K.S.INSTITUTE OF TECHNOLOGY, BANGALORE

(AFFLIATED TO VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGG.

ENGINEERING MATHEMATICS-III

(Common to all Branches)

Course Title: Engineering Mathematics-III | **Course Code : 15MAT31**
Credits:04 | **L-T-P :4-0-0**
Contact Hours/Week: 04 | **Total Hours:50**
Exam. Marks:60 | **IA Marks :40**
Exam. Hours : 03

Module-1
Fourier Series: Periodic functions, Dirichlet's condition, Fourier Series of periodic functionswithperiod2πandwitharbitraryperiod$2c$.Fourierseriesofevenandodd functions. Half range Fourier Series, practical harmonic analysis-Illustrative examplesfromengineeringfield. **L1, L2,L4**
Module-2
FourierTransforms: InfiniteFouriertransforms,Fouriersineandcosinetransforms. Inverse Fouriertransform. **Z-transform:**Differenceequations,basicdefinition,z-transform-definition,Standardz-transforms,Dampingrule,Shiftingrule,Initialvalueandfinalvaluetheorems(without proof) and problems, Inverse z-transform. Applications of z-transforms to solve differenceequations. **L2, L3,L4**
Module-3
Statistical Methods: Review of measures of central tendency and dispersion. Correlation-Karl Pearson's coefficient of correlation-problems. Regression analysis- lines of regression (without proof) –Problems **CurveFitting:**Curvefittingbythemethodofleastsquares-fittingofthecurvesofthe form, $y = ax + b$, $y = ax^2 + bx + c$ *and* $y = ae^{bx}$. **NumericalMethods:**Numericalsolutionofalgebraicandtranscendentalequationsby Regula-FalsiMethodandNewton-Raphsonmethod. **L3**
Module-4
Finite differences: Forward and backward differences, Newton's forward and backward interpolation formulae. Divided differences- Newton's divided difference formula. Lagrange's interpolation formula and inverse interpolation formula (all formulae withoutproof)-Problems **Numerical integration:** Simpson's $(1/3)^{th}$ and $(3/8)^{th}$ rules, Weddle's rule (withoutproof)–Problems. **L3**
Module-5
Vectorintegration: Line integrals-definition andproblems, surface and volume integrals-definition, Green's theorem in a plane, Stokes and Gauss-divergence theorem(withoutproof)andproblems. **L3, L4** **Calculus of Variations:** Variation of function and Functional, variational problems. Euler'sequation,Geodesics,hangingchain,Problems**.** **L2,L4**

Course outcomes: On completion of this course, students are able to:

- Knowtheuseofperiodicsignalsand Fourierseriestoanalyzecircuitsandsystem communications.
- Explainthegenerallinearsystemtheoryforcontinuous-timesignalsanddigital signalprocessingusingtheFourierTransformandz-transform.
- Employ appropriate numerical methods to solve algebraic and transcendental equations.
- Apply Green's Theorem, Divergence Theorem and Stokes' theorem in various applicationsinthefieldofelectro-magneticandgravitationalfieldsandfluidflow problems.
- Determinetheextremalsoffunctionalsandsolvethesimpleproblemsofthe calculus ofvariations.

Text Books:

1. B.S.Grewal:HigherEngineeringMathematics,KhannaPublishers,43rdEd.,2015.
2. E.Kreyszig: Advanced Engineering Mathematics, John Wiley & Sons,10th Ed., 2015.

Reference Books:

1. N.P.Bali and Manish Goyal: A Text Book of Engineering Mathematics, Laxmi Publishers, 7th Ed.,2010.
2. B.V.Ramana:"HigherEngineeringMathematics"TataMcGraw-Hill,2006.
3. H. K. Dass and Er. Rajnish Verma: "Higher EngineeringMathematics", S.Chand publishing, 1st edition, 2011.

Web Link and Video Lectures:

1. http://nptel.ac.in/courses.php?disciplineID=111
2. http://www.khanacademy.org/
3. http://www.class-central.com/subject/math

ADDITIONAL MATHEMATICS - I

B.E., III Semester, Common to all Branches

(A Bridge course for Lateral Entry students of III Sem. B. E.) [As per Choice Based Credit System (CBCS) Scheme]

Course Code	**17MATDIP31**	**CIE Marks**	**--**
Number of Lecture Hours/Week	**03**	**SEE Marks**	**60**
Total Number of Lecture Hours	**40 (08 Hours per Module)**	**Exam Hours**	**03**

Credits – 00

Course Objectives: This course will enable students to:

- Acquirebasicconceptsofcomplextrigonometry,vectoralgebra,differential& integral calculus and vectordifferentiation.
- Solve first order differentialequations.

Module-1

Complex Trigonometry: Complex Numbers: Definitions & properties. Modulus and amplitude of a complex number, Argand's diagram, De-Moivre's theorem (without proof).
VectorAlgebra:Scalarandvectors.Vectorsadditionandsubtraction.Multiplicationof vectors(DotandCrossproducts).Scalarandvectortripleproducts-simpleproblems.
L1

Module-2

Differential Calculus: Review of successive differentiation. Formulae for n^{th} derivatives of standard functions- Liebnitz's theorem (without proof). Polar curves– anglebetweentheradiusvectorandthetangentpedalequation-Problems.Maclaurin's series expansions-Illustrative examples. Partial Differentiation : Euler's theoremfor homogeneousfunctionsoftwovariables.Totalderivatives-differentiationofcomposite andimplicitfunction.ApplicationtoJacobians. **L1, L2**

Module-3

Integral Calculus: Statement of reduction formulae for $sin^n x$, $cos^n x$, and $sin^m x cos^n x$ andevaluationofthesewithstandardlimits-Examples.Doubleandtripleintegrals-Simpleexamples. **L1, L2**

Module-4

VectorDifferentiation:Differentiationofvectorfunctions.Velocityandaccelerationof a particle moving on a space curve. Scalar and vector point functions. Gradient, Divergence, Curl and Laplacian (Definitions only). Solenoidal and irrotationalvector fields-Problems. **L1,L2**

Module-5

Ordinarydifferentialequations(ODE's): Introduction-solutionsoffirstorderandfirst degree differential equations: homogeneous**,** exact, linear differential equations of order oneandequationsreducibletoabovetypes. **L1, L2**

Course outcomes: On completion of the course, students are able to:

- Understand the fundamental concepts of complex numbers and vector algebrato analyze the problems arising in relatedarea.

Usederivativesandpartialderivativestocalculateratesofchangeofmultivariate functions.

- Learntechniquesofintegrationincludingdoubleandtripleintegralstofindarea, volume,massandmomentofinertiaofplaneandsolidregion.
- Analyze position, velocity and acceleration in two or three dimensions using the calculus of vector valuedfunctions.
- Recognizeandsolvefirst-orderordinarydifferentialequationsoccurringindifferent branches ofengineering.

Text Book:

B.S.Grewal:HigherEngineeringMathematics,KhannaPublishers,NewDelhi,43rdEd.,2015.

Reference Books:

1. E.Kreyszig: Advanced Engineering Mathematics, John Wiley & Sons, 10th Ed., 2015.
2. N.P.Bali and Manish Goyal: Engineering Mathematics, Laxmi Publishers, 7th Ed., 2007.

ELECTRONIC INSTRUMENTATION
SEMESTER – III (EC/TC)
[As per Choice Based Credit System (CBCS) Scheme]

Course Code	**17EC32**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**03**	**SEE Marks**	**60**
Total Number of Lecture Hours	**40 (08 Hours per Module)**	**Exam Hours**	**03**

CREDITS – 03

Course objectives: This course will enable students to:

- Define and describe accuracy and precision, types of errors.
- Describe the operation of Ammeters, Voltmeters, Multimeters and develop circuits for multirange Ammeters andVoltmeters.
- DescribefunctionalconceptsandoperationofvariousAnalogandDigital measuringinstruments.
- Describe basic concepts and operation of Digital Voltmeters.
- DescribeanddiscussfunctioningandtypesofOscilloscopes,Signalgenerators, AC and DCbridges.
- Recognize and describe significance and working of different types of transducers.

Module- 1

MeasurementandError: Definitions,Accuracy,Precision,ResolutionandSignificant Figures,TypesofErrors,Measurementerrorcombinations.**(Text2)**

Ammeters:DCAmmeter,MultirangeAmmeter,TheAyrtonShuntorUniversal Shunt, Requirements ofShunt,ExtendingofAmmeterRanges,RFAmmeter (Thermocouple), Limitations of Thermocouple. **(Text1)**

Voltmeters and Multimeters: Introduction, Basic Meter as a DC Voltmeter, DC Voltmeter,MultirangeVoltmeter,ExtendingVoltmeterRanges,Loading,ACVoltmeter usingRectifiers.TrueRMSVoltmeter,Multimeter.**(Text1)** **L1, L2,L3**

Module -2

DigitalVoltmeters: Introduction,RAMPtechnique,DualSlopeIntegratingTypeDVM, Integrating Type DVM, Most Commonly used principles of ADC, Successive Approximations, $3\frac{1}{2}$-Digit, Resolution and Sensitivity of Digital Meters, General Specifications of DVM, **(Text1)**

Digital Instruments: Introduction, Digital Multimeters, Digital Frequency Meter, Digital Measurement of Time, Universal Counter, Digital Tachometer, Digital pHMeter, DigitalPhaseMeter,DigitalCapacitanceMeter,**(Text1)** **L1,L2,L3**

Module -3

Oscilloscopes: Introduction, Basic principles, CRT features, Block diagram of Oscilloscope,SimpleCRO,VerticalAmplifier,HorizontalDeflectingSystem,Sweepor Time Base Generator, Measurement of Frequency by Lissajous Method, Digital Storage Oscilloscope. **(Text1)**

SignalGenerators: Introduction,FixedandVariableAFOscillator,StandardSignal Generator,LaboratoryTypeSignalGenerator,AFsineandSquareWaveGenerator, Function Generator,**(Text1)** **L1,L2**

Module -4

Measuring Instruments: Field Strength Meter, Stroboscope, Phase Meter, Q Meter, Megger. **(Text 1)**

Bridges: Introduction, Wheatstone's bridge, Kelvin's Bridge; AC bridges, Capacitance Comparison Bridge, Inductance Comparison Bridge, Maxwell's bridge, Wien's bridge. **(Text 1) L1, L2, L3**

Module -5

Transducers: Introduction,Electricaltransducers,Selectingatransducer,Resistive transducer,Resistivepositiontransducer,Straingauges,Resistancethermometer, Thermistor,Inductivetransducer, – LVDT, Piezoelectric transducer, Photo cell,Photo voltaiccell,Semiconductorphotodiodeandtransistor.**(Text1)** **L1, L2,L3**

CourseOutcomes: Afterstudyingthiscourse,studentswillbeableto:

- Make use of the fundamentals of electronic measurements to analyze various parameters of measurement
- Identify the functioning of various types of analog and digital measuring instruments.
- Examine the functioning of various types of oscilloscopes and signal generators.
- Utilize AC and DC bridges for passive component and frequency measurements.
- Analyse different types of transducers in various applications.

TextBooks:

1. H.S. Kalsi, ―ElectronicInstrumentation‖, McGraw Hill,3rdEdition,2012, ISBN:9780070702066.
2. DavidA.Bell,―ElectronicInstrumentation&Measurements‖,OxfordUniversity Press PHI 2nd Edition, 2006, ISBN81-203-2360-2.

Reference Books:

1. A. D. Helfrick and W.D. Cooper, ―Modern Electronic Instrumentation and MeasuringTechniques‖,Pearson,1stEdition,2015,ISBN:9789332556065.
2. A. K. Sawhney, ―Electronics and Electrical Measurements‖, Dhanpat Rai &Sons.ISBN -81-7700-016-0

Web Link and Video Lectures:

1. https://swayam.gov.in/nd1_noc19_ee44/preview
2. https://ekeeda.com/subject/electronic-instrumentation-and-measurement

ANALOG ELECTRONICS
SEMESTER – III(EC/TC)
[As per Choice Based Credit System (CBCS) Scheme]

Course Code	**17EC33**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**04**	**SEE Marks**	**60**
Total Number of Lecture Hours	**50 (10 Hours per Module)**	**Exam Hours**	**03**

CREDITS – 04

Course objectives: This course will enable students to:

- Explain various BJT parameters, connections andconfigurations.
- Explain BJT Amplifier, Hybrid Equivalent and HybridModels.
- Explain construction and characteristics of JFETs andMOSFETs.
- ExplainvarioustypesofFETbiasing,anddemonstratetheuseofFETamplifiers.
- ConstructfrequencyresponseofBJTandFETamplifiersatvariousfrequencies.
- AnalyzePoweramplifiercircuitsindifferentmodesofoperation.
- Construct Feedback and Oscillator circuits usingFET.

Module -1

BJTACAnalysis:BJTTransistorModeling,Theretransistormodel,Commonemitter fixedbias,Voltagedividerbias,Emitterfollowerconfiguration.Darlingtonconnection-DCbias;TheHybridequivalentmodel,ApproximateHybridEquivalentCircuit-Fixed bias, Voltage divider, Emitter follower configuration; Complete Hybrid equivalent model, HybridπModel. **L1,L2,L3**

Module -2

Field Effect Transistors: Construction and Characteristics of JFETs, Transfer Characteristics, Depletion type MOSFET, Enhancement type MOSFET.

FET Amplifiers: JFET small signal model, Fixed bias configuration, Self bias configuration, Voltage divider configuration, Common Gate configuration. Source- Follower Configuration,Cascadeconfiguration. **L1, L2,L3**

Module -3

BJTandJFETFrequencyResponse: Logarithms,Decibels,Lowfrequencyresponse – BJT Amplifier with RL, Low frequency response-FET Amplifier, Miller effect capacitance,Highfrequencyresponse–BJTAmplifier,Highfrequencyresponse-FET Amplifier, MultistageFrequencyEffects. **L1, L2,L3**

Module -4

Feedback and Oscillator Circuits: Feedback concepts, Feedback connection types, Practical feedback circuits, Oscillator operation, FET Phase shift oscillator, Wien bridge oscillator, Tuned Oscillator circuit, Crystal oscillator, UJT construction,UJT Oscillator. **L1,L2,L3**

Module -5

Power Amplifiers: Definition and amplifier types, Series fed class A amplifier, Transformer coupled class A amplifier, Class B amplifier operation and circuits, Amplifier distortion, Class C and Class D amplifiers.

VoltageRegulators: Discretetransistorvoltageregulation-SeriesandShuntVoltage regulators. **L1, L2,L3**

Course Outcomes: After studying this course, students will be able to:

- Identify the working principle and characteristics of BJT, FET, Single stage, cascaded and feedback amplifiers.
- Construct the Phase shift, Wien bridge, tuned and crystal Oscillators using BJT/FET/UJT.
- Solve for the AC gain and impedance for BJT using re and h
- Parameters models for CE and CC configuration.
- Identify the performance characteristics and parameters of BJT and FET amplifier using small signal model.
- Determine parameters which affect low frequency and high frequency responses of BJT and FET amplifiers. Compare efficiency of Class A and Class B power amplifiers and voltage regulators.

TextBook:

Robert L. Boylestad and Louis Nashelsky, ―Electronics devices and Circuit theory‖, Pearson, 10th/11th Edition, 2012, ISBN:978-81-317-6459-6.

Reference Books:

1. AdelS.SedraandKennethC.Smith,―MicroElectronicCircuitsTheoryand Application‖, 5th EditionISBN:0198062257
2. FundamentalsofMicroelectronics,BehzadRazavi,JohnWeilyISBN2013978-81- 265-2307-8
3. J.Millman&C.C.Halkias―IntegratedElectronics,2nd edition,2010,TMH.ISBN0- 07-462245-5
4. K.A.Navas,―ElectronicsLabManual‖,VolumeI,PHI,5thEdition,2015, ISBN:9788120351424.

Web Link and Video Lectures:

1. https://www.classcentral.com/course/swayam-analog-circuits
2. https://swayam.gov.in/nd1_noc19_ee38/preview

DIGITAL ELECTRONICS

SEMESTER – III(EC/TC)

[As per Choice Based Credit System (CBCS) Scheme]

Course Code	**17EC34**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**04**	**SEE Marks**	**60**
Total Number of Lecture Hours	**50 (10 Hours per Module)**	**Exam Hours**	**03**

CREDITS – 04

Course objectives: This course will enable students to:

- IllustratesimplificationofAlgebraicequationsusingKarnaughMapsandQuine- McCluskyTechniques. Design combinational logic circuits.
- Design Decoders, Encoders, Digital Multiplexer, Adders, Subtractors and Binary Comparators.
- DescribeLatchesandFlip-flops,RegistersandCounters. Analyze Mealy and MooreModels.
- Develop state diagrams Synchronous Sequential Circuits.
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Module – 1

Principles of combination logic: Definition of combinational logic, canonicalforms, Generationofswitchingequationsfromtruthtables,Karnaughmaps-3,4,5variables, Incompletelyspecifiedfunctions(Don‘tcareterms)SimplifyingMaxtermequations, Quine-McCluskeyminimizationtechnique,Quine-McCluskeyusingdon‘tcareterms, ReducedprimeimplicantsTables(Text1,Chapter3). **L1, L2,L3**

Module -2

Analysis and design of combinational logic: General approach to combinational logic design, Decoders, BCD decoders, Encoders, digital multiplexers, Using multiplexersasBooleanfunctiongenerators,Addersandsubtractors,Cascadingfull adders,Lookaheadcarry,Binarycomparators(Text1,Chapter4). **L1, L2,L3**

Module -3

Flip-Flops: BasicBistableelements,Latches,Timingconsiderations,Themaster-slave flip-flops (pulse-triggered flip-flops): SR flip-flops, JK flip-flops, Edge triggered flip-flops,Characteristicequations.(Text2,Chapter6) **L1,L2**

Module -4

SimpleFlip-FlopsApplications:Registers,binaryripplecounters,synchronousbinary counters, Counters based on shift registers, Design of a synchronous counters, Design of a synchronous mod-n counter using clocked T , JK , D and SR flip-flops. (Text 2,Chapter6) **L1,L2, L3**

Module -5

Sequential Circuit Design: Mealy and Moore models, State machine notation, Synchronous Sequential circuit analysis, Construction of state diagrams, counter design. (Text 1,Chapter6) **L1, L2,L3**

Course Outcomes: After studying this course, students will be able to:

- Apply Boolean algebra and Karnaugh Map to analyze combinational digital circuits.
- Apply Quine Mc-Cluskey technique for minimization of Boolean expression to get minimal SOP and POS Forms.
- Analyze and design combinational digital electronic circuits to meet the given Specifications/Constraints.
- Model Sequential circuit by understanding the working of basic components used in Sequential circuits.
- Analyze and develop state diagram, state table, state equation for Mealy and Moore Finite state machine.

