values in Management - Values for managers - Chanakya neethi on leadership	9
V	**ETHICS** Introduction to Greek philosophers - Perspectives on ethics - Indian constitution and Unity in diversity - Thirukural on ethics	9
Total Instructional Hours		45

Course Outcome	CO1: To impart knowledge on Indian Ethos for inspirational life CO2: To apply Business concepts and philosophies for broader perspective in society CO3: To familiarize students about Indian philosophy system to handle life efficiently CO4: To apply values in day to day functioning for better standard of life. CO5: To conceptualize ethics from western and Indian perspective

TEXT BOOKS:

T1- Nandagopal.R and Ajith Sankar R.N. Indian Ethos and Values in Management, ISBN – 978-0-07-106779-9. Tata McGraw Hill Education Private Ltd, 2011.
T2-Khandelwal.N.M, Indian Ethos and Values for Managers, ISBN 978-93-5024-452-4, 3rd Edition, Himalaya Publishing House, 2011.

REFERENCE BOOKS:

R1-Management Thoughts in Thirukkural by K. Nagarajan – ANMOL Publications PVT Ltd 4374/4B Ansari Road, New Delhi 110 002. 2010.
R2-Dr. Radhakrishnan Pillai, Corporate Chanakya, ISBN 978-81-8495-133-2, Jaico Publishing House, 2016.
R3-Soham, LEEP (Life Empowerment and Enrichment Program), ISBN 9788175977259 Central Chinmaya Mission Trust, 2017.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech.	19LS6403	INDIAN CONSTITUTION and POLITICAL SYSTEM	3	0	0	3

Course Objective	OBJECTIVES: 1.Teach history and philosophy of Political Science. 2.Describe the Indian Constitution and fundamental rights. 3.Summarize powers and functions and Emergency rule of Indian government. 4.Explain Local Governance. 5.Converse the challenges to Indian Democracy

Unit	Description	Instructional Hours
I	**INTRODUCTION** Meaning, Nature and Scope of Political Science – Significance of Political Science as a Discipline - Approaches to the study of Political Science – Key Concepts: State, Nation and Sovereignty - Political Science as a Science or an Art .	9
II	**CONSTITUTION OF INDIA &FUNDAMENTAL RIGHTS** Meaning of the constitution law and constitutionalism – Historical perspective of the constitution of India – salient features and characteristics of the constitution of India. Scheme of the fundamental rights – fundamental duties and its legislative status – The directive principles of state policy –Rights of women and Children -Constitutional Remedies for citizens	9
III	**PARLIAMENTARY FORM OF GOVERNMENT AND EMERGENCY PROVISIONS** The constitution powers and the status of the president in India. – Amendment of the constitutional powers and procedures – Emergency provisions: National emergency, President rule, Financial emergency.	9
IV	**LOCAL GOVERNANCE** Panchayati Raj and Municipal Government; Structure, Power & Functions; Significance of 73rd and 74th Amendments; Changes in Rural Power structure and empowerment of the marginalized groups such as SCs/STs and Women	9
V	**CHALLENGES TO INDIAN DEMOCRACY** Caste, class, ethnicity and gender in Indian politics; Criminalization and corruption, politics of regionalism, communalism, backward class and Dalit movements, Tribal people movements, struggle for gender justice	9
Total Instructional Hours		45

Course Outcome	Upon completion of the course, students will be able to CO1: Understand the history of Indian Constitution CO2: Understand fundamental rights and fundamental duties. CO3: Understand the Parliamentary form of Governmentand Challenges to Indian Demorcracy

TEXT BOOKS:

T1 - Durga Das Basu, "Introduction to the Constitution of India ", Prentice Hall of India, New Delhi, 1997.
T2 -Agarwal R C., "Indian Political System",S.Chand and Company, New Delhi, 1997.
T3 - Johari,J.C. Principles of Modern Political Science. New Delhi: Sterling, 1989.
T4 - Sharma K L., "Social Stratification in India: Issues and Themes", Jawaharlal Nehru University, New Delhi, 1997.

REFERENCE BOOKS:

R1 - Sharma, Brij Kishore, " Introduction to the Constitution of India:, Prentice Hall of India, New Delhi.
R2 - Gahai U R., "Indian Political System ", New Academic Publishing House, Jalaendhar.
R3 -Sharma R N., "Indian Social Problems ", Media Promoters and Publishers Pvt. Ltd.

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Programme	Course Code	Course Title	L	T	P	C
BE/BTECH	19LS6405	YOGA FOR HUMAN EXCELLENCE	2	0	1	3

Course Objectives:	Understanding of 1.Structure and functions of Human Body, 2.Importance of Physical Exercises and various Medical systems 3.Life- force and Philosophy of Kaya Kalpa 4. Mind and its functions and 5.Meditation Practices.

Unit	Description	Instructional Hours
I	**PHYSICAL STRUCTURE** Purpose of life - life — yoga — modern life style - importance of physical health,Physical structure—combination of five elements - three forms of body,Blood circulation system - Respiratory system. Nervous system - Digesting system	9
II	**FUNCTIONS OF PHYSICAL BODY** Three circulations - disease, pain and death - causes for disease, Limit and method in five aspects — food, work, sleep, sensual pleasure and thought, Importance of physical exercises - Simplified Physical Exercises - Rules and regulations, Food and Medicine — yogic food habits — natural food - naturopathy -Medical systems: Allopathy, Siddha, Ayurvedha,Unani and Homeopathy.	9
III	**REJUVENATION OF LIFE-FORCE** Philosophy of Kaya kalpa - Physical body - Sexual vital fluid - Life force- Bio-Magnetism - Mind,Anti-ageing and postponing death - Kayakalpa Practical - benefits,Sex and spirituality - value of sexual vital fluid - married life - chastity,Functional Relationships of body, life force and mind.	9
IV	MIND Bio-magnetic wave - Mind - imprinting and magnifying - Eight essential factors of living beings, Mental Frequency - functions of mind — five layers, Ten stages of mind Benefits of meditation -habitual imprints - understandable imprints, Importance of meditation - benefits of meditation.	9
V	**MEDITATION** Simplified Kundalini Yoga - greatness of guru - types of meditation,Agna meditation - explanation - benefits,Santhi meditation - explanation - benefits - clearance of spinal cord - benefits,Thuriam meditation - explanation - benefits - Thuriyatheetham meditation - explanation - benefits.	9
	Total Instructional Hours	45
Text Book:	1. Yogic Life- VISION, Vethathiri Publications.	
Reference Books:	1VethathiriMaharishi,YogaforModernage,2017,VethathiriPublications, Erode. 2Vethathiri Maharishi, Mind, 2017, Vethathiri Publications, Erode. 3Dr.Mathuram Sekar, Medicine and Health, NarmadhaPublications. 4Vethathiri Maharishi, Simplified Physical Exercises, 2013, Vethathiri Publications, Erode 5WCSC-VISION for Wisdom, Yogasanas, 2012, Vethathiri Publications, Erode.	

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