Text Books:

1. DigitalLogicApplicationsandDesign,JohnMYarbrough,ThomsonLearning, 2001. ISBN981-240-062-1.
2. DonaldD.Givone,—DigitalPrinciplesandDesign‖,McGrawHill,2002.ISBN978-0-07-052906-9.

Reference Books:

1. D.P.KothariandJ.SDhillon,—DigitalCircuitsandDesign‖,Pearson,2016, ISBN:9789332543539.
2. MorrisMano,—DigitalDesign‖,PrenticeHallofIndia,ThirdEdition.
3. CharlesHRoth,Jr.,—Fundamentalsoflogicdesign‖,CengageLearning.
4. K.A.Navas,—ElectronicsLabManual‖,VolumeI, PHI, 5th Edition,2015,ISBN: 9788120351424.

Web Link and Video Lectures:

1. https://swayam.gov.in/nd1_noc19_ee51/preview.
2. https://www.edx.org/learn/electronics

NETWORK ANALYSIS
SEMESTER – III(EC/TC)
[As per Choice Based Credit System (CBCS) Scheme]

Course Code	**17EC35**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**04**	**SEE Marks**	**60**
Total Number of Lecture Hours	**50 (10 Hours per Module)**	**Exam Hours**	**03**

CREDITS – 04

Course objectives: This course enables students to:

- Describe basic network concepts emphasizing source transformation, source shifting, mesh and nodal techniques to solve for resistance/impedance, voltage, current andpower.
- Explain network Thevenin's, Millman's, Superposition, Reciprocity, Maximum Power transfer and Norton's Theorems and apply them in solving the problems related to ElectricalCircuits.
  Explainthebehaviorofnetworkssubjectedtotransientconditions.
  UseapplicationsofLaplacetransformstonetworkproblems.
- Describe Series and Parallel Combination of Passive Components as resonating circuits, related
- parameters and to analyze frequency response.
- Studytwoportnetworkparameterslike Z, Y, Tandhandtheirinter-relationships andapplications.

Module -1

BasicConcepts: Practicalsources,Sourcetransformations,Networkreductionusing Star – Delta transformation, Loop and node analysis with linearly dependent and independent sources for DC and AC networks, Concepts of super node and super mesh. **L1,L2,L3,L4**

Module -2

Network Theorems:
Superposition, Reciprocity, Millman's theorems, Thevinin's and Norton's theorems, Maximum Power transfer theorem. **L1, L2, L3,L4**

Module -3

Transient behavior and initial conditions: Behavior of circuit elements under switchingconditionandtheirRepresentation,evaluationofinitialandfinalconditions in RL, RC and RLC circuits for AC and DCexcitations.
Laplace Transformation & Applications: Solution of networks, step, ramp and impulse responses, waveform Synthesis. **L1, L2, L3,L4**

Module -4

ResonantCircuits: Seriesandparallelresonance,frequency-responseofseriesand Parallel circuits, Q–Factor, Bandwidth. **L1, L2,L3,L4**

Module -5

Two port network parameters: Definition of Z, Y, h and Transmission parameters, modelingwiththeseparameters,relationshipbetweenparameterssets.**L1,L2,L3,L4**

Course Outcomes: After studying this course, students will be able to:

- Make use of different transformation techniques and Mesh & Nodal nodal analysis to analyse DC and AC electrical circuits.
- Solve for current/voltage in electrical circuits by applying network theorems.
- Make use of Laplace transform to calculate current and voltages for the given circuit under transient conditions.
- Solve for different parameters in resonant circuits.
- Solve the given network using specified two port network parameters.

TextBooks:

1. M.E.VanValkenberg(2000),―Networkanalysis‖,PrenticeHallofIndia,3rdedition, 2000, ISBN:9780136110958.

2. RoyChoudhury,―Networksandsystems‖,2ndedition,NewAgeInternational Publications, 2006, ISBN:9788122427677.

Reference Books:

1. Hayt, Kemmerly and Durbin ―Engineering Circuit Analysis‖, TMH7th Edition, 2010.
2. J.DavidIrwin/R.MarkNelms,―BasicEngineeringCircuitAnalysis‖,JohnWiley, 8thed,2006.
3. CharlesKAlexanderandMathewNOSadiku,―FundamentalsofElectric Circuits‖, Tata McGraw-Hill, 3rd Ed,2009.

Web Link and Video Lectures:

1. https://www.udemy.com/course/full-course-circuit-analysis/
2. https://www.khanacademy.org/science/electrical-engineering

ENGINEERING ELECTROMAGNETICS

SEMESTER – III (EC/TC)

[As per Choice Based Credit System (CBCS) Scheme]

Course Code	**17EC36**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**04**	**SEE Marks**	**60**
Total Number of Lecture Hours	**50 (10 Hours per Module)**	**Exam Hours**	**03**

CREDITS – 04

Course objectives: This course will enable students to:

- Studythedifferentcoordinatesystems,PhysicalsignifianceofDivergence,Curl andGradient.
- UnderstandtheapplicationsofCoulomb'slawandGausslawtodifferentcharge distributionsandtheapplicationsofLaplace'sandPoisson'sEquationstosolve realtimeproblemsoncapacitanceofdifferentchargedistributions.
- UnderstandthephysicalsignificanceofBiot-Savart's,Amperes'sLawandStokes' theorem for different currentdistributions.
  Infer the effects of magnetic forces, materials and inductance.
- KnowthephysicalinterpretationofMaxwell'equationsandapplicationsforPlane waves for their
- behaviour in differentmedia
- AcquireknowledgeofPoyntingtheoremanditsapplicationofpowerflow.

Module - 1

Coulomb's Law, Electric Field Intensity and Flux density

ExperimentallawofCoulomb,Electricfieldintensity,Fieldduetocontinuousvolume chargedistribution,Fieldofalinecharge,Electricfluxdensity.**L1,L2,L3**

Module -2

Gauss's law andDivergence

Gauss' law, Divergence. Maxwell's First equation (Electrostatics), Vector Operator ▼ and divergence theorem.

Energy, Potential and Conductors

Energyexpendedinmovingapointchargeinanelectricfield,Thelineintegral, Definitionofpotentialdifferenceandpotential,Thepotentialfieldofpointcharge, Current and Current density, Continuity of current. **L1, L2,L3**

Module -3

Poisson's and Laplace'sEquations

DerivationofPoisson'sandLaplace'sEquations,Uniquenesstheorem,Examplesof the solution of Laplace'sequation.

Steady Magnetic Field

Biot-SavartLaw,Ampere'scircuitallaw,Curl,Stokes'theorem,Magneticfluxand magneticfluxdensity,ScalarandVectorMagneticPotentials. **L1, L2,L3**

Module -4

MagneticForces
Forceonamovingcharge,differentialcurrentelements,Forcebetweendifferential currentelements.
Magnetic Materials
Magnetisation and permeability, Magnetic boundary conditions, Magnetic circuit, Potential Energy and forces on magnetic materials. **L1, L2, L3**

Module -5

Time-varying fields and Maxwell's equations
Faraday'slaw,displacementcurrent,Maxwell'sequationsinpointform,Maxwell's equations in integralform.
Uniform Plane Wave
Wavepropagationinfreespaceandgoodconductors.Poynting'stheoremandwave power, Skin Effect. **L1, L2,L3**

Course Outcomes: After studying this course, students will be able to:

- Interpret the problems on electric field due to point, linear, volume charges by applying conventional methods or by Gauss law.
- Analyze potential and energy with respect to point charge and capacitance using Laplace equation.
- Solve for magnetic field, force, and potential energy of magnetic materials.
- Apply Maxwell's equation for time varying fields, EM waves in free space and conductors.
- Make use of Poynting theorem to find power associated with EM waves.

TextBook:

W.H.HaytandJ.A. Buck, -EngineeringElectromagnetics‖,7thEdition,Tata McGraw-Hill, 2009, ISBN-978-0-07-061223-5.

Reference Books:

1. JohnKraussandDanielAFleisch,-Electromagneticswithapplications‖, McGraw-Hill.
2. N.NarayanaRao,—FundamentalsofElectromagneticsforEngineering‖,Pearson.

Web Link and Video Lectures:

1. https://www.coursera.org/lecture/electrodynamics-introduction/1-1-introduction-to-electromagnetism-qiIQb
2. https://www.classcentral.com/course/swayam-electromagnetic-theory

ANALOG ELECTRONICS LABORATORY

SEMESTER – III (EC/TC)

[As per Choice Based Credit System (CBCS) Scheme]

Laboratory Code	**17ECL37**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**01Hr Tutorial (Instructions) + 02 Hours Laboratory**	**SEE Marks**	**60**
RBT Level	**L1, L2, L3**	**Exam Hours**	**03**

CREDITS – 02

Courseobjectives: Thislaboratorycourseenablesstudentstogetpracticalexperience in design, assembly, testing and evaluationof:

- Rectifiers andVoltageRegulators.
- BJTcharacteristicsandAmplifiers.
- JFET Characteristics andAmplifiers.
- MOSFET CharacteristicsandAmplifiers
- PowerAmplifiers.
- RC-Phase shift, Hartley, Colpitts and CrystalOscillators.

NOTE: The experiments are to be carried using discrete components only.

Laboratory Experiments:

1. Designandsetupthefollowingrectifierswithandwithoutfiltersandtodetermine ripple factor and rectifierefficiency:
   (a) FullWaveRectifier (b) BridgeRectifier
2. Conductexperimenttotestdiodeclipping(single/doubleended)andclamping circuits(positive/negative).
3. ConductanexperimentonSeriesVoltageRegulatorusingZenerdiodeandpower transistortodeterminelineandloadregulationcharacteristics.
4. RealizeBJTDarlingtonEmitterfollowerwithandwithoutbootstrappingand determine the gain, input and outputimpedances.
5. DesignandsetuptheBJTcommonemitteramplifierusingvoltagedividerbiaswith and without feedback and determine the gain- bandwidth product from its frequencyresponse.
6. Plotthetransferanddraincharacteristicsofa JFETandcalculateitsdrain resistance, mutual conductance and amplificationfactor.
7. Design,setupandplotthefrequencyresponseofCommonSourceJFET/MOSFET amplifier and obtain thebandwidth.

8.Plotthetransferanddraincharacteristicsofn-channelMOSFETandcalculateits parameters,namely;drainresistance,mutualconductanceandamplificationfactor.

9.Set-upandstudytheworkingofcomplementarysymmetryclass Bpushpullpower amplifier and calculate theefficiency.

10.Designandset-uptheRC-PhaseshiftOscillatorusingFET,andcalculatethe frequency of outputwaveform.

11.Designandset-upthefollowingtunedoscillatorcircuitsusingBJT,anddetermine the frequency ofoscillation.

(a) Hartley Oscillator (b) Colpitts Oscillator

12.Designandset-upthecrystaloscillatoranddeterminethefrequencyofoscillation.

CourseOutcomes: Onthecompletionofthislaboratorycourse,thestudentswillbe ableto:

- Construct the circuits to identify the working of rectifiers, clipping circuits, clamping circuits and voltage regulators.
- Identify the characteristics of BJT and FET amplifiers and plot its frequency response.
- Identify the performance parameters of amplifiers and voltage regulators.
- Construct the BJT Power amplifier to calculate its efficiency
- Examine the performance characteristics of oscillators.

Conduct of Practical Examination:

- Alllaboratoryexperimentsaretobeincludedforpracticalexamination.

Studentsareallowedtopickoneexperimentfromthelot.

- Strictlyfollowtheinstructionsasprintedonthecoverpageofanswerscriptfor breakup ofmarks.
- ChangeofexperimentisallowedonlyonceandMarksallottedtotheprocedure part to be madezero.

DIGITAL ELECTRONICS LAB

SEMESTER – III (EC/TC)

[As per Choice Based Credit System (CBCS) Scheme]

Laboratory Code	**17ECL38**	**CIE Marks**	**40**
Number ofLecture Hours/Week	**01Hr Tutorial (Instructions) + 02 Hours Laboratory**	**SEE Marks**	**60**
RBT Level	**L1, L2, L3**	**Exam Hours**	**03**

CREDITS – 02

Course objectives: This laboratory course enables students to get practical experience in design, realisation and verificationof

- Demorgan's Theorem, SOP, POS forms
- Full/Parallel Adders, Subtractors and Magnitude Comparator Demultiplexers and Decoders
- applications
- Flip-Flops, Shift registers and Counters

NOTE:

1. Usediscretecomponentstotestandverifythelogicgates.TheICumbers givenaresuggestive.AnyequivalentICcanbeused.
2. ForexperimentNo.11and12anyopensourceorlicensedsimulationtool may beused.

Laboratory Experiments:

1. Verify
   (a) Demorgan's Theorem for 2variables.
   (b) Thesum-ofproductandproduct-of-sumexpressionsusinguniversalgates.
2. Design andimplement
   (a) FullAdderusing(i)basiclogicgatesand(ii)NANDgates.
   (b) Fullsubtractorusing(i)basiclogicgatesand(ii)NANADgates.
3. Design and implement 4-bit Parallel Adder/ Subtractor using IC 7483.
4. Design and Implementation of 5-bit Magnitude Comparator using IC 7485.
5. Realize
   (a) Adder & Subtractor using IC74153.
   (b) 3-variable function using IC74151(8:1MUX).
6. Realize a Boolean expression using decoder IC74139.
7. Realize Master-Slave JK, D & T Flip-Flops using NAND Gates.
8. RealizethefollowingshiftregistersusingIC7474/IC7495
   (a) SISO(b)SIPO(c)PISO(d)PIPO(e)Ringand(f)Johnsoncounter.
9. Realize (i)Mod-NAsynchronousCounterusingIC7490and (ii)Mod-NSynchronouscounterusingIC74192
10. Design Pseudo Random Sequence generator using 7495.

11. Simulate Full- Adder using simulation tool.
12. Simulate Mod-8 Synchronous UP/DOWN Counter using simulation tool.
CourseOutcomes: Onthecompletionofthislaboratorycourse,thestudentswillbe ableto: • Identify the truth table of various expressions and combinational circuits using logic gates. • Design and test various combinational circuits such as adders, subtractors, comparators, multiplexers. • Develop Boolean expressions using decoders. • Construct flips-flops, counters and shift registers • Construct full adder and up/down counters
Conduct of Practical Examination: Alllaboratoryexperimentsaretobeincludedforpractical examination. Studentsareallowedtopickoneexperimentfromthelot. Strictlyfollowtheinstructionsasprintedonthecoverpageofanswerscriptfor breakup ofmarks. • ChangeofexperimentisallowedonlyonceandMarksallottedtotheprocedure part to be madezero.

MANAGEMENT AND ENTREPRENEURSHIP DEVELOPMENT **B.E., V Semester, EC/TC/EI/BM/ML**			
Course Code	**15ES51**	**CIE Marks**	**40**

Number of Lecture Hours/Week	**04**	**SEE Marks**	**60**
Total Number of Lecture Hours	**50 (10 Hours / Module)**	**Exam Hours**	**03**

CREDITS – 04

CourseObjectives: Thiscoursewillenablestudentsto: Understand
basic skills ofManagement
UnderstandtheneedforEntrepreneursandtheirskills
UnderstandProjectidentificationandSelection
Identify the Management functions and Social responsibilities Distinguish between management and administration

Module-1

Management: Nature and Functions of Management – Importance, Definition, ManagementFunctions,LevelsofManagement,RolesofManager,ManagerialSkills, Management&Administration,ManagementasaScience,Art&Profession(Selected topics of Chapter 1, Text1).

Planning: Planning-Nature, Importance, Types, Steps and Limitations of Planning; DecisionMaking–Meaning,TypesandStepsinDecisionMaking(Selectedtopicsfrom Chapters 4 & 5, Text 1). **L1,L2**

Module-2

Organizing and Staffing: Organization-Meaning, Characteristics, Process of Organizing, Principles of Organizing, Span of Management (meaning andimportance only), Departmentalisation, Committees–Meaning, Types of Committees; Centralization Vs Decentralization of Authority and Responsibility; **Staffing**-Need and Importance**,** RecruitmentandSelectionProcess(SelectedtopicsfromChapters7,8&11,Text1).

DirectingandControlling: MeaningandRequirementsofEffectiveDirection,Giving Orders; Motivation-Nature of Motivation, Motivation Theories (Maslow's Need- Hierarchy Theory and Herzberg's Two Factor Theory); Communication – Meaning, Importance and Purposes of Communication; Leadership-Meaning, Characteristics, Behavioural Approach of Leadership; Coordination-Meaning, Types, Techniques of Coordination; Controlling – Meaning, Need for Control System, Benefits of Control, EssentialsofEffectiveControlSystem,StepsinControlProcess(Selectedtopicsfrom Chapters 15 to 18 and 9, Text 1). **L1, L2**

Module-3

Social Responsibilities of Business: Meaning of Social Responsibility, Social Responsibilities of Business towards Different Groups, Social Audit, Business Ethics and Corporate Governance (Selected topics from Chapter 3, Text 1).

Entrepreneurship: Definition of Entrepreneur, Importance of Entrepreneurship, concepts of Entrepreneurship, Characteristics of successful Entrepreneur, Classification of Entrepreneurs, Myths of Entrepreneurship, Entrepreneurial Developmentmodels,
Entrepreneurial development cycle, Problems faced by Entrepreneurs and capacity

building for Entrepreneurship (Selected topics from Chapter 2, Text 2). **L1, L2**

Module-4

Modern Small Business Enterprises: Role of Small Scale Industries, Impact of Globalization and WTO on SSIs, Concepts and definitions of SSI Enterprises, Government policy and development of the Small Scale sector in India, Growth and Performance of Small Scale Industries in India, Sickness in SSI sector, Problems for SmallScaleIndustries,AncillaryIndustryandTinyIndustry(Definitiononly)(Selected topics from Chapter1, Text2).

Institutional Support for Business Enterprises: Introduction, Policies & Schemes of CentralLevelInstitutions,StateLevelInstitutions(SelectedtopicsfromChapter4,Text 2). **L1,L2**

Module-5

ProjectsManagement:AProject.SearchforaBusinessidea**:**Introduction,Choosingan Idea,Selectionofproduct,TheAdoptionprocess,ProductInnovation,ProductPlanning and Development Strategy, Product Planning and Development Process. Concepts of Projects and Classification**:** Introduction, Meaning of Projects, Characteristics of a Project, Project Levels, Project Classification, Aspects of a Project, The projectCycle, Features and Phases of Project management, Project Management Processes.Project Identification**:** Feasibility Report, Project Feasibility Analysis. Project Formulation**:** Meaning,StepsinProjectformulation,SequentialStagesofProjectFormulation,Project Evaluation.

Project Design and Network Analysis: Introduction, Importance of NetworkAnalysis, OriginofPERTandCPM,Network,NetworkTechniques,NeedforNetworkTechniques, Steps in PERT, CPM, Advantages, Limitations andDifferences.

(Selected topics from Chapters 16 to 20 of Unit 3, Text 3). **L1, L2, L3**

Course Outcomes: After studying this course, students will be able to:

- Understand the fundamental concepts of Management and Entrepreneurship Select a best
- Entrepreneurship model for the required domain of establishment
- DescribethefunctionsofManagers,Entrepreneursandtheirsocialresponsibilities
- Compare various types of Entrepreneurs

Analyze the Institutional support by various state and central government agencies

Text Books:

1. PrinciplesofManagement–P.CTripathi,P.NReddy,McGrawHillEducation,6thEdition, 2017.ISBN-13:978-93-5260-535-4.
2. Entrepreneurship Development Small Business Enterprises- Poornima M Charantimath, Pearson Education 2008, ISBN978-81-7758-260-4.
3. Dynamics of Entrepreneurial Development and Management by Vasant Desai. HPH 2007, ISBN:978-81-8488-801-2.

Reference Book:

Essentials of Management: An International, Innovation and Leadership perspectivebyHaroldKoontz,HeinzWeihrichMcGrawHillEducation,10th Edition 2016. ISBN- 978-93-392-2286-4.

Web Link and Video Lectures:

1. https://www.edx.org/learn/entrepreneurship
2. https://www.startupindia.gov.in/content/sih/en/reources/l-d-listing.html

DIGITAL SIGNAL PROCESSING

B.E., V Semester, Electronics & Communication Engineering / Telecommunication Engineering

[As per Choice Based Credit System (CBCS) Scheme]

Course Code	**17EC52**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**04**	**SEE Marks**	**60**
Total Number of Lecture Hours	**50 (10 Hours / Module)**	**Exam Hours**	**03**

CREDITS – 04

Course objectives: This course will enable students to

- Understandthefrequencydomainsamplingandreconstructionofdiscretetime signals.
- Studythepropertiesandthedevelopmentofefficientalgorithmsforthecomputation ofDFT.
  Realization of FIR and IIR filters in different structural forms.
  Learntheprocedurestodesignof IIRfiltersfromtheanalogfiltersusingimpulse invariance and bilineartransformation.
- StudythedifferentwindowsusedinthedesignofFIRfiltersand designappropriatefiltersbasedonthespecifications.

Module-1

Discrete Fourier Transforms (DFT): Frequency domain sampling and reconstruction of discrete time signals. DFT as a linear transformation, its relationship with other transforms. Properties of DFT, multiplication of two DFTs- the circular convolution.

L1, L2

Module-2

Additional DFT properties, use of DFT in linear filtering, overlap-save and overlap-add method.Fast-Fourier-Transform(FFT)algorithms:DirectcomputationofDFT,needfor efficient computation of the DFT (FFT algorithms). **L1, L2,L3**

Module-3

Radix-2 FFT algorithm for the computation of DFT and IDFT–decimation-in-time and decimation-in-frequencyalgorithms.Goertzelalgorithm,andchirp-ztransform.**L1,L2,L3**

Module-4

Structure for IIR Systems: Direct form, Cascade form, Parallel form structures.
IIR filter design: Characteristics of commonly used analog filter – Butterworth and Chebyshev filters, analog to analog frequency transformations.
Design of IIR Filters from analog filter using Butterworth filter: Impulse invariance, Bilineartransformation.

L1, L2,L3

Module-5

Structure for FIR Systems: Direct form, Linear Phase, Frequency sampling structure, Lattice structure.
FIR filter design: Introduction to FIR filters, design of FIR filters using - Rectangular, Hamming, Hanning and Bartlett windows. **L1, L2, L3**

Course Outcomes: After studying this course, students will be able to:

- Construct the frequency domain sampling and reconstruction of discrete time signals.
- Make use of the properties and develop efficient algorithms for the computation of DFT.
- Construct FIR and IIR filters in different structural forms.
- Utilize the procedures to design IIR filters from the analog filters using impulse invariance and bilinear transformation.

Identify the different windows used in the design of FIR filters and design appropriate filters based on the specifications.

Text Book:

Digital signal processing – **Principles Algorithms & Applications**, Proakis & Monalakis, Pearson education, 4th Edition, New Delhi, 2007.

Reference Books:

1. DiscreteTimeSignalProcessing,Oppenheim&Schaffer,PHI,2003.
2. DigitalSignalProcessing,S.K.Mitra,TataMc-GrawHill,3rdEdition,2010.
3. DigitalSignalProcessing,LeeTan:Elsevierpublications,2007.

Web Link and Video Lectures:

1. https://www.classcentral.com/course/dsp
2. https://ocw.mit.edu/resources/res-6-008-digital-signal-processing-spring-2011/

VERILOG HDL

B.E., V Semester, Electronics & Communication Engineering/ Telecommunication Engineering

[As per Choice Based Credit System (CBCS) Scheme]

Course Code	**17EC53**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**04**	**SEE Marks**	**60**
Total Number of Lecture Hours	**50 (10 Hours / Module)**	**Exam Hours**	**03**

CREDITS – 04

Course objectives: This course will enable students to: Differentiate between

- Verilog and VHDL descriptions. Learn different Verilog HDL and VHDL
- constructs.
- FamiliarizethedifferentlevelsofabstractioninVerilog. Understand Verilog
- Tasks andDirectives.
- UnderstandtiminganddelaySimulation.
- LearnVHDLatdesignlevelsofdataflow,behavioralandstructuralforeffective modeling of digitalcircuits.

Module-1

Overview of Digital Design with Verilog HDL

EvolutionofCAD,emergenceofHDLs,typicalHDL-flow,whyVerilogHDL?,trendsin HDLs.(Text1)

Hierarchical Modeling Concepts

Top-down and bottom-up design methodology, differences between modules and module instances, parts of a simulation, design block, stimulus block. (Text1)

L1, L2, L3

Module-2

Basic Concepts

Lexical conventions, data types, system tasks, compiler directives. (Text1)

Modules and Ports

Moduledefinition,portdeclaration,connectingports,hierarchicalnamereferencing. (Text1) **L1, L2,L3**

Module-3

Gate-Level Modeling

Modeling using basic Verilog gate primitives, description of and/or and buf/not type gates, rise, fall and turn-off delays, min, max, and typical delays. (Text1)

Dataflow Modeling

Continuous assignments, delay specification, expressions, operators, operands, operator types. (Text1) **L1, L2,L3**

Module-4

Behavioral Modeling

Structured procedures, initial and always, blocking and non-blocking statements, delay control, generate statement, event control, conditional statements, Multiway branching, loops, sequential and parallel blocks. (Text1) **L1, L2, L3**

Module-5

Introduction to VHDL

Introduction: Why use VHDL?, Shortcomings, Using VHDL for Design Synthesis,

Design tool flow, Font conventions.
Entities and Architectures: Introduction, A simple design, Design entities, Identifiers, Data objects, Data types, and Attributes. (Text 2) **L1, L2, L3**

Course Outcomes: At the end of this course, students should be able to

- Identify the history and programming basci's of verilog hdl
- Design digital circuit/system and test benches
- Identify the suitable abstraction level for a particular digital design
- Apply the timing controls through Verilog HDL
- Develop simple programs in VHDL using different styles

Text Books:

1. SamirPalnitkar,-**VerilogHDL:AGuidetoDigital Design andSynthesis"**, Pearson Education, SecondEdition.
2. KevinSkahill,-**VHDLfor Programmable Logic**‖,PHI/Pearsoneducation,2006.

Reference Books:

1. Donald E. Thomas, Philip R. Moorby, ―The Verilog Hardware Description Language‖,SpringerScience+BusinessMedia,LLC,Fifthedition.
2. Michael D. Ciletti, ―Advanced Digital Design with the Verilog HDL‖ Pearson (Prentice Hall), Secondedition.
3. Padmanabhan, Tripura Sundari, ―Design through Verilog HDL‖, Wiley, 2016 or earlier.

Web and video links

1. https://www.coursera.org/courses?query=verilog

INFORMATION THEORY AND CODING

B.E., V Semester, Electronics & Communication Engineering / Telecommunication Engineering

[As per Choice Based Credit System (CBCS) Scheme]

Course Code	**17EC54**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**04**	**SEE Marks**	**60**
Total Number of Lecture Hours	**50 (10 Hours / Module)**	**Exam Hours**	**03**

CREDITS – 04

Course Objectives: This course will enable students to:

- UnderstandtheconceptofEntropy,Rateofinformationandorderofthesource with reference to dependent and independentsource.
- Study various source encoding algorithms.
- Modeldiscrete&continuouscommunicationchannels.
- Studyvariouserrorcontrolcodingalgorithms.

Module-1

Information Theory: Introduction, Measure of information, Information content of message, Average Information content of symbols in Long Independentsequences, Average Information content of symbols in Long dependent sequences, Markov Statistical Model of Information Sources, Entropy and Information rate ofMarkoff

Sources (Section 4.1, 4.2 of Text 1). **L1, L2, L3**

Module-2

Source Coding: Source coding theorem, Prefix Codes, Kraft McMillan Inequality property – KMI (Section 2.2 of Text 2).

EncodingoftheSourceOutput,Shannon'sEncodingAlgorithm(Sections4.3,4.3.1of Text1).

Shannon Fano Encoding Algorithm, Huffman codes, Extended Huffman coding, Arithmetic Coding, Lempel – Ziv Algorithm (Sections 3.6, 3.7, 3.8, 3.10 of Text 3).

L1, L2, L3

Module-3

Information Channels: Communication Channels (Section 4.4 of Text 1).
ChannelModels,ChannelMatrix,JointprobabiltyMatrix,BinarySymmetricChannel, System Entropies, Mutual Information, Channel Capacity, Channel Capacity of : BinarySymmetricChannel,BinaryErasureChannel,Muroga,sTheorem,Contineuos Channels (Sections 4.2, 4.3, 4.4, 4.6, 4.7 of Text 3). **L1, L2,L3**

Module-4

Error Control Coding:
Introduction,ExamplesofErrorcontrolcoding,methodsofControllingErrors,Types of Errors, types of Codes, Linear Block Codes: matrix description of Linear Block Codes,ErrorDetectionandErrorCorrectionCapabilitiesofLinearBlockCodes,Single ErrorCorrectinghammingCodes,TablelookupDecodingusingStandardArray.
BinaryCyclicCodes: AlgebraicStructureofCyclicCodes,Encodingusingan(n-k)Bit Shiftregister,SyndromeCalculation,ErrorDetectionandCorrection
(Sections 9.1, 9.2, 9.3, 9.3.1, 9.3.2, 9.3.3 of Text 1). **L1, L2,L3**

Module-5

Some Important Cyclic Codes: Golay Codes, BCH Codes(Section 8.4 – Article 5 of Text 2). **ConvolutionCodes**:ConvolutionEncoder,Timedomainapproach,Transformdomain approach,CodeTree,TrellisandStateDiagram,TheViterbiAlgorithm)(Section8.5– Articles 1,2 and 3, 8.6-Article 1 of Text 2). **L1, L2,L3**

Course Outcomes: At the end of the course the students will be able to:

- Make use of the concepts of dependent & independent source to measure the information, entropy, rate of information and order of a source.
- Construct the information codes using Shannon Encoding, Shannon Fano, Prefix and Huffman Encoding Algorithms.
- Model the continuous and discrete communication channels using input, output and joint probabilities.
- Develop a code word comprising of the check bits computed using Linear Block codes, cyclic codes & convolution codes
- Examine the encoding and decoding circuits for Linear Block codes, cyclic codes, convolution codes, BCH and Golay codes.

TextBooks:

1. Digitalandanalogcommunicationsystems,K.SamShanmugam,JohnWiley India Pvt. Ltd,1996.
2. Digitalcommunication,SimonHaykin,JohnWileyIndiaPvt.Ltd,2008.
3. InformationTheoryandCoding,MuralidharKulkarni,K.S.Shivaprakasha,Wiley India Pvt. Ltd, 2015,ISBN:978-81-265-5305-1.

Reference Books:

1. ITC and Cryptography, Ranjan Bose, TMH, II edition,2007
2. Principlesofdigitalcommunication,J.Das,S.K.Mullick,P.K.Chatterjee, Wiley, 1986 - Technology &Engineering
3. DigitalCommunications–FundamentalsandApplications,BernardSklar, SecondEdition,PearsonEducation,2016,ISBN:9780134724058.
4. InformationTheoryandCoding,K.N.Haribhat,D.GaneshRao,Cengage Learning, 2017.

Web and video links

1. https://www.coursera.org/learn/information-theory
2. https://www.classcentral.com/course/informationtheory

NANOELECTRONICS

B.E., V Semester, Electronics & Communication Engineering / Telecommunication Engineering

[As per Choice Based Credit System (CBCS) Scheme]

Course Code	**17EC551**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**03**	**SEE Marks**	**60**
Total Number of Lecture Hours	**40 (8 Hours / Module)**	**Exam Hours**	**03**

CREDITS – 03

Course Objectives: This course will enable students to:

- Enhance basic engineering science and technical knowledge of nanoelectronics.
- Explainbasicsoftop-downandbottom-upfabricationprocess,devicesand systems.
  Describe technologies involved in modern day electronic devices.
  Knowvariousnanostructuresofcarbonandthenatureofthecarbonbonditself.
- Learnthephotophysicalpropertiesofsensorusedingeneratingasignal.
-
-

Module-1

Introduction: Overviewofnanoscienceandengineering.Developmentmilestonesin microfabricationandelectronicindustry.Moore'slawandcontinuedminiaturization, Classification of Nanostructures, Electronic properties of atoms and solids:Isolated atom, Bonding between atoms, Giant molecular solids, Free electron models and energybands,crystallinesolids,Periodicityofcrystallattices,Electronicconduction, effectsofnanometerlengthscale,Fabricationmethods:Topdownprocesses,Bottom upprocessesmethodsfortemplatingthegrowthofnanomaterials,orderingof nanosystems (Text 1). **L1, L2**

Module-2

Characterization: Classification, Microscopic techniques, Field ion microscopy, scanningprobetechniques,diffractiontechniques:bulkandsurfacediffraction techniques (Text1).

Inorganic semiconductor nanostructures: overview of semiconductor physics. Quantum confinement in semiconductor nanostructures: quantum wells, quantum wires,quantumdots,super-lattices,bandoffsets,electronicdensityofstates(Text1).

L1, L2

Module-3

Fabrication techniques: requirements of ideal semiconductor, epitaxial growth of quantumwells,lithographyandetching,cleaved-edgeovergrowth,growthofvicinal substrates, strain induced dots and wires, electrostatically induced dots and wires, Quantumwellwidthfluctuations,thermallyannealedquantumwells,semiconductor nanocrystals,collidalquantumdots,self-assemblytechniques.(Text1).

Physical processes: modulation doping, quantum hall effect, resonant tunneling, charging effects, ballistic carrier transport, Inter band absorption, intraband absorption, Light emission processes, phonon bottleneck, quantum confined stark effect,nonlineareffects,coherenceanddephasing,characterizationofsemiconductor nanostructures: optical electrical and structural (Text 1). **L1,L2**

Module-4

Carbon Nanostructures: Carbon molecules, Carbon Clusters, Carbon Nanotubes, application of Carbon Nanotubes. (Text 2) **L1, L2**

Module-5

Nanosensors: Introduction, What is Sensor and Nanosensors?, What makes them Possible?, Order From Chaos, Characterization, Perception, Nanosensors Based On Quantum Size Effects, Electrochemical Sensors, Sensors Based On Physical Properties, Nanobiosensors, Smart dust Sensor for the future. (Text 3)

Applications: Injection lasers, quantum cascade lasers, single-photon sources, biologicaltagging,opticalmemories,coulombblockadedevices,photonicstructures, QWIP's, NEMS, MEMS (Text 1). **L1, L2**

Course Outcomes: After studying this course, students will be able to:

- KnowtheprinciplesbehindNanoscienceengineeringandNanoelectronics.
- Knowtheeffectofparticlessizeonmechanical,thermal,opticalandelectrical properties ofnanomaterials.
- Knowthepropertiesofcarbonandcarbonnanotubesanditsapplications.
- Knowthepropertiesusedforsensingandtheuseofsmartdustsensors.
- Apply the knowledge to prepare and characterize nanomaterials.
- Analysetheprocessflowrequiredtofabricatestate-of-the-arttransistor technology.

TextBooks:

1. EdRobertKelsall,IanHamley,MarkGeoghegan,―NanoscaleScienceand Technology‖, John Wiley,2007.
2. CharlesPPoole,Jr,FrankJOwens,―IntroductiontoNanotechnology‖, John Wiley, Copyright 2006, Reprint2011.
3. TPradeep,―Nano:Theessentials-UnderstandingNanoscienceand Nanotechnology‖,TMH.

Reference Book:

EdWilliamAGoddardIII,DonaldWBrenner,SergeyE.Lyshevski,GeraldJ Iafrate,―HandBookofNanoscienceEngineeringandTechnology‖,CRCpress, 2003.

SWITCHING & FINITE AUTOMATA THEORY

B.E., V Semester, Electronics & Communication Engineering / Telecommunication Engineering

[As per Choice Based Credit System (CBCS) Scheme]

Course Code	**17EC552**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**03**	**SEE Marks**	**60**
Total Number of Lecture Hours	**40 (8 Hours / Module)**	**Exam Hours**	**03**

CREDITS – 03

Course Objectives: This course will enable students to:

- Understandthebasicsofthresholdlogic,effectofhazardsondigitalcircuits and techniques of faultdetection
- Explain finite state model and minimization techniques
- Knowstructureofsequentialmachines,andstateidentification
- Understandtheconceptoffaultdetectionexperiments

Module-1

Threshold Logic: Introductory Concepts: Threshold element, capabilities and limitations of threshold logic, Elementary Properties, Synthesis of Threshold networks:Unatefunctions,Identificationandrealizationofthresholdfunctions,The mapasatoolinsynthesizingthresholdnetworks.(Sections7.1,7.2ofText)

L1, L2, L3

Module-2

ReliableDesignandFaultDiagnosis:Hazards,statichazards,DesignofHazard-free Switching Circuits, Fault detection in combinational circuits, Fault detection in combinational circuits: The faults, The Fault Table, Covering the fault table, Fault location experiments: Preset experiments, Adaptive experiments, Boolean differences, Faultdetectionbypathsensitizing.(Sections8.1,8.2,8.3,8.4,8.5ofText)

L1, L2, L3

Module-3

Sequential Machines: Capabilities, Minimization and Transformation

The Finite state model and definitions, capabilities and limitations of finite state machines, State equivalence and machine minimization: k-equivalence, The minimization Procedure, Machine equivalence, Simplification of incompletely specified machines. (Section 10.1, 10.2, 10.3, 10.4 of Text) **L1, L2,L3**

Module-4

Structure of Sequential Machines: Introductory example, State assignment using partitions: closed partitions, The lattice of closed partitions, Reduction of output dependency, Input dependence and autonomous clocks, Covers and generation of closedpartitionsbystatesplitting:Covers,Theimplicationgraph,Anapplicationof statesplittingtoparalleldecomposition.(Section12.1,12.2,12.3,12.4,12.5,12.6of Text) **L1, L2, L3**

Module-5

State–Identification and Fault Detection Experiments: Experiments, Homing experiments, Distinguishing experiments, Machine identification, Fault detection experiments,Designofdiagnosablemachines,Secondalgorithmforthedesignof

faultdetectionexperiments.(Sections13.1,13.2,13.3,13.4,13.5,13.6,13.7ofText)
L1, L2, L3

Courseoutcomes: Attheendofthecourse,studentsshouldbeableto: Explain the concept of

- thresholdlogic
- Understand the effect of hazards on digital circuits and fault detection and analysis
  Define the concepts of finite state model
- Analyzethestructureofsequentialmachine
- Explain methods of state identification and fault detection experiments
-

TextBook:

SwitchingandFiniteAutomataTheory–ZviKohavi,McGrawHill,2nd edition, 2010 ISBN:0070993874.

Reference Books:

1. **FaultTolerantAndFaultTestableHardwareDesign**-ParagKLala,Prentice Hall Inc.1985.
2. **DigitalCircuitsandLogicDesign**.-CharlesRothJr,LarryL.Kinney,Cengage Learning, 2014, ISBN: 978-1-133-62847-7.

OPERATING SYSTEM

B.E., V Semester, Electronics & Communication Engineering / Telecommunication Engineering

[As per Choice Based Credit System (CBCS) Scheme]

Course Code	**17EC553**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**03**	**SEE Marks**	**60**
Total Number of Lecture Hours	**40 (8 Hours / Module)**	**Exam Hours**	**03**

CREDITS – 03

Course objectives: This course will enable students to:

- Understandtheservicesprovidedbyanoperatingsystem.
- Understandhowprocessesaresynchronizedandscheduled.
- Understanddifferentapproachesofmemorymanagement andvirtualmemory management. Understand the structure and organization of the file system
- Understandinterprocesscommunicationanddeadlocksituations.
-

Module-1

Introduction to Operating Systems
OS, Goals of an OS, Operation of an OS, Computational Structures, Resource allocationtechniques,Efficiency,SystemPerformanceandUserConvenience,Classes operatingSystem,Batchprocessing,Multiprogramming,TimeSharingSystems,Real Time and distributed Operating Systems (Topics from Sections 1.2, 1.3, 2.2 to 2.8of
Text). **L1, L2**

Module-2

Process Management: OS View of Processes, PCB, Fundamental State Transitions, Threads,KernelandUserlevelThreads,Non-preemptivescheduling-FCFSandSRN, Preemptive Scheduling-RR and LCN, Long term, medium term and short term schedulinginatimesharingsystem(TopicsfromSections3.3,3.3.1to3.3.4,3.4,
3.4.1, 3.4.2 , 4.2, 4.3, 4.4.1 of Text). **L1, L2**

Module-3

Memory Management: Contiguous Memory allocation, Non-Contiguos Memory Allocation, Paging, Segmentation, Segmentation with paging, Virtual Memory Management, Demand Paging, Paging Hardware, VM handler, FIFO, LRU page
replacementpolicies(TopicsfromSections5.5to5.9,6.1to6.3,exceptOptimalpolicy
and 6.3.1of Text). **L1, L2**

Module-4

File Systems: File systems and IOCS, File Operations, File Organizations, Directory structures,FileProtection,InterfacebetweenFilesystemandIOCS,Allocationofdisk space,Implementingfileaccess(TopicsfromSections7.1to7.8ofText).**L1,L2,L3**

Module-5

Message Passing and Deadlocks: Overview of Message Passing, Implementing message passing, Mailboxes, Deadlocks, Deadlocks in resource allocation, Resource state modelling, Deadlock detection algorithm, Deadlock Prevention (Topics from
Sections 10.1 to 10.3, 11.1 to 11.5 of Text). **L1, L2, L3**

Course outcomes: After studying this course, students will be able to:

- Identify the role of operating system
- Analyze scheduling policies and deadlock situations
- Apply file organization and IOCS techniques
- Analyze memory management techniques for efficient storage
- Identify message passing techniques

Text Book:

Operating Systems – A concept based approach, by Dhamdare, TMH, 2nd edition.

Reference Books:

1. Operatingsystemsconcepts,SilberschatzandGalvin,JohnWileyIndiaPvt.Ltd, 5thedition,2001.
2. Operatingsystem–internalsanddesignsystem,WilliamStalling,Pearson Education, 4th ed,2006.
3. Design of operating systems, Tannanbhaum, TMH,2001.

ELECTRICAL ENGINEERING MATERIALS

B.E., V Semester, Electronics & Communication Engineering/ Telecommunication Engineering

[As per Choice Based Credit System (CBCS) Scheme]

Course Code	**17EC554**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**03**	**SEE Marks**	**60**
Total Number of Lecture Hours	**40 (8 Hours/Module)**	**Exam Hours**	**03**

CREDITS – 03

Course Objectives: This course will enable students to:

- Understandtheformationofbandsinmaterialsandtheclassificationofmaterials on the basis of bandtheory
- Understandtheclassificationofmagneticmaterialsonthebasisoftheirbehaviorin an external magnetizingfield.
- Understandthecharacteristicsandpropertiesofconductingandsuperconducting materials
- Understandtheelectricalcharacteristicsofthematerialtobeconsideredonthe basis of theiruses.
- Classifyelectricalengineeringmaterialsintolowandhighresistancematerials.

Module-1

Band Theory of Solids: Introduction to free electron theory, Kroning-Penney Model, ExplanationforDiscontinuitiesinEvs.Kcurve,FormationofSolidMaterial,Formation of Band in Metals, Formation of Bands in Semiconductors and Insulating Materials, ClassificationofMaterialsontheBasisofBandStructure,Explanationfordifferencesin the Electrical properties of different Materials. Important Characteristics of a Band Electron, Number of energy states per band, Explanation for Insulating and Metallic Behavior of Materials, Concept of Hole. **L1,L2**

Module-2

Magnetic Properties of Materials: Introduction, Origin of Magnetism, Basic Terms in Magnetism, Relation between Magnetic Permeability and Susceptibility, Classification of magnetic Materials, Characteristics of Diamagnetic Materials, Paramagnetic Materials, Ferromagnetic Materials, Ferrimagnetic Materials, Langevin‘s Theory of Diamagnetism, Explanation of Dia, Para and Ferromagnetism, Ampere‘s Lam in Dia, Para and Ferromagnetism, Hystersis and Hystersis loss, Langevin‘s Theory of paramagnetism, Modification in the Langevin‘s Theory, Anti-Ferromagnetism and Neel Temperature, Ferrimagnetic Materials, Properties of some important Magnetic Materials, Magentostriction and Magnetostrictive Materials, Hard and Soft FerromagneticMaterials and their Applications. **L1,L2**

Module-3

Behavior of Dielectric Materials in AC and DC Fields: Introduction, Classification of Dielectric Materials at Microscopic level, Polar Dielectric Materials, Non-polar Dielectric Materials,KindsofPolarizations,behaviorofdielectricmaterials,ThreeelectricVectors, Gauss'sLawinaDielectric,ElectricSusceptibilityandStaticDielectricconstant,Effect ofDielectricmediumuponcapacitance,macroscopicelectricfield,MicroscopicElectric field,temperaturedependenceofdielectricconstant, polardielectricinacanddcfields, behaviorofpolardielectricathighfrequencies,Dielectricloss,Dielectricstrengthand DielectricBreakdown,VariouskindsofDielectricMaterials,HysteresisinFerroelectric Materials,ApplicationsofFerroelectricMaterialsinDevices.**L1,L2**

Module-4

ConductivityofMetalsandSuperconductivity: Introduction,Ohm'slaw,Explanation for the dependence of electrical resistivity upon temperature, Free-electron theory of metals,ApplicationofLorentz-Drudefree-electrontheory,Effectofvariousparameters on Electrical Conductivity, Resistivity Ratio, Variation of resistivity of alloys with temperature, Thermal Conductivity of Materials, Heat produced in Current Carrying Conductor,ThermoelectricEffect,ThermoelectricSeries,Seebeck'sExperiment.

Discovery of superconductivity, superconductivity and transition temperature, superconducting materials, explanation of superconductivity phenomenon, characteristics of superconductors, change in thermodynamic parameters in superconducting state, frequency dependence of superconductivity, current status of high temperature superconductors, practical applications of superconductors. **L1, L2**

Module-5

Electrical Conducting and Insulating materials: Introduction, Classification of conducting materials, difference in properties of Hard-Drawn and Annealed copper, standard conductors, comparison between some popular Low-Resistivity Materials, Low-ResistivityCopperAlloys,Electricalcontactmaterialsandtheirselection,classification ofcontactmaterials,MaterialsforLampFilaments,PreparationofTungstenFilaments.

Insulatinggases,Liquidsandsolidsandtheircharacteristics,Selectionoftheinsulating material, other important properties of Insulating materials, Thermal characteristics, chemicalpropertiesofInsulatingmaterials,classificationofInsulatingmaterialsonthe basis of structure. **L1,L2**

Course Outcomes: At the end of the course, students will be able to

- Understandthevariouskindsofmaterialsandtheirapplicationsinacanddcfields. Understand the conductivity
- of superconductivity ofmaterials.
- Explaintheelectricalpropertiesofdifferentmaterialsandmetallicbehaviorof materials on the basis of bandtheory.
- Explainthepropertiesandapplicationsofallkindofmagneticmaterials.
- Explainthepropertiesofelectricalconductingandinsulatingmaterials.
- Assessavarietyofapproachesindevelopingnewmaterialswithenhanced performance to replace existingmaterials.

TextBook:

R K Shukla and Archana Singh, ―Electrical Engineering Materials‖ McGraw Hill, 2012, ISBN: 978-1-25-90062-03.

Reference Books:

1. S.O.KASAP,―ElectronicMaterialsandDevices‖3rdedition,McGrawHill,2014, ISBN-978-0-07-064820-3.
2. C.S.Indulkar and S. Thiruvengadam, S., ―An Introduction to Electrical Engineering Materials‖,ISBN-9788121906661.

MSP430 MICROCONTROLLER

B.E., V Semester, Electronics & Communication Engineering [As per Choice Based Credit System (CBCS) Scheme]

Course Code	**17EC555**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**03**	**SEE Marks**	**60**
Total Number of Lecture Hours	**40 (8 Hours / Module)**	**Exam Hours**	**03**

CREDITS – 03

Course objectives: This course will enable students to:

- Understandthearchitecturalfeaturesandinstructionsetof16bitmicrocontroller MSP430. Program MSP430 using the various instructions for different applications.
- Understandthefunctionsofthevariousperipheralswhichareinterfacedwith MSP430.
- Describe the power saving modes in MSP430. ExplainthelowpowerapplicationsusingMSP430.
-
-

Module-1

MSP430Architecture: Introduction–WheredoestheMSP430fit,Theoutsideview,The inside view-Functional block diagram, Memory, Central Processing Unit, Memory Mapped Input and Output, Clock Generator, Exceptions: Interrupts and Resets, MSP430family.
(Text: Ch1- 1.3 to 1.7, Ch2- 2.1 to 2.7, Ch5- 5.1, 5.7 up to 5.7.1) **L1, L2**

Module-2

AddressingModes&InstructionSet-AddressingModes,Instructionset**,**Constant Generator and Emulated Instructions, ProgramExamples.
(Text: Ch5- 5.2 to 5.5) **L1, L2, L3**

Module-3

Clock System, Interrupts and Operating Modes-Clock System, Interrupts, What happenswhenaninterruptedisrequested,InterruptServiceRoutines,LowPower ModesofOperation,WatchdogTimer,BasicTimer1,RealTimeClock,Timer-A:Timer Block, Capture/Compare Channels, Interrupts fromTimer-A.
(Text: Ch5 - 5.8 upto 5.8.4, Ch 6-6.6 to 6.8, 6.10, Ch8 -8.1, 8.2, 8.3) **L1, L2**

Module-4

Analog Input-Output and PWM - Comparator-A, ADC10, ADC12, Sigma-Delta ADC, Internal Operational Amplifiers, DAC, Edge Aligned PWM, Simple PWM, Design of PWM. LCD interfacing.
(Text: Ch9 – 9.1 up to 9.1.2, 9.4, 9.5 up to 9.5.1, 9.7, 9.8 up to 9.8.1, 9.11.5, 9.12 (without 9.12.1), 8.6.2 to 8.6.4) **L1, L2**

Module-5

Digital Input-Output and SerialCommunication:
ParallelPorts,LightingLEDs,FlashingLEDs,ReadInputfromaSwitch,ToggltheLED state by pressing the push button, LCDinterfacing.
AsynchronousSerialCommunication,AsynchronousCommunicationwithUSCI_A, Communications,PeripheralsinMSP430,SerialPeripheralInterface.
(Text: Selected topics from Ch4 & Ch7 and Ch7- 7.1, Ch10 – 10.1, 10.2, and 10.12)
L1, L2, L3

Course outcomes: After studying this course, students will be able to:

- Understandthearchitecturalfeaturesandinstructionsetof16bitmicrocontroller MSP430.
- Developprogramsusingthevariousinstructionsof MSP430fordifferent applications.
- Understandthefunctionsofthevariousperipheralswhichareinterfacedwith MSP430microcontroller.
  Describe the power saving modes in MSP430.
  Explain the low power applications using MSP430 microcontroller.
-
-

Evaluation of CIE Marks:

Itissuggestedthatatleastafewsimpleprogramstobeexecutedbystudentsusing anyevaluationboardofMSP430forbetterunderstandingofthecourse.Thisactivity canbeconsideredfortheevaluationof10marksoutof40CIE(ContinuousInternal Evaluation) marks, reserved for the otheractivities.

Question paper pattern:

- Thequestionpaperwillhavetenquestions.

Eachfullquestionconsistsof16marks.

- Therewillbe2fullquestions(withamaximumofthreesubquestions)fromeach module.
- Eachfullquestionwillhavesubquestionscoveringallthetopicsunderamodule.

Thestudentswillhavetoanswer5fullquestions,selectingonefullquestionfrom each module

TextBook:

JohnHDavies,MSP430MicrocontrollerBasics,NewnesPublications,Elsevier, 2008.

References:

1. ChrisNagy,EmbeddedSystemsDesignusingTIMSP430Series,Newnes Publications, Elsevier,2003.
2. User Guide from TexasInstruments.

DSP LAB

B.E., V Semester, ELECTRONICS & COMMUNICATION ENGINEERING / TELECOMMUNICATION ENGINEERING

[As per Choice Based Credit System (CBCS) Scheme]

Course Code	**17ECL57**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**01Hr Tutorial(Instructions) + 02 Hours Laboratory=03**	**SEE Marks**	**60**
RBT Levels	**L1, L2, L3**	**Exam Hours**	**03**

CREDITS – 02

Course Objectives: This course will enable students to

- Simulate discrete time signals and verification of sampling theorem.
- ComputetheDFTforadiscretesignalandverificationofitspropertiesusing MATLAB.
- Findsolutiontothedifferenceequationsandcomputationofconvolutionand correlation along with the verification ofproperties.
- Computeanddisplaythefilteringoperationsandcomparewiththetheoretical values.
- ImplementtheDSPcomputationsonDSPhardwareandverifytheresult.

Laboratory Experiments

Following Experiments to be done using MATLAB / SCILAB / OCTAVE or equivalent:

1. Verification of samplingtheorem.
2. Linearandcircularconvolutionoftwogivensequences,Commutative,distributive and associative property ofconvolution.
3. Autoandcrosscorrelationoftwosequencesandverificationoftheirproperties
4. Solving a given differenceequation.
5. ComputationofNpointDFTofagivensequenceandtoplotmagnitudeand phasespectrum(usingDFTequationandverifyitbybuilt-inroutine).
6. (i)VerificationofDFTproperties(likeLinearityandParsevalstheorem,etc.) (ii) DFT computation of square pulse and Sinc function etc.
7. DesignandimplementationofFIRfiltertomeetgivenspecifications(using different windowtechniques).
8. DesignandimplementationofIIRfiltertomeetgivenspecifications.

Following Experiments to be done using DSP kit

9. Linear convolution of twosequences
10. Circular convolution of twosequences
11. N-point DFT of a givensequence
12. Impulse response of first order and second ordersystem
13. Implementation of FIRfilter

CourseOutcomes: Onthecompletionofthislaboratorycourse,thestudentswillbe ableto:

- Apply sampling theorem and effective reconstruction of signal.
- Compute the DFT for a discrete signal and verification of its properties using MATLAB.
- Solve difference equations and perform different operations on discrete time signals
- Design IIR and FIR filters for the given specifications.
- Build DSP computations on TMS processor and verify the result

Conduct of Practical Examination:

1. Alllaboratoryexperimentsaretobeincludedforpracticalexamination.
2. Strictlyfollowtheinstructionsasprintedonthecoverpageofanswerscriptfor breakup ofmarks.
3. ChangeofexperimentisallowedonlyonceandMarksallottedtotheprocedure part to be madezero.

HDL LAB

B.E., V Semester, ELECTRONICS & COMMUNICATION ENGINEERING / TELECOMMUNICATION ENGINEERING

[As per Choice Based Credit System (CBCS) Scheme]

Course Code	**17ECL58**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**01Hr Tutorial(Instructions) + 02 Hours Laboratory = 03**	**SEE Marks**	**60**
RBT Levels	**L1, L2, L3**	**Exam Hours**	**03**

CREDITS – 02

Course Objectives: This course will enable students to: Familiarize with the

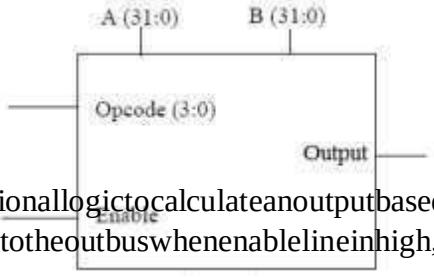
- CAD tool to write HDL programs. Understand simulation and synthesis
- of digital design. Program FPGAs/CPLDs to synthesize the digital
- designs. InterfacehardwaretoprogrammableICsthroughI/Oports.
- Choose either Verilog or VHDL for a given Abstraction level.
-

Note: Programming can be done using any compiler. Download the programs on a FPGA/CPLD boards such as Apex/Acex/Max/Spartan/Sinfi or equivalent and performance testing may be done using 32 channel pattern generator and logic analyzerapartfromverificationbysimulationwithtoolssuchasAltera/Modelsimor equivalent.

Laboratory Experiments

Part–A: PROGRAMMING

1. Write Verilog code to realize all the logicgates
2. WriteaVerilogprogramforthefollowingcombinationaldesigns
   a. 2 to 4decoder
   b. 8 to 3 (encoder without priority & withpriority)
   c. 8 to 1multiplexer.
   d. 4 bit binary to grayconverter
   e. Multiplexer, de-multiplexer,comparator.
3. WriteaVHDLandVerilogcodetodescribethefunctionsofaFullAdderusing three modelingstyles.
4. WriteaVerilogcodetomodel32bitALUusingtheschematicdiagramshown below



- ALUshouldusecombinationallogictocalculateanoutputbasedonthefourbit op-codeinput.
- ALUshouldpasstheresulttotheoutbuswhenenablelineinhigh,andtri-state the out bus when the enable line islow.
- ALUshoulddecodethe4bitop-codeaccordingtotheexamplegivenbelow.

OPCODE	ALU Operation
1.	A+B
2.	A-B
3.	A Complement
4.	A*B
5.	A AND B
6.	A OR B
7.	A NAND B
8.	A XOR B

5. DeveloptheVerilogcodeforthefollowingflip-flops,SR,D,JKandT.
6. Designa4bitbinary,BCDcounters(SynchronousresetandAsynchronous reset)and―anysequence‖counters,usingVerilogcode.

Part–B: INTERFACING (at least four of the following must be covered using VHDL/Verilog)

1. WriteHDLcodetodisplaymessagesonanalphanumericLCDdisplay.
2. Write HDL code to interface Hex key pad and display the key code on seven segmentdisplay.
3. WriteHDLcodetocontrolspeed,directionofDCandSteppermotor.
4. WriteHDLcodetoacceptAnalogsignal,Temperaturesensoranddisplaythe data on LCD or Seven segmentdisplay.
5. WriteHDLcodetogeneratedifferentwaveforms(Sine,Square,Triangle,Ramp etc.,) using DAC - change thefrequency.
6. Write HDL code to simulate Elevatoroperation.

Course Outcomes: At the end of this course, students should be able to:

- Develop and write the Verilog/vhdl programs to simulate combinational circuits in dataflow, behavioral and gate level abstractions
- Develop and describe sequential circuits like flip flops and counters in behavioral description and obtain simulation waveforms
- Develop and synthesize combinational and sequential circuits on programmable ics and test the hardware
- Develop and interface the hardware to the programmable chips and obtain the required output
- Develop hardware descriptive programmes using verilog or vhdl for a given abstraction level

Conduct of Practical Examination:

1. Alllaboratoryexperimentsaretobeincludedforpracticalexamination.
2. Strictlyfollowtheinstructionsasprintedonthecoverpageofanswerscriptfor breakup ofmarks.
3. ChangeofexperimentisallowedonlyonceandMarksallottedtotheprocedure part to be madezero.

5th Semester Open Electives Syllabus for the Courses offered by EC/TC Board

AUTOMOTIVE ELECTRONICS
B.E V Semester (Open Elective)
[As per Choice Based Credit System (CBCS) Scheme

Course Code	**17EC561**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**03**	**SEE Marks**	**60**
Total Number of Lecture Hours	**40 (08 Hrs per Module)**	**Exam Hours**	**03**

CREDITS –03

Course objectives: This course will enable students to:

- Understandthebasicsofautomobiledynamicsanddesignelectronicsto complement thosefeatures.
- Designandimplementtheelectronicsthatattributethereliability,safety,and smartness to the automobiles, providing add-oncomforts.

Module-1

Automotive Fundamentals Overview – Evolution of Automotive Electronics, AutomobilePhysicalConfiguration,SurveyofMajorAutomotiveSystems,TheEngine– Engine Block, Cylinder Head, Four Stroke Cycle, Engine Control, Ignition System - Spark plug, High voltage circuit and distribution, Spark pulse generation, Ignition Timing,DieselEngine,DriveTrain-Transmission,DriveShaft,Differential,Suspension, Brakes,SteeringSystem(Text1:Chapter1),StarterBattery–Operatingprinciple:(Text 2:Pg.407-410) (4hours)

TheBasicsofElectronicEngineControl–MotivationforElectronicEngineControl– Exhaust Emissions, Fuel Economy, Concept of an Electronic Engine control system, DefinitionofGeneralterms,DefinitionofEngineperformanceterms,Enginemapping, Effect of Air/Fuel ratio, spark timing and EGR on performance, Control Strategy, ElectronicFuelcontrolsystem,AnalysisofintakemanifoldpressureElectronicIgnition.
(Text 1: Chapter 5) (4 hours) **L1, L2**

Module-2

AutomotiveControlSystemapplicationsofSensorsandActuators–TypicalElectronic EngineControlSystem,Variablestobemeasured(Text1:Chapter6)
(1 hour)
Automotive Sensors – Airflow rate sensor, Strain Gauge MAP sensor, Engine Crankshaft AngularPositionSensor, Magnetic Reluctance Position Sensor, Hall effect Position Sensor, Shielded Field Sensor, Optical Crankshaft Position Sensor, Throttle Angle Sensor (TAS), Engine Coolant Temperature (ECT) Sensor, Exhaust GasOxygen (O2/EGO) Lambda Sensors, Piezoelectric Knock Sensor.
(Text 1: Chapter 6) (5 hours) **AutomotiveActuators–**
Solenoid,FuelInjector,EGRActuator,IgnitionSystem(Text1: Chapter 6) (2 hours) **L1,L2**

Module-3

Digital Engine Control Systems – Digital Engine control features, Control modes for fuel Control (Seven Modes), EGR Control, Electronic Ignition Control - Closed loop Ignitiontiming,SparkAdvanceCorrectionScheme,IntegratedEngineControlSystem-SecondaryAirManagement,EvaporativeEmissionsCanisterPurge,AutomaticSystem Adjustment, System Diagnostics. (Text 1: Chapter 7) (6hours)

ControlUnits–Operatingconditions,Design,Dataprocessing,Programming,Digital modulesintheControlunit,Controlunitsoftware.(Text2:Pg.196-207)(2hours)
L1, L2

Module-4

Automotive Networking –Bus Systems – Classification, Applications in the vehicle, Couplingofnetworks,Examplesofnetworkedvehicles(Text2:Pg.85-91),Buses-CAN Bus, LIN Bus, MOST Bus, Bluetooth, Flex Ray, Diagnostic Interfaces. (Text 2: Pg.92-151) (6 hours)

Vehicle Motion Control – Typical Cruise Control System, Digital Cruise Control System,DigitalSpeedSensor,ThrottleActuator,DigitalCruiseControlconfiguration, CruiseControlElectronics(Digitalonly),AntilockBrakeSystem(ABS)(Text1:Chapter 8) (2 hours) **L1, L2**

Module-5

Automotive Diagnostics–Timing Light, Engine Analyzer, On-board diagnostics, Off-boarddiagnostics,ExpertSystems,OccupantProtectionSystems–Accelerometerbased Air Bag systems. (Text 1: Chapter 10) (2hours)

Future Automotive Electronic Systems – Alternative Fuel Engines, Electric and Hybrid vehicles, Fuel cell powered cars, Collision Avoidance Radar warningSystems, Low tire pressure warning system, Heads Up display, Speech Synthesis, Navigation– NavigationSensors-RadioNavigation,Signpostnavigation,deadreckoningnavigation, VoiceRecognitionCellPhonedialing,AdvancedCruiseControl,StabilityAugmentation, Automatic driving Control (Text 1: Chapter 11) (6 hours) **L1, L2, L3**

Course Outcomes: At the end of the course, students will be able to:

- Acquire an overview of automotive components, subsystems, and basics of Electronic Engine Control in today's automotiveindustry.
- Use available automotive sensors and actuators while interfacing with microcontrollers/microprocessorsduringautomotivesystemdesign.
- Understand the networking of various modules in automotive systems, communication protocols and diagnostics of the subsystems.
- Design and implement the electronics that attribute the reliability, safety, and smartness to the automobiles, providing add-on comforts and get fair idea on future Automotive ElectronicSystems.

Text Books:

1. William B. Ribbens, ―Understanding Automotive Electronics‖, 6th Edition,Elsevier Publishing.
2. RobertBoschGmbh(Ed.)BoschAutomotiveElectricsandAutomotiveElectronics Systems and Components, Networking and Hybrid Drive, 5th edition, John Wiley& Sons Inc.,2007.

OBJECT ORIENTED PROGRAMMING USING C++

B.E. V Semester (Open Elective)

[As per Choice Based Credit System (CBCS) Scheme]

Course Code	**17EC562**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**03**	**SEE Marks**	**60**
Total Number of Lecture Hours	**40 (08 Hrs/ Module**	**Exam Hours**	**03**

CREDITS – 03

Course objectives: This course will enable students to: Define

- Encapsulation, Inheritance andPolymorphism.
- Solve the problem with object oriented approach.
- Analyze the problem statement and build object oriented system model. Describe the
- characters and behavior of the objects that comprise a system.
  Explain function overloading, operator overloading and virtual functions. Discuss the
- advantages of object oriented programming over procedure oriented programming.
-

Module -1

Beginning with C++ and its features:
What is C++?, Applications and structure of C++ program, Different Data types,Variables,DifferentOperators,expressions,operatoroverloadingand control structures in C++ (Topics from Ch -2,3 of Text). **L1,L2**

Module -2

Functions, classes and Objects:
Functions,Inlinefunction,functionoverloading,friendandvirtualfunctions, Specifyingaclass,C++programwithaclass,arrayswithinaclass,memory allocation to objects, array of objects, members, pointers to members and memberfunctions(SelectedTopicsfromChap-4,5ofText).**L1,L2,L3**

Module -3

Constructors, Destructors and Operator overloading: Constructors, Multiple constructors in a class, Copy constructor, Dynamic constructor, Destructors, Defining operator overloading, Overloading Unary and binary operators, Manipulation of strings using operators (Selected topics from
Chap-6, 7 of Text). **L1, L2, L3**

Module -4

Inheritance, Pointers, Virtual Functions, Polymorphism:
Derived Classes, Single, multilevel, multiple inheritance, Pointers to objects andderivedclasses,thispointer,Virtualandpurevirtualfunctions(Selected topics from Chap-8,9 of Text). **L1, L2,L3**

Module -5

StreamsandWorkingwithfiles:C++streamsandstreamclasses,formatted and unformatted I/O operations, Output with manipulators, Classes for file stream operations, opening and closing a file, EOF (Selected topics from Chap-10, 11 of Text). **L1, L2,L3**

CourseOutcomes: Attheendofthecourse,studentswillbeableto: Explainthe

- Apply Encapsulation, Inheritance and Polymorphism.
- Utilize Object Oriented approach to solve problems
- Examine problem statements and build object oriented models to solve the problems after analysing the objects that constitute the system.
- Build solutions using function overloading, operator overloading and virtual functions.
- Identify advantages of object oriented programming over procedure oriented programming.

Text Book:

Object Oriented Programming with C++, E.Balaguruswamy, TMH, 6th Edition, 2013.

Reference Book:

Object Oriented Programming using C++, Robert Lafore, Galgotia publication2010.

8051 MICROCONTROLLER

B.E., V Semester (Open Elective)

[As per Choice Based Credit System (CBCS) Scheme]

Course Code	**17EC563**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**03**	**SEE Marks**	**60**
Total Number of Lecture Hours	**40 (08 Hrs/ Module)**	**Exam Hours**	**03**

CREDITS – 03

Course objectives: This course will enable students to:

- UnderstandthedifferencebetweenaMicroprocessorandaMicrocontroller and embeddedmicrocontrollers.
- Familiarize the basic architecture of 8051 microcontroller.
- Program 8051microprocessor using Assembly Level Language and C. Understand the
- interrupt system of 8051 and the use of interrupts.
- UnderstandtheoperationanduseofinbuiltTimers/CountersandSerial port of8051.
- Interface8051toexternalmemoryandI/OdevicesusingitsI/Oports.

Module -1

8051 Microcontroller:
Microprocessor Vs Microcontroller, Embedded Systems, Embedded Microcontrollers, 8051 Architecture- Registers, Pin diagram, I/O ports functions, Internal Memory organization. External Memory (ROM & RAM)
interfacing. **L1, L2**

Module -2

8051 Instruction Set: Addressing Modes, Data Transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Bit manipulation instructions. Simple Assembly language programexamples
(without loops) to use these instructions. **L1, L2**

Module -3

8051 Stack, I/O Port Interfacing and Programming: 8051 Stack, Stack and Subroutineinstructions.Assemblylanguageprogramexamplesonsubroutine and involving loops - Delay subroutine, Factorial of an 8 bit number (result maximum 8 bit), Block move without overlap, Addition of N 8 bit numbers, Picking smallest/largest of N 8 bitnumbers.
Interfacing simple switch and LED to I/O ports to switch on/off LED with
respect to switch status. **L1, L2, L3**

Module -4

8051 Timers and Serial Port: 8051 Timers and Counters – Operation and Assembly language programming to generate a pulse using Mode-1 and a square wave using Mode-2 on a port pin.
8051 Serial Communication- Basics of Serial Data Communication, RS-232
standard, 9 pin RS232 signals, Simple Serial Port programming in Assembly and C to transmit a message and to receive data serially. **L1, L2, L3**

Module -5

8051 Interrupts and Interfacing Applications: 8051 Interrupts. 8051 Assemblylanguageprogrammingtogenerateanexternalinterruptusinga

switch, 8051 C programming to generate a square waveform on a port pin using a Timer interrupt.
Interfacing 8051 to ADC-0804, LCD and Stepper motor and their 8051 Assembly language interfacing programming. **L1, L2,L3**

Evaluation of CIE Marks:

Itissuggestedthatatleastafewsimpleprogramstobeexecutedbystudents using a simulation software or an 8051 microcontroller kit for better understandingofthecourse.Thisactivitycanbeconsideredfortheevaluation of10marksoutof40CIE(ContinuousInternalEvaluation)marks,reservedfor the otheractivities.

Course outcomes: At the end of the course, students will be able to:

- Distinguish the role of functional units in the architecture of 8051 microcontroller
- Identify various instructions of 8051 Microcontroller
- Build solutions using assembly level language and high level language
- Make use of timers/counters, serial port and interrupts to generate delay and perform serial communication
- Design interfacing of peripherals to 8051 Microcontroller

TEXT BOOKS:

1. **"The 8051 Microcontroller and Embedded Systems – using assembly and C ",** Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay; PHI, 2006 / Pearson, 2006.
2. **"The 8051 Microcontroller",** Kenneth J. Ayala, 3rd Edition, Thomson/CengageLearning.

REFERENCE BOOKS:

1. **"The 8051 Microcontroller Based Embedded Systems",** Manish K Patel, McGraw Hill, 2014, ISBN:978-93-329-0125-4.
2. **"Microcontrollers: Architecture, Programming, Interfacingand System Design",** Raj Kamal, Pearson Education,2005.

B.E E&C SEVENTH SEMESTER SYLLABUS

MICROWAVES AND ANTENNAS **B.E., VII Semester, Electronics &Communication Engineering [As per Choice Based Credit System (CBCS) Scheme]**			
Course Code	**17EC71**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**04**	**SEE Marks**	**60**

Total Number of LectureHours	50 (10 Hours / Module)	Exam Hours	03

CREDITS – 04

Course objectives: This course will enable students to:

Describethemicrowavepropertiesanditstransmissionmedia Describe microwave devices for several applications Understand the basics of antennatheory

Select antennas for specific applications

Module-1

MicrowaveTubes: Introduction,ReflexKlystronOscillator,MechanismofOscillations, Modes of Oscillations, Mode Curve (Qualitative Analysis only). (Text 1: 9.1, 9.2.2) **Microwave Transmission Lines:** Microwave Frequencies, Microwave devices, MicrowaveSystems,TransmissionLineequationsandsolutions,ReflectionCoefficient andTransmissionCoefficient,StandingWaveandStandingWaveRatio,SmithChart, Single Stub matching. (Text 2: 0.1, 0.2, 0.3, 3.1, 3.2, 3.3, 3.5, 3.6 Except Double stub matching) **L1,L2**

Module-2

MicrowaveNetworktheory: SymmetricalZandY-ParametersforReciprocalNetworks, SmatrixrepresentationofMulti-PortNetworks.(Text1:6.1,6.2,6.3)

Microwave Passive Devices: Coaxial Connectors and Adapters, Attenuators, Phase Shifters, Waveguide Tees, Magic tees. (Text 1: 6.4.2, 6.4.14, 6.4.15, 6.4.16) **L1, L2**

Module-3

Strip Lines: Introduction, Micro Strip lines, Parallel Strip lines, Coplanar Strip lines, Shielded Strip Lines. (Text 2: Chapter 11)

Antenna Basics: Introduction, Basic Antenna Parameters, Patterns, Beam Area, RadiationIntensity,BeamEfficiency,DirectivityandGain,AntennaApertures,Effective Height, Bandwidth, Radio Communication Link, Antenna Field Zones & Polarization. (Text 3: 2.1- 2.11, 2.13,2.15) **L1, L2,L3**

Module-4

Point Sources and Arrays: Introduction, Point Sources, Power Patterns, Power Theorem,RadiationIntensity,FieldPatterns,PhasePatterns,ArraysofTwoIsotropic Point Sources, Pattern Multiplication, Linear Arrays of n Isotropic Point Sources of equal Amplitude and Spacing.(Text 3: 5.1 – 5.11,5.13)

ElectricDipoles: Introduction,ShortElectricDipole,FieldsofaShortDipole(General and Far Field Analyses), Radiation Resistance of a Short Dipole, Thin LinearAntenna (Field Analyses), Radiation Resistances of Lambda/2 Antenna. (Text 3: 6.1 -6.6) **L1, L2, L3,L4**

Module-5

Loop and Horn Antenna: Introduction, Small loop, Comparison of Far fields of Small LoopandShortDipole,TheLoopAntennaGeneralCase,FarfieldPatternsofCircular Loop Antenna with Uniform Current, Radiation Resistance of Loops, Directivity of Circular Loop Antennas with Uniform Current, Horn antennas Rectangular Horn Antennas.(Text 3: 7.1-7.8, 7.19,7.20)

AntennaTypes: HelicalAntenna,HelicalGeometry,PracticalDesignConsiderationsof Helical Antenna, Yagi-Uda array, Parabola General Properties, Log PeriodicAntenna. (Text 3: 8.3, 8.5, 8.8, 9.5, 11.7) **L1, L2,L3**

CourseOutcomes: Attheendofthecourse,studentswillbeableto: Describetheuse

- Identify the working of Reflex Klystron by studying the mode curves and also understand transmission lines structure along with its line equations using smiths charts to calculate the reflection coefficient, SWR, input and load impedance
- Solve for Microwave network parameters using S –Matrix also study Passive microwave devices like Connectors, Adapters Attenuators, Tees and phase shifters
- Identify the different types of Strip lines and understand the antenna basics to find various parameters like antenna gain, directivity.
- Classify the point source Isotropic antenna and Electric dipole
- Identify loop, Horn antenna and the Helical antenna by making use of the design considerations

TextBooks:

1. **Microwave Engineering** – Annapurna Das, Sisir K Das TMH Publication, 2nd, 2010.
2. **Microwave Devices and circuits**- Liao, PearsonEducation.
3. **Antennas and Wave Propagation,** John D. Krauss, Ronald J Marhefka and Ahmad S Khan,4th Special Indian Edition , McGraw- Hill Education Pvt. Ltd., 2010.

Reference Books:

1. **Microwave Engineering** – David M Pozar, John Wiley India Pvt. Ltd. 3rdEdn, 2008.
2. **MicrowaveEngineering**–SushrutDas,OxfordHigherEducation,2ndEdn,2015.
3. **Antennas and Wave Propagation** – Harish and Sachidananda: OxfordUniversity Press,2007.

DIGITAL IMAGE PROCESSING

B.E., VII Semester, Electronics & Communication Engineering [As per Choice Based Credit System (CBCS) Scheme]

Course Code	**17EC72**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**04**	**SEE Marks**	**60**
Total Number of Lecture Hours	**50 (10 Hours / Module)**	**Exam Hours**	**03**

CREDITS – 04

Course Objectives: The objectives of this course are to:

- Understand the fundamentals of digital image processing
- Understandtheimagetransformusedindigitalimageprocessing
- Understandtheimageenhancementtechniquesusedindigitalimageprocessing
- Understandtheimagerestorationtechniquesandmethodsusedindigitalimage processing
- UnderstandtheMorphologicalOperationsandSegmentationusedindigitalimage processing

Module-1

Digital ImageFundamentals: What is Digital Image Processing?, Origins of Digital Image Processing, Examples of fields that use DIP, Fundamental Steps in Digital ImageProcessing,ComponentsofanImageProcessingSystem,ElementsofVisual Perception,ImageSensingandAcquisition,ImageSamplingandQuantization,Some BasicRelationshipsBetweenPixels,LinearandNonlinearOperations.
[Text: Chapter 1 and Chapter 2: Sections 2.1 to 2.5, 2.6.2] **L1, L2**

Module-2

Spatial Domain: Some Basic Intensity Transformation Functions, Histogram Processing,FundamentalsofSpatialFiltering,SmoothingSpatialFilters,Sharpening SpatialFilters
FrequencyDomain:PreliminaryConcepts,TheDiscreteFourierTransform(DFT)of TwoVariables,Propertiesofthe2-DDFT,FilteringintheFrequencyDomain,Image Smoothing and Image Sharpening Using Frequency Domain Filters, Selective Filtering.
[Text: Chapter 3: Sections 3.2 to 3.6 and Chapter 4: Sections 4.2, 4.5 to 4.10]
L1, L2, L3

Module-3

Restoration: Noisemodels,RestorationinthePresenceofNoiseOnlyusingSpatial FilteringandFrequencyDomainFiltering,Linear,Position-InvariantDegradations, EstimatingtheDegradationFunction,InverseFiltering,MinimumMeanSquareError (Wiener) Filtering, Constrained Least SquaresFiltering.
[Text: Chapter 5: Sections 5.2, to 5.9] **L1, L2, L3**

Module-4

Color Image Processing: Color Fundamentals, Color Models, Pseudocolor Image Processing.
Wavelets: Background, Multiresolution Expansions.
MorphologicalImageProcessing: Preliminaries,ErosionandDilation,Openingand Closing,TheHit-or-MissTransforms,SomeBasicMorphologicalAlgorithms.
[Text: Chapter 6: Sections 6.1 to 6.3, Chapter 7: Sections 7.1 and 7.2, Chapter 9: Sections 9.1 to 9.5] **L1, L2, L3**

Module-5

Segmentation: Point, Line, and Edge Detection, Thresholding, Region-Based Segmentation, Segmentation Using MorphologicalWatersheds.
Representation and Description: Representation, Boundary descriptors.
[Text: Chapter 10: Sections 10.2, to 10.5 and Chapter 11: Sections 11.1 and 11.2]
L1, L2, L3

Course Outcomes: At the end of the course students should be able to:

- Identify the elements, components, steps, applications, and basic operations in digital image formation and processing.
- Utilize basic mathematical operations for (Gray/Colour) image enhancementin spatial domain
- Model image restoration techniques and make use of morphologicaloperations in image processing
- Examine application of Fourier Transforms and wavelets in imageenhancement and multi-resolution
- Distinguish image analysis techniques for image segmentation,representation and description.

TextBook:

DigitalImageProcessing-RafelCGonzalezandRichardE.Woods,PHI3rd Edition2010.

Reference Books:

1. **DigitalImageProcessing**-S.Jayaraman,S.Esakkirajan,T.Veerakumar,Tata McGraw Hill2014.
2. **Fundamentals of Digital Image Processing**-A. K. Jain, Pearson2004.

POWER ELECTRONICS

B.E., VII Semester, Electronics & Communication Engineering
[As per Choice Based Credit System (CBCS) Scheme]

Course Code	**17EC73**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**04**	**SEE Marks**	**60**
Total Number of LectureHours	**50 (10 Hours / Module)**	**Exam Hours**	**03**

CREDITS – 04

Course Objectives: This course will enable students to:

- Understand the construction and working of various power devices.
- Study and analysis of thyristor circuits with different triggering conditions. Learn the applications of
- power devices in controlled rectifiers, converters and inverters.
- Studyofpowerelectronicscircuitsundervariousloadconditions.

Module-1

Introduction-ApplicationsofPowerElectronics,PowerSemiconductorDevices,Control CharacteristicsofPowerDevices,typesofPowerElectronicCircuits,PeripheralEffects. PowerTransistors:PowerBJTs:Steadystatecharacteristics.PowerMOSFETs:device operation,switchingcharacteristics,IGBTs:deviceoperation,outputandtransfer characteristics, di/dt and dv/dt limitations. (Text 1) **L1, L2**

Module-2

Thyristors - Introduction, Principle of Operation of SCR, Static Anode-Cathode Characteristics of SCR, Two transisitor model of SCR, Gate Characteristics of SCR, Turn-ON Methods, Turn-OFF Mechanism, Turn-OFF Methods: Natural and Forced
Commutation – Class A and Class B types, Gate Trigger Circuit: Resistance Firing Circuit, Resistance capacitance firing circuit, UJT Firing Circuit. (Text 2) **L1, L2, L3**

Module-3

ControlledRectifiers-Introduction,PrincipleofPhase-ControlledConverterOperation, Single-PhaseFullConverterwithRLLoad,Single-PhaseDualConverters,Single-Phase Semi Converter with RLload.
ACVoltageControllers-Introduction,PrinciplesofON-OFFControl,PrincipleofPhase Control, Single phase controllers with resistive and inductive loads. (Text1)
L1, L2, L3

Module-4

DC-DC Converters - Introduction, principle of step-down operation and it‘s analysis with RL load, principle of step-up operation, Step-up converter with a resistive load, Performance parameters, Converter classification, Switching mode regulators: Buck regulator, Boost regulator, Buck-Boost Regulators, Chopper circuit design. (Text 1)
L1, L2

Module-5

Pulse Width Modulated Inverters- Introduction, principle of operation, performance parameters, Single phase bridge inverters, voltage control of single phase inverters, current source inverters, Variable DC-link inverter, Boost inverter, Inverter circuit design.
Static Switches: Introduction, Single phase AC switches, DC Switches, Solid state relays, Microelectronic relays. (Text 1) **L1, L2**

Course Outcomes: At the end of the course students should be able to:

- Identify the basic operation of various power semiconductor devices and their applications.
- Identify the characteristics of SCR and construct commutation and gate triggering circuits for SCR
- Make use of firing circuits model to analyse the AC Voltage controller and rectifier Circuits.
- Analyze applications of Power electronics in Chopper and Static Switching Operation
- Analyze applications of Power electronics for generating PWM in Inverter Circuits.

Evaluation of Internal Assessment Marks:

Itissuggestedthatatleast4experimentsofPowerElectronicstobeconductedbythe students. This activity can be considered for the evaluation of 10 marks out of 40 ContinuousInternalEvaluationmarks,reservedfortheotheractivities.

Text Books:

1. MohammadHRashid,PowerElectronics,Circuits,DevicesandApplications, 3rd/4thEdition,PearsonEducationInc,2014,ISBN:978-93-325-1844-5.
2. M.DSinghandKBKhanchandani,PowerElectronics,2ndEdition,TataMc-Graw Hill, 2009, ISBN: 0070583897

Reference Books:

1. L.Umanand,PowerElectronics,EssentialsandApplications,JohnWileyIndia Pvt. Ltd,2009.
2. Dr.P.S.Bimbhra,―PowerElectronics‖,KhannaPublishers,Delhi,2012.
3. P.C.Sen,―ModernPowerElectronics‖,SChand&CoNewDelhi,2005.
4. EarlGose,RichardJohnsonbaugh,SteveJost,PatternRecognitionandImage Analysis, ePubeBook.

MULTIMEDIACOMMUNICATION

B.E., VII Semester, Electronics & CommunicationEngineering/ TelecommunicationEngineering

[As per Choice Based credit System (CBCS) Scheme

Course Code	**17EC741**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**03**	**SEE Marks**	**60**
Total Number of LectureHours	**40 (08 Hours / Module)**	**Exam Hours**	**03**

CREDITS – 03

Course objectives: This course will enable students to:

- Gainfundamentalknowledgeinunderstandingthebasicsofdifferentmultimedia networks andapplications.
- Understand digitization principle techniques required to analyze different media types.
- Analyzecompressiontechniquesrequiredtocompresstextandimageandgain knowledge ofDMS. Analyze compression techniques required to compress audio and video. Gainfundamentalknowledgeaboutmultimediacommunicationacrossdifferent networks.
-
-

Module-1

MultimediaCommunications:Introduction,Multimediainformationrepresentation, multimedia networks, multimedia applications, Application and networking terminology. (Chap 1 of Text 1) **L1,L2**

Module-2

Information Representation: Introduction, Digitization principles, Text, Images, Audio and Video (Chap 2 of Text 1) **L1, L2**

Module-3

Text and image compression: Introduction, Compression principles, text compression, image Compression. (Chap 3 of Text1)

Distributed multimedia systems: Introduction, main Features of a DMS, Resource managementofDMS,Networking,Multimediaoperatingsystems(Chap.4-Sections 4.1 to 4.5 of Text 2). **L1, L2, L3**

Module-4

Audio and video compression: Introduction, Audio compression, video compression, video compression principles, video compression. (Chap. 4 of Text 1). **L1, L2, L3**

Module-5

Multimedia Communication Across Networks: Packet audio/video in the network environment,Videotransportacrossgenericnetworks,MultimediaTransportacross ATM Networks (Chap. 6 - Sections 6.1, 6.2, 6.3 of Text 2). **L1,L2**

Course Outcomes: After studying this course, students will be able to: Understand basics of

- different multimedia networks and applications.
- Understanddifferentcompressiontechniquestocompressaudioandvideo. Describe multimedia
- Communication acrossNetworks.
- Analyse different media types to represent them in digital form.
- Compressdifferenttypesoftextandimagesusingdifferentcompression techniques and analyseDMS.

TextBooks:

1. Fred Halsall, ―Multimedia Communications‖, Pearson education, 2001 ISBN- 9788131709948.
2. K.R.Rao,ZoranS.Bojkovic,DragoradA.Milovanovic,―Multimedia Communication Systems‖, Pearson education, 2004. ISBN -9788120321458

Reference Book:

Raifsteinmetz, Klara Nahrstedt, ―Multimedia: Computing, Communications and Applications‖, Pearson education, 2002. ISBN -9788177584417

BIOMEDICAL SIGNALPROCESSING

B.E., VII Semester, Electronics & Communication Engineering/ Telecommunication Engineering

[As per Choice Based Credit System (CBCS) Scheme]

Course Code	**17EC742**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**03**	**SEE Marks**	**60**
Total Number of LectureHours	**40 (8 Hours / Module)**	**Exam Hours**	**03**

CREDITS – 03

Course Objectives: The objectives of this course are to:

- Describetheorigin,propertiesandsuitablemodelsofimportantbiologicalsignals such as ECG andEEG.
- Introducestudentstobasicsignalprocessingtechniquesinanalysingbiological signals.
- Developthestudentsmathematicalandcomputationalskillsrelevanttothefieldof biomedical signalprocessing.
- DevelopathoroughunderstandingonbasicsofECGsignalcompression algorithms.
- Increasethestudent'sawarenessofthecomplexityofvariousbiologicalphenomena and cultivate an understanding of the promises, challenges of the biomedical engineering.

Module-1

Introduction to Biomedical Signals: The nature of Biomedical Signals, Examples of Biomedical Signals, Objectives and difficulties in Biomedical analysis.
Electrocardiography: Basic electrocardiography, ECG lead systems, ECG signal characteristics.
Signal Conversion :Simple signal conversion systems, Conversion requirements for biomedical signals, Signal conversion circuits (Text-1) **L1,L2**

Module-2

Signal Averaging: Basics of signal averaging, signal averaging as a digital filter, a typical averager, software for signal averaging, limitations of signal averaging.
Adaptive Noise Cancelling: Principal noise canceller model, 60-Hz adaptive cancelling using a sine wave model, other applications of adaptive filtering (Text-1) **L1, L2, L3**

Module-3

Data Compression Techniques: Turning point algorithm, AZTEC algorithm, Fan algorithm, Huffman coding, data reduction algorithms The Fourier transform, Correlation,Convolution,Powerspectrumestimation,Frequencydomainanalysisof the ECG (Text-1) **L1, L2,L3**

Module-4

Cardiological signal processing:
Basic Electrocardiography, ECG data acquisition, ECG lead system, ECG signal characteristics(parametersandtheirestimation),Analogfilters,ECGamplifier,and QRS detector, Power spectrum of the ECG, Bandpass filtering techniques, Differentiation techniques, Template matching techniques, A QRS detection algorithm, Realtime ECG processing algorithm, ECG interpretation, ST segment analyzer, Portable arrhythmia monitor. (Text -2) **L1, L2,L3**

Module-5

Neurologicalsignalprocessing: Thebrainanditspotentials,Theelectrophysiological origin of brain waves, The EEG signal and its characteristics (EEG rhythms, waves, and transients),Correlation.

Analysis of EEG channels: Detection of EEG rhythms, Template matching for EEG, spike and wave detection (Text-2). **L1, L2, L3**

Course outcomes: At the end of the course, students will be able to:

- Possessthebasicmathematical,scientificandcomputationalskillsnecessaryto analyse ECG and EEGsignals.
- ApplyclassicalandmodernfilteringandcompressiontechniquesforECGand EEGsignals
- DevelopathoroughunderstandingonbasicsofECGandEEGfeatureextraction.

Text Books:
1. **Biomedical Digital Signal Processing-** Willis J. Tompkins, PHI2001.
2. **BiomedicalSignalProcessingPrinciplesandTechniques-**DCReddy,McGraw- Hill publications2005

Reference Book:
Biomedical Signal Analysis-Rangaraj M. Rangayyan, John Wiley & Sons 2002

REAL TIMESYSTEMS

B.E., VII Semester, Electronics & Communication Engineering /Telecommunication Engineering

[As per Choice Based Credit System (CBCS) Scheme]

Course Code	**17EC743**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**03**	**SEE Marks**	**60**
Total Number of Lecture Hours	**40 (08 Hours per Module)**	**Exam Hours**	**03**

Credits – 03

Course Objectives: This Course will enable students to:

- Discuss the historical background of Real-time systems and its classifications.
- DescribetheconceptsofcomputercontrolandhardwarecomponentsforReal- TimeApplication. Discuss the languages to develop software for Real-Time Applications.
- ExplaintheconceptsofoperatingsystemandRTSdevelopmentmethodologies.
-

Module-1

IntroductiontoReal-TimeSystems: Historicalbackground,ElementsofaComputer Control System, RTS-Definition, Classification of Real-time Systems, Time Constraints, Classification ofPrograms.

Concepts of Computer Control: Introduction, Sequence Control, LoopControl, SupervisoryControl,CentralizedComputerControl,HierarchicalSystems.(TextBook: 1.1 to 1.6 and 2.1 to 2.6) **L1,L2**

Module-2

Computer Hardware Requirements for Real-Time Applications: Introduction, General Purpose Computer, Single Chip Microcomputers and Microcontrollers, Specialized Processors, Process-Related Interfaces, Data Transfer Techniques,
Communications, Standard Interface.(Text Book: 3.1 to 3.8) **L1, L2**

Module-3

LanguagesforReal-TimeApplications: Introduction,SyntaxLayoutandReadability, Declaration and Initialization of Variables and Constants, Modularity and Variables, CompilationofModularPrograms,Datatypes,ControlStructures,ExceptionHandling, Low-levelfacilities,Co-routines,InterruptsandDeviceHandling,Concurrency,Real-
Time Support, Overview of Real-Time Languages. (Text Book: 5.1 to 5.14) **L1, L2, L3**

Module-4

OperatingSystems: Introduction,Real-TimeMulti-TaskingOS,SchedulingStrategies, Priority Structures, Task Management, Scheduler and Real-Time Clock Interrupt Handler,MemoryManagement,CodeSharing,ResourceControl,TaskCo-Operation
and Communication, Mutual Exclusion.(Text Book: 6.1 to 6.11) **L1, L2**

Module-5

Design of RTS – General Introduction: Introduction, Specification Document, Preliminary Design, Single-Program Approach, Foreground/Background System.

RTS Development Methodologies: Introduction, Yourdon Methodology, Ward and MellorMethod,HatelyandPirbhaiMethod.(TextBook:7.1to7.5and8.1,8.2,8.4,8.5) **L1, L2,L3**

Course Outcomes: At the end of the course, students should be able to:

- UnderstandthefundamentalsofRealtimesystemsanditsclassifications.
- Understandtheconceptsofcomputercontrol,operatingsystemandthesuitable computer hardware requirements for real-timeapplications.
- Develop the software languages to meet Real time applications.
- Apply suitable methodologies to design and develop Real-Time Systems.

Text Book:

Real-Time Computer Control, by Stuart Bennet, 2nd Edn. Pearson Education. 2008.

Reference Books:

1. C.M. Krishna, Kang G. Shin, ―Real –Time Systems‖, McGraw –HillInternational Editions,1997.
2. Real-TimeSystemsDesignandAnalysis,Phillip.A.Laplante,secondedition, PHI,2005.
3. EmbeddedSystems,RajKamal,TataMcGrawHill,India,thirdedition,2005.

CRYPTOGRAPHY

B.E., VII Semester, Electronics & Communication Engineering
[As per Choice Based Credit System (CBCS) Scheme]

Course Code	**17EC744**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**03**	**SEE Marks**	**60**
Total Number of Lecture Hours	**40 (08 Hours / Module)**	**Exam Hours**	**03**

CREDITS – 03

Course Objectives: This Course will enable students to:

- Enablestudentstounderstandthebasicsofsymmetrickeyandpublickey cryptography.
- Equipstudentswithsomebasicmathematicalconceptsandpseudorandom number generators required forcryptography.
  Enablestudentstoauthenticateandprotecttheencrypteddata.
- EnrichknowledgeaboutEmail,IPandWebsecurity.
-

Module-1

Basic Concepts of Number Theory and Finite Fields: Divisibility and the divisibilityalgorithm,Euclideanalgorithm,Modulararithmetic,Groups,Ringsand Fields,FinitefieldsoftheformGF(p),Polynomialarithmetic,Finitefieldsoftheform GF(2^n)(Text 1: Chapter 3) **L1,L2**

Module-2

Classical Encryption Techniques: Symmetric cipher model, Substitution techniques, Transposition techniques, Steganography (Text 1: Chapter 1)
SYMMETRICCIPHERS: TraditionalBlockCipherstructure,DataEncryption Standard (DES) (Text 1: Chapter 2: Section1, 2) **L1,L2**

Module-3

SYMMETRIC CIPHERS: The AES Cipher. (Text 1: Chapter 4: Section 2, 3, 4) **Pseudo-Random-SequenceGeneratorsandStreamCiphers:**LinearCongruential Generators,LinearFeedbackShiftRegisters,Designandanalysisofstreamciphers, StreamciphersusingLFSRs(Text2:Chapter16:Section1,2,3,4)**L1,L2,L3**

Module-4

More number theory: Prime Numbers, Fermat's and Euler's theorem, Primality testing, Chinese Remainder theorem, discrete logarithm. (Text 1: Chapter 7) **PrinciplesofPublic-KeyCryptosystems**:TheRSAalgorithm,Diffie-HellmanKey Exchange,EllipticCurveArithmetic,EllipticCurveCryptography(Text1:Chapter8, Chapter 9: Section 1, 3, 4) **L1, L2,L3**

Module-5

One-Way Hash Functions: Background, Snefru, N-Hash, MD4, MD5, Secure Hash Algorithm [SHA],One way hash functions using symmetric block algorithms, Using publickeyalgorithms,Choosingaone-wayhashfunctions,MessageAuthentication Codes. Digital Signature Algorithm, Discrete Logarithm Signature Scheme (Text 2: Chapter18:Section18.1to18.5,18.7,18.11to18.14andChapter20:Section20.1, 20.4) **L1, L2,L3**

CourseOutcomes: Afterstudyingthiscourse,studentswillbeableto:

- Usebasiccryptographicalgorithmstoencryptthedata.
- Generate some pseudorandom numbers required for cryptographic applications.
- Provide authentication and protection for encrypteddata.

Text Books:

1. WilliamStallings,―CryptographyandNetworkSecurityPrinciplesandPractice‖, Pearson Education Inc., 6th Edition, 2014, ISBN:978-93-325-1877-3
2. BruceSchneier,―AppliedCryptographyProtocols,Algorithms,andSourcecodein C‖, Wiley Publications, 2nd Edition, ISBN:9971-51-348-X

Reference Books:

1. CryptographyandNetworkSecurity,BehrouzA.Forouzan,TMH,2007.
2. CryptographyandNetworkSecurity,AtulKahate,TMH,2003.

CAD for VLSI

B.E., VII Semester, Electronics & Communication Engineering [As per Choice Based Credit System (CBCS) Scheme]

Course Code	**17EC745**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**03**	**SEE Marks**	**60**
Total Number of Lecture Hours	**40 (8 Hours per Module)**	**Exam Hours**	**03**

CREDITS – 03

Course Objectives: This course will enable students to:

- UnderstandvariousstagesofPhysicaldesignofVLSIcircuits
- KnowaboutmappingadesignproblemtoarealizablealgorithmBecome aware of graph theoretic, heuristic andgeneticalgorithmsCompare performance of differentalgorithms

Module 1

Data Structures and Basic Algorithms:

Basic terminology, Complexity issues and NP-Hardness. Examples - Exponential,heuristic,approximationandspecialcases.BasicAlgorithms. Graph Algorithms for Search, spanning tree, shortest path, min-cut and max-cut,Steinertree.ComputationalGeometryAlgorithms:Linesweepand extended line sweep methods. **L1, L2**

Module 2

Basic Data Structures. Atomic operations for layout editors, Linked list of blocks,Bin-basedmethod,Neighborpointers,corner-stitching,Multi-layer operations, Limitations of existing data structures. Layout specification languages.

Graph algorithms for physical design: Classes of graphs in physical design, Relationship between graph classes, Graph problems in physical design,AlgorithmsforIntervalgraphs,permutationgraphsandcircle graphs. **L1, L2**

Module 3

Partitioning: Problem formulation, Design style specific partitioning problems, Classification of PartitioningAlgorithms.

Group migration algorithms: Kernighan-Lin algorithm, Fiduccia-Mattheyses Algorithm, Simulated Annealing, Simulated Evolution.

Floor Planning: Problem formulation, Constraint based floor planning, Rectangular dualization, Simulated evolution algorithms. **L1, L2, L3**

Module 4

Pin Assignment: Problem formulation. Classification of pin assignment problems, General pin assignment problem.

Placement: Problem formulation, Classification of placement algorithms. Simulation based placement: Simulated annealing, simulated evolution, forcedirectedplacement.Partitioningbasedalgorithms:Breur'sAlgorithm, Terminal propagation algorithm, Other algorithms for placement. **L1, L2,L3**

Module 5

Global Routing: Problem formulation, Classification of Global routing algorithms,Mazeroutingalgorithms:Lee'salgorithm,Soukup'salgorithm and Hadlock's Algorithm, Line probealgorithms.

Detailed Routing: Problem formulation, Routing considerations, models, channel routing and switch box routing problems. General river routing problem, Single row routing problem.

Two-layer channel routing algorithms: Basic Left Edge Algorithm, Dogleg router, Symbolic router-YACR2. **L1, L2, L3**

CourseOutcomes: Afterstudyingthiscourse,studentswillbeableto:

- Appreciatetheproblemsrelatedtophysicaldesignof VLSI
- Use genralized graph theoretic approach to VLSIproblems
- Design Simulated Annealing andEvolutionaryalgorithms
- Know various approaches to write generalizedalgorithms

Question paper pattern:

- Thequestionpaperwillhave10fullquestionscarryingequalmarks.
- Eachfullquestionconsistsof16markswithamaximumofThreesub questions.
- Therewillbe2fullquestionsfromeachmodulecoveringallthetopics of themodule
- Thestudentswillhavetoanswer5fullquestions,selectingonefull question from eachmodule.

Text Book:

Algorithms for VLSI Physical Design Automation, 3rd Ed, Naveed Sherwani, 1999 Kluwer Academic Publishers, Reprint 2009 Springer (India) Private Ltd. ISBN 978-81-8128-317-7.

DSP ALGORITHMS and ARCHITECTURE

B.E., VII Semester, Electronics & Communication Engineering /Telecommunication Engineering

[As per Choice Based Credit System (CBCS) Scheme]

Course Code	**17EC751**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**03**	**SEE Marks**	**60**
Total Number of LectureHours	**40 (8 Hours / Module)**	**Exam Hours**	**03**

CREDITS – 03

Course Objectives: This course will enable students to:

- Figureouttheknowledgeandconceptsofdigitalsignalprocessingtechniques.
- Understandthecomputationalbuildingblocksof DSPprocessorsanditsspeed issues.
- Understand the various addressing modes, peripherals, interrupts and pipelining structure of TMS320C54xxprocessor.
- Learn how to interface the external devices to TMS320C54xx processor in variousmodes.
- Understand basic DSP algorithms with theirimplementation.

Module-1

Introduction to Digital Signal Processing:
Introduction, A Digital Signal – Processing System, The Sampling Process, Discrete TimeSequences,DiscreteFourierTransform(DFT)andFastFourierTransform(FFT), LinearTime-InvariantSystems,DigitalFilters,DecimationandInterpolation.

Computational Accuracy in DSP Implementations:
Number Formats for Signals and Coefficients in DSP Systems, Dynamic Range and Precision, Sources of Error in DSP Implementation. **L1, L2**

Module-2

Architectures for Programmable Digital Signal – Processing Devices:
Introduction,BasicArchitecturalFeatures,DSPComputationalBuildingBlocks,Bus Architecture and Memory, Data Addressing Capabilities, Address Generation Unit, Programmability and Program Execution, Speed Issues, Features for External Interfacing. **L1, L2,L3**

Module-3

Programmable Digital Signal Processors:
Introduction, Commercial Digital Signal-processing Devices, Data Addressing Modes of TMS32OC54XX,MemorySpaceofTMS32OC54xxProcessors,ProgramControl.Detail StudyofTMS320C54X&54xxInstructionsandProgramming,On–ChipPeripherals, Interrupts of TMS32OC54XX Processors, Pipeline Operation of TMS32OC54xx Processor. **L1, L2,L3**

Module-4

Implementation of Basic DSP Algorithms:
Introduction, The Q – notation, FIR Filters, IIR Filters, Interpolation and Decimation Filters (one example in each case).

Implementation of FFT Algorithms:
Introduction, An FFT Algorithm for DFT Computation, Overflow and Scaling, Bit – Reversed Index. Generation & Implementation on the TMS32OC54xx. **L1, L2, L3**

Module-5

Interfacing Memory and Parallel I/O Peripherals to Programmable DSP Devices:
Introduction,MemorySpaceOrganization,ExternalBusInterfacingSignals.Memory Interface,ParallelI/OInterface,ProgrammedI/O,InterruptsandI/ODirectMemory Access(DMA).

Interfacing and Applications of DSP Processors:
Introduction, Synchronous Serial Interface, A CODEC Interface Circuit, DSP Based Bio-telemetry Receiver, A Speech Processing System, An Image Processing System.
L1, L2, L3

Course Outcomes: At the end of this course, students would be able to

- Comprehendtheknowledgeandconceptsofdigitalsignalprocessingtechniques.
- ApplytheknowledgeofDSPcomputationalbuildingblockstoachievespeedinDSP architecture orprocessor.
- Applyknowledgeofvarioustypesofaddressingmodes,interrupts,peripheralsand pipelining structure of TMS320C54xxprocessor.
- Develop basic DSP algorithms using DSP processors.
- Discuss about synchronous serial interface and multichannel buffered serial port (McBSP) of DSP device.
- Demonstrate the programming of CODECinterfacing.

Text Book:
—DigitalSignalProcessing‖,AvatarSinghandS.Srinivasan,ThomsonLearning,2004.

Reference Books:
1. —DigitalSignalProcessing:Apracticalapproach‖,IfeachorE.C.,JervisB.W Pearson-Education, PHI,2002.
2. —DigitalSignalProcessors‖,BVenkataramaniandMBhaskar,TMH,2nd,2010
3. —ArchitecturesforDigitalSignalProcessing‖,PeterPirschJohnWeily,2008

IoT & WIRELESS SENSOR NETWORKS

B.E., VII Semester, Electronics & Communication Engineering /Telecommunication Engineering

[As per Choice Based Credit System (CBCS) Scheme]

Course Code	**17EC752**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**03**	**SEE Marks**	**60**
Total Number of LectureHours	**40 (8 Hours / Module)**	**Exam Hours**	**03**

CREDITS – 03

Course Objectives: This course will enable students to:

- UnderstandvarioussourcesofIoT&M2Mcommunicationprotocols.
- DescribeCloudcomputinganddesignprinciplesofIoT.
- BecomeawareofMQTTclients,MQTTserveranditsprogramming.
- UnderstandthearchitectureanddesignprinciplesofWSNs.
- EnrichtheknowledgeaboutMACandroutingprotocolsin WSNs.

Module-1

OverviewofInternetofThings: IoTConceptualFramework,IoTArchitecturalView, TechnologyBehindIoT,SourcesofIoT,M2Mcommunication,ExamplesofIoT.Modified OSIModelfortheIoT/M2MSystems,dataenrichment,dataconsolidationanddevice managementatIoT/M2MGateway,webcommunicationprotocolsusedbyconnected IoT/M2M devices, Message communication protocols (CoAP-SMS, CoAP-MQ, MQTT,XMPP) for IoT/M2M devices. **L1,L2**

Module-2

Architecture and Design Principles for IoT: Internet connectivity, Internet-based communication,IPv4, IPv6,6LoWPAN protocol, IP Addressing in the IoT, Application layer protocols: HTTP, HTTPS,FTP,TELNET and ports.

Data Collection, Storage and Computing using a Cloud Platform: Introduction, Cloudcomputingparadigmfordatacollection,storageandcomputing,Cloudservice models, IoT Cloud- based data collection, storage and computing services using Nimbits. **L1,L2**

Module-3

Prototyping and Designing Software for IoT Applications: Introduction, Prototyping Embedded device software, Programming Embedded Device Arduino Platform using IDE, Reading data from sensors and devices, Devices, Gateways, Internet and Web/Cloud services software development.

ProgrammingMQTTclientsandMQTTserver.IntroductiontoIoTprivacyandsecurity. Vulnerabilities,securityrequirementsandthreatanalysis,IoTSecurityTomography and layered attacker model. **L1, L2,L3**

Module-4

Overview of Wireless Sensor Networks:
ChallengesforWirelessSensorNetworks,EnablingTechnologiesforWirelessSensor Networks.

Architectures: Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes, Operating Systems and Execution Environments, NetworkArchitecture-SensorNetworkScenarios,OptimizationGoalsandFiguresof Merit,DesignprinciplesforWSNs,ServiceinterfacesofWSNsGatewayConcepts.
L1, L2, L3

Module-5

Communication Protocols:
Physical Layer and Transceiver Design Considerations, MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts - S-MAC , The Mediation Device Protocol, Wakeup Radio Concepts, Contention based protocols(CSMA,PAMAS), Schedule based protocols (LEACH, SMACS, TRAMA) Address andNameManagementinWSNs,AssignmentofMACAddresses,RoutingProtocols-Energy-EfficientRouting,GeographicRouting,Hierarchicalnetworksbyclustering.
L1, L2, L3

CourseOutcomes: Attheendofthecourse,studentswillbeableto:

- DescribetheOSIModelfortheIoT/M2MSystems.
- UnderstandthearchitectureanddesignprinciplesforIoT. Learn the
- programming for IoTApplications.
- Identify the communication protocols which best suits the WSNs.

Text Books:

1. RajKamal,‖InternetofThings-Architectureanddesignprinciples‖,McGrawHill Education.
2. HolgerKarl&AndreasWillig,"ProtocolsAndArchitecturesforWirelessSensor Networks" , John Wiley,2005.
3. Feng Zhao & Leonidas J. Guibas, ―Wireless Sensor Networks- An Information Processing Approach", Elsevier,2007.

Reference Books:

1. Kazem Sohraby, Daniel Minoli, & Taieb Znati, ―Wireless Sensor Networks- Technology, Protocols, And Applications‖, John Wiley,2007.
2. AnnaHac,―WirelessSensorNetworkDesigns‖,JohnWiley,2003.

PATTERNRECOGNITION

B.E., VII Semester, Electronics & Communication Engineering/ Telecommunication Engineering

[As per Choice Based Credit System (CBCS) Scheme]

Course Code	**17EC753**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**03**	**SEE Marks**	**60**
Total Number of LectureHours	**40 (8 Hours / Module)**	**Exam Hours**	**03**

CREDITS – 03

Course Objectives: The objectives of this course are to: Introduce

- mathematical tools needed for Pattern Recognition
- Impart knowledge about the fundamentals of Pattern Recognition. Provide knowledge of
- recognition, decision making and statistical learning problems
- Introduceparametricandnon-parametrictechniques,supervisedlearningand clustering concepts of pattern recognition

Module-1

Introduction: Importance of pattern recognition, Features, Feature Vectors, andClassifiers,Supervised,Unsupervised,andSemi-supervisedlearning,Introductionto BayesDecisionTheory,DiscriminantFunctionsandDecisionSurfaces,GaussianPDF and Bayesian Classification for Normal Distributions. **L1,L2**

Module-2

Data Transformation and Dimensionality Reduction: Introduction, Basis Vectors, The Karhunen Loeve (KL) Transformation, Singular Value Decomposition, Independent ComponentAnalysis(Introductiononly).NonlinearDimensionalityReduction,Kernel PCA. **L1, L2**

Module-3

Estimation of Unknown Probability Density Functions: Maximum Likelihood Parameter Estimation, Maximum a Posteriori Probability estimation, Bayesian Interference,MaximumEntropyEstimation,MixtureModels,Naive-BayesClassifier, The Nearest Neighbor Rule. **L1, L2, L3**

Module-4

Linear Classifiers: Introduction, Linear Discriminant Functions and DecisionHyperplanes, The Perceptron Algorithm, Mean Square Error Estimate,Stochastic Approximation of LMS Algorithm, Sum of Error Estimate. **L1, L2, L3**

Module-5

Nonlinear Classifiers: The XOR Problem, The two Layer Perceptron, Three Layer Perceptron,BackpropagationAlgorithm,BasicConceptsofClustering,Introductionto Clustering , Proximity Measures. **L1, L2,L3**

Course outcomes: At the end of the course, students will be able to:

- IdentifyareaswherePatternRecognitionandMachineLearningcanoffera solution.
- Describethestrengthandlimitationsofsometechniquesusedincomputational Machine Learning for classification, regression and density estimation problems Describe genetic algorithms, validation methods and sampling techniques
- Describeandmodeldatatosolveproblemsinregressionandclassification
- Implement learning algorithms for supervised tasks
-

Text Book:

PatternRecognition:SergiosTheodoridis,KonstantinosKoutroumbas,Elsevier India Pvt. Ltd (Paper Back), 4thedition.

Reference Books:

1. **TheElementsofStatisticalLearning:**TrevorHastie,Springer-VerlagNew York, LLC (Paper Back),2009.
2. **PatternClassification:**RichardO.Duda,PeterE.Hart,DavidG.Stork. John Wiley & Sons,2012.
3. **Pattern Recognition and Image Analysis Earl Gose:**Richard Johnsonbaugh,SteveJost,ePubeBook.

ADVANCED COMPUTER ARCHITECTURE

B.E., VII Semester, Electronics & Communication Engineering /Telecommunication Engineering

[As per Choice Based Credit System (CBCS) Scheme]

Course Code	**17EC754**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**03**	**SEE Marks**	**60**
Total Number of Lecture Hours	**40 (8 Hours / Module)**	**Exam Hours**	**03**

CREDITS – 03

Course Objectives: This course will enable students to:

- Understandthevariousparallelcomputermodelsandconditionsofparallelism
- Explainthecontrolflow,dataflowanddemanddrivenmachines
- StudyCISC,RISC,superscalar,VLIWandmultiprocessorarchitectures Understand the
- concept of pipelining and memory hierarchy design Explain cache coherenceprotocols.
-

Module-1

Parallel Computer Models: The state of computing, Classification of parallel computers,Multiprocessorsandmulticomputer,MultivectorsandSIMDcomputers.

Program and Network Properties: Conditions of parallelism, Data and resource Dependences, Hardware and software parallelism, Program partitioning and scheduling, Grain Size and latency. **L1, L2**

Module-2

Program flow mechanisms: Control flow versus data flow, Data flow Architecture, Demand driven mechanisms, Comparisons of flow mechanisms.

Principles of Scalable Performance: Performance Metrics and Measures, Parallel Processing Applications, Speedup Performance Laws, Scalability Analysis and Approaches. **L1, L2, L3**

Module-3

SpeedupPerformanceLaws: Amdhal'slaw,Gustafson'slaw,Memoryboundedspeed up model, Scalability Analysis andApproaches.

AdvancedProcessors: Advancedprocessortechnology,Instruction-setArchitectures, CISC Scalar Processors, RISC Scalar Processors, Superscalar Processors, VLIW Architectures. **L1, L2,L3**

Module-4

Pipelining: Linear pipeline processor, nonlinear pipeline processor, Instruction pipeline Design, Mechanisms for instruction pipelining, Dynamic instruction scheduling, Branch Handling techniques, branch prediction, Arithmetic Pipeline Design.

Memory Hierarchy Design: Cache basics & cache performance, reducing miss rate andmisspenalty,multilevelcachehierarchies,mainmemoryorganizations,designof memory hierarchies. **L1, L2,L3**

Module-5

MultiprocessorArchitectures: Symmetricsharedmemoryarchitectures,distributed shared memory architectures, models of memory consistency, cache coherence protocols(MSI,MESI,MOESI),scalablecachecoherence,overviewofdirectorybased approaches, design challenges of directory protocols, memory based directory protocols, cache based directory protocols. **L1, L2,L3**

CourseOutcomes: Attheendofthecourse,thestudentswillbeableto:

- Explainparallelcomputermodelsandconditionsofparallelism
- Differentiate control flow, dataflow, demanddrivenmechanisms
- Explain the principle of scalableperformance
- Discuss advanced processors architectures like CISC, RISC, superscalar and VLIW
- Understandthebasicsofinstructionpipeliningandmemorytechnologies
- Explain the issues in multiprocessorarchitectures

Question paper pattern:

The question paper will have ten questions.

- Each full question consists of 16marks.
- Therewillbe2fullquestions(withamaximumofThreesubquestions)fromeach module.
- Eachfullquestionwillhavesubquestionscoveringallthetopicsunderamodule. Thestudentswillhavetoanswer5fullquestions,selectingonefullquestionfrom eachmodule.

TextBook:

Kai Hwang, ―Advanced computer architecture‖; TMH.

Reference Books:

1. KaiHwangandZu,―ScalableParallelComputersArchitecture‖;MGH.
2. M.JFlynn,―ComputerArchitecture,PipelinedandParallelProcessorDesign‖; NarosaPublishing.
3. D.A.Patterson, J.L.Hennessy, ―Computer Architecture :A quantitative approach‖; Morgan Kauffmann Feb,2002.

SATELLITE COMMUNICATION

B.E., VII Semester, Electronics & Communication Engineering [As per Choice Based Credit System (CBCS) Scheme]

Course Code	**17EC755**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**03**	**SEE Marks**	**60**
Total Number of LectureHours	**40 (8 Hours / Module)**	**Exam Hours**	**03**

CREDITS – 03

Course Objectives: This course will enable students to

- Understand the basic principle of satellite orbits and trajectories.
- Study of electronic systems associated with a satellite and the earth station.
- Understandthevarioustechnologiesassociatedwiththesatellitecommunication.
- Focusonacommunicationsatelliteandthenationalsatellitesystem.
- Studyofsatelliteapplicationsfocusingvariousdomainsservicessuchasremote sensing, weather forecasting andnavigation.

Module-1

Satellite Orbits and Trajectories: Definition, Basic Principles, Orbital parameters, Injection velocity and satellite trajectory, Types of Satellite orbits, Orbital perturbations, Satellite stabilization, Orbital effects on satellite‘s performance, Eclipses, Look angles: Azimuth angle, Elevation angle. **L1, L2**

Module-2

Satellite subsystem: Power supply subsystem, Attitude and Orbit control, Tracking, Telemetry and command subsystem, Payload.

Earth Station: Types of earth station, Architecture, Design considerations, Testing, Earth station Hardware, Satellite tracking. **L1, L2**

Module-3

Multiple Access Techniques: Introduction, FDMA (No derivation), SCPC Systems, MCPC Systems, TDMA, CDMA, SDMA.

Satellite Link Design Fundamentals: Transmission Equation, Satellite Link Parameters, Propagation considerations. **L1, L2,L3**

Module-4

Communication Satellites: Introduction, Related Applications, Frequency Bands, Payloads,SatelliteVs.TerrestrialNetworks,SatelliteTelephony,SatelliteTelevision, Satelliteradio,RegionalsatelliteSystems,NationalSatelliteSystems.**L1,L2**

Module-5

Remote Sensing Satellites: Classification of remote sensing systems, orbits, Payloads,Typesofimages:ImageClassification,Interpretation,Applications.

Weather Forecasting Satellites: Fundamentals, Images, Orbits, Payloads, Applications.

Navigation Satellites: Development of Satellite Navigation Systems, GPS system, Applications. **L1, L2, L3**

Course Outcomes: At the end of the course, the students will be able to:

- Describethesatelliteorbitsanditstrajectorieswiththedefinitionsofparameters associated withit. Describetheelectronichardwaresystemsassociatedwiththesatellitesubsystem and earthstation.
- Describethevariousapplicationsofsatellitewiththefocusonnationalsatellite system. Computethesatellitelinkparametersundervariouspropagationconditionswiththe illustration of multiple
- accesstechniques.
-

Text Book:

AnilK.Maini,VarshaAgrawal,SatelliteCommunications,WileyIndiaPvt.Ltd., 2015, ISBN:978-81-265-2071-8.

Reference Books :

1. DennisRoddy,SatelliteCommunications,4th Edition,McGraw-HillInternational edition,2006
2. TimothyPratt,CharlesBostian,JeremyAllnutt,SatelliteCommunications,2nd Edition,WileyIndiaPv t.Ltd,2017,ISBN:978-81-265-0833-4

ADVANCED COMMUNICATION LAB

B.E., VII Semester, Electronics & Communication Engineering [As per Choice Based Credit System (CBCS) Scheme]

Course Code	**17ECL76**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**01Hr Tutorial(Instructions) + 02 Hours Laboratory = 03**	**SEE Marks**	**60**
RBT Levels	**L1, L2, L3**	**Exam Hours**	**03**

CREDITS – 02

Course objectives: This course will enable students to:

- Designanddemonstratethedigitalmodulationtechniques
- Demonstrateandmeasurethewavepropagationinmicrostripantennas
- Characteristicsofmicrostripdevicesandmeasurementofitsparameters.
- Modelanopticalcommunicationsystemandstudyitscharacteristics.
- Simulatethedigitalcommunicationconceptsandcomputeanddisplayvarious parameters along withplots/figures.

Laboratory Experiments

PART-A: Following Experiments No. 1 to 4 has to be performed using discrete components.

1. TimeDivisionMultiplexingandDemultiplexingoftwobandlimitedsignals.
2. ASK generation anddetection
3. FSK generation anddetection
4. PSK generation anddetection
5. Measurementoffrequency,guidewavelength,power,VSWRandattenuationin microwave testbench.
6. MeasurementofdirectivityandgainofmicrostripdipoleandYagiantennas.
7. Determinationof
    a. Couplingandisolationcharacteristicsofmicrostripdirectionalcoupler.
    b. Resonancecharacteristicsofmicrostripringresonatorandcomputationof dielectric constant of thesubstrate.
    c. Powerdivisionandisolationofmicrostrippowerdivider.
8. Measurement of propagation loss, bending loss and numerical aperture of an opticalfiber.

PART-B: Simulation Experiments using SCILAB/MATLAB/Simulink or LabView

1. Simulate NRZ, RZ, half-sinusoid and raised cosine pulses and generate eye diagram for binary polarsignaling.
2. Simulate the Pulse code modulation and demodulation system and display the waveforms.
3. SimulatetheQPSKtransmitterandreceiver.Plotthesignalsanditsconstellation diagram.
4. Test the performance of a binary differential phase shift keying system by simulating the non-coherent detection of binaryDPSK.

Courseoutcomes: Onthecompletionofthislaboratorycourse,thestudentswillbe ableto:

- Make use of the characteristics and response of microwave devices
- Utilize the characteristics of micros trip antennas and measurement of its parameters.
- Construct the digital modulation schemes with the display of waveforms and computation of performance parameters
- Make use of the characteristics of Optical Fiber Communication and calculate the parameters associated with it.
- Model different digital communication concepts using simulation

Conduct of Practical Examination:

- Alllaboratoryexperimentsaretobeconsideredforpractical examination.
- Forexaminationonequestionfrom**PART-A**andonequestionfrom**PART-Bor**only onequestionfrom**PART-B**experimentsbasedonthecomplexity,tobeset.
- Students are allowed to pick one experiment from the lot.
- Strictlyfollowtheinstructionsasprintedonthecoverpageofanswerscriptfor breakup ofmarks.
- ChangeofexperimentisallowedonlyonceandMarksallottedtotheprocedurepart to be madezero.

VLSILAB

B.E., VII Semester, Electronics & Communication Engineering [As per Choice Based Credit System (CBCS) Scheme]

Course Code	**17ECL77**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**01Hr Tutorial(Instructions) + 02 Hours Laboratory = 03**	**SEE Marks**	**60**
RBT Levels	**L1, L2, L3**	**Exam Hours**	**03**

CREDITS – 02

Course objectives: This course will enable students to:

- ExploretheCADtoolandunderstandtheflowoftheFullCustomICdesigncycle.
- LearnDRC,LVSandParasiticExtractionofthevariousdesigns.
- DesignandsimulatethevariousbasicCMOSanalogcircuitsandusetheminhigher circuitslikedataconvertersusingdesignabstractionconcepts.
- DesignandsimulatethevariousbasicCMOSdigitalcircuitsandusetheminhigher circuitslikeaddersandshiftregistersusingdesignabstractionconcepts.

Experiments can be conducted using any of the following or equivalent design tools: Cadence/Synopsis/Mentor Graphics/Microwind

Laboratory Experiments

PART - A

ASIC-DIGITAL DESIGN

1. WriteVerilogCodeforthefollowingcircuitsandtheirTestBenchforverification, observe the waveform and synthesize the code with technological librarywith givenconstraints*.Dotheinitialtimingverificationwithgatelevelsimulation.
   i. Aninverter
   ii. ABuffer
   iii. TransmissionGate
   iv. Basic/universalgates
   v. Flip flop -RS, D, JK, MS,T
   vi. Serial & Paralleladder
   vii. 4-bit counter [Synchronous and Asynchronouscounter]
   viii. Successive approximation register[SAR]

PART - B
ANALOG DESIGN

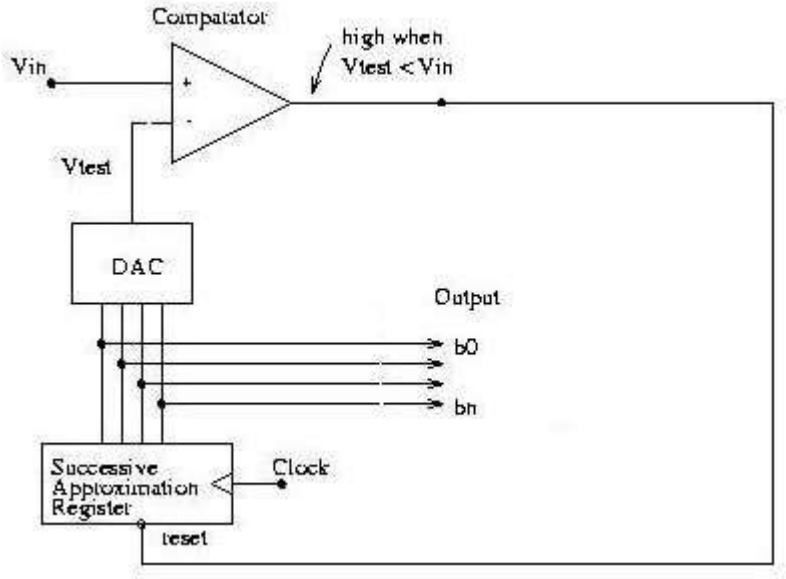
1. Design an Inverter with given specifications**, completing the design flow mentionedbelow:
   a. Draw the schematic and verify thefollowing
      i) DCAnalysis
      ii) TransientAnalysis
   b. Draw the Layout and verify the DRC,ERC
   c. Check forLVS
   d. ExtractRCandbackannotatethesameandverifytheDesign
   e. Verify&OptimizeforTime,PowerandAreatothegivenconstraint*

2. Design the (i) Common source and Common Drain amplifier and (ii) A Single Stagedifferentialamplifier,withgivenspecifications**,completingthe design flow mentioned below:
   a. Draw the schematic and verify thefollowing
      i) DCAnalysis
      ii) ACAnalysis
      iii) TransientAnalysis
   b. Draw the Layout and verify the DRC,ERC
   c. Check forLVS
   d. ExtractRCandbackannotatethesameandverifytheDesign.

3. Design an op-amp with given specification** using given differential amplifier CommonsourceandCommonDrainamplifierinlibrary***andcompletingthe design flow mentionedbelow:
   a. Draw the schematic and verify the following
      i) DC Analysis
      ii).ACAnalysis
      iii) Transient Analysis
   b. Draw the Layout and verify the DRC,ERC
   c. Check forLVS
   d. ExtractRCandbackannotatethesameandverifytheDesign.

4. Design a 4 bit R-2R based DAC for the given specification and completing the designflowmentionedusinggivenop-ampinthelibrary***.
   a. Draw the schematic and verify thefollowing
      i) DCAnalysis
      ii) ACAnalysis
      iii) TransientAnalysis
   b. Draw the Layout and verify the DRC,ERC

5. For the SAR based ADC mentioned in the figure below draw the mixedsignal schematic and verify the functionality by completing ASIC Design FLOW. [Specifications toGDS-II]



* An appropriate constraint should begiven.

** Appropriate specification should begiven.

*** ApplicableLibraryshouldbeadded&informationshouldbegiventothe Designer.

Courseoutcomes: Onthecompletionofthislaboratorycourse,thestudentswillbe ableto:

- Model basic digital circuits, simulate and synthesize using EDA Tool.
- Make use of logic gates to realize shift registers and adders to meet desired parameters.
- Construct and generate layout structure for basic CMOS circuits like inverter, common source amplifier and differential amplifier.
- Experiment with the basic amplifiers to design higher level circuits like operational amplifier and analog/digital converters to meet desired parameters.
- Inspect concepts of DC Analysis, AC Analysis and Transient Analysis in analog circuits.

Conduct of Practical Examination:

All laboratory experiments are to be included for practical examination.

For examination, one question from **PART-A** and one question from **PART-B** to be set.

Students are allowed to pick one experiment from the lot.

Change of experiment is allowed only once and Marks allotted to the procedure part to be made zero.