E.G.S. PILLAY ENGINEERING COLLEGE

(Autonomous)

Approved by AICTE, New Delhi | Affiliated to Anna University, Chennai

Accredited by NAAC with „A" Grade | Accredited by NBA (CSE, EEE, MECH)

NAGAPATTINAM – 611 002

B.E. Electronics and Communication Engineering

Full Time Curriculum and Syllabus

First Year – First Semester

Course Code	Course Name	L	T	P	C	Maximum Marks		
						CA	ES	Total
Theory Course								
1701MA101	Engineering Mathematics-I	3	2	0	4	40	60	100
1701PH101	Applied Physics for Engineers	3	0	0	3	40	60	100
1701EN101	Technical English	3	0	0	3	100	0	100
1701CH104	Applied Chemistry	3	0	0	3	40	60	100
1701GE101	Basic Electrical and Instrumentation Engineering	3	0	0	3	40	60	100
1701GEX02	Engineering Graphics	2	2	0	3	50	50	100
1701GEX03	Programming in C	3	0	0	3	40	60	100
Laboratory Course								
1701HS151	Physics and Chemistry Lab –I	0	0	2	1	50	50	100
1701GEX51	Programming in C Lab	0	0	2	1	50	50	100

L – Lecture | T – Tutorial | P – Practical | C – Credit | CA – Continuous Assessment | ES – End Semester

1701MA101	ENGINEERING MATHEMATICS I	L	T	P	C
	(Common to all B.E / B.Tech Degree Programmes)	3	2	0	4

COURSE OBJECTIVES:

1. To educate Matrix Algebra Technique and curvature Theory
2. To impart knowledge of Techniques in solving Ordinary Differential Equations and to apply in solving Modern Engineering Problems
3. To acquaint the students about functions of several variables and also to familiarize the students in infinite series and their convergence

UNIT I EIGEN VALUE PROBLEMS **9 Hours**

Characteristic equation - Eigen values and Eigen vectors of a real matrix – Properties - Cayley– Hamilton theorem- Diagonalization of Matrices - Reduction of a quadratic form to a canonical form by orthogonal transformation – Application of Matrices in Structural Engineering and image processing

UNIT II ORDINARY DIFFERENTIAL EQUATIONS **9 Hours**

Higher order linear differential equations with constant coefficients – Cauchy‟s and Legendre‟s linear equations – Method of variation of parameters in solution of ordinary differential equations.

UNIT III DIFFERENTIATION AND GEOMETRICAL APPLICATIONS **9 Hours**

Derivative of special functions (Trigonometry, Exponential, Logarithmic), Derivative by rule (Product, Quotient, Chain rule), Curvature in Cartesian co-ordinates – Centre and radius of curvature – Circle of curvature- Evolutes and involutes.

UNIT IV MULTIVARIABLE CALCULUS **9 Hours**

Functions of two variables and solutions(Partial derivatives and Euler‟s theorem)– Taylor‟s series - Maxima and Minima – Application of Partial Derivatives to find the optimum requirement using Lagrangian multipliers.

UNIT V SEQUENCES AND SERIES **9 Hours**

Sequences: Definition and examples – Series: Types and Convergence – Series of positive terms – Tests of convergence: Comparison test, Integral test and D‟Alembert‟s ratio test – Alternating series – Leibnitz‟s test – Application of Sequences in real life.

TOTAL: 45 + 15 HOURS

FURTHER READING:

1. Modeling and solutions using Newton‟s Law of Cooling of Bodies
2. Differentiation of implicit Functions, Jacobians and Properties

COURSE OUTCOMES:

On the Successful completion of the course, Students will be able to

CO1: Analyze the characteristics of a linear system with Eigen value and Eigen Vectors
CO2: Recognize and solve Higher order Ordinary Differential Equations
CO3: Solve Derivative of special functions and apply it in solving Geometrical problems
CO4: Apply Partial Derivatives in finding Maxima and Minima of a function
CO5: Test the convergence of any series

REFERENCES:

1. Veerarajan R., “Engineering Mathematics”, updated second edition for semester I and II,(2017)
2. Grewal. B.S, “Higher Engineering Mathematics”, 44th Edition, Khanna Publications, Delhi, (2014).
3. Bali N. P and Manish Goyal, “Text book of Engineering Mathematics”, Sixth edition, Laxmi Publications(p) Ltd.,(2014).
4. Glyn James, “Advanced Modern Engineering Mathematics”, 3rd Edition, Pearson Education, (2012).
5. P.Kandasamy, K. Gunavathy and K. Thilagavathy, Engineering Mathematics ,Volume II, S. Chand & Co ., New Delhi, (2009)
6. Erwin Kreyszig, Advanced Engineering Mathematics,9th Edition, Wiley International edition, (2006)
7. Ramana B.V, “Higher Engineering Mathematics”,Tata McGrawHill Publishing, New Delhi, (2007).
8. M K Venkataraman, Engineering mathematics, Volume I, 2nd ed., National Publishing Co.(2003)
9. nptel.ac.in/courses/111105035, www.nptelvideos.in/2012/11/Mathematics.html
10. www.learnerstv.com/Free-maths-video lectures - ltv348-page1.htm

1701PH101	APPLIED PHYSICS FOR ENGINEERS	L	T	P	C
	(Common to all B.E. / B.Tech Degree Programmes)	3	0	0	3

COURSE OBJECTIVES:

1. To impart knowledge in properties of matter, crystallography and ultrasonics.
2. To understand the applications of lasers and fiber optics.
3. To implement the principles of quantum physics in the respective engineering fields.

UNIT I PROPERTIES OF MATTER 9 Hours

Elasticity: elastic and plastic materials – Hooke‟s law – elastic behavior of a material – stress – strain diagram – factors affecting elasticity. Three moduli of elasticity – Poisson‟s ratio – torsional pendulum – twisting couple on a cylinder. Young‟s modulus – uniform bending – non-uniform bending. Viscosity: coefficient of viscosity – streamline and turbulent flow – experimental determination of viscosity of a liquid – Poiseuille‟s method.

UNIT II APPLIED OPTICS 9 Hours

Interference: air wedge – theory – uses – testing of flat surfaces – thickness of a thin wire. Laser: introduction – principle of laser – characteristics of laser light– types: CO2 laser – semiconductor laser (homojunction). Fiber optics: principle of light transmission through fiber – expression for acceptance angle and numerical aperture – types of optical fibers (refractive index profile and modes) – fiber optic communication system (block diagram & description).

UNIT III ULTRASONICS 9 Hours

Ultrasonics: introduction – properties of ultrasonic waves – generation of ultrasonic waves – magnetostriction - piezo electric methods – detection of ultrasonic waves – Determination of velocity of ultrasonic waves (acoustic grating). Applications of ultrasonic waves: pulse echo method, SONAR – measurement of velocity of blood flow – modes of operation (A scan, B Scan & C Scan).

UNIT IV SOLID STATE PHYSICS 9 Hours

Crystal Physics: lattice – unit cell – crystal systems – Bravais lattices – Miller indices – „d‟ spacing in cubic lattice – calculation of number of atoms per unit cell, atomic radius, coordination number and determination of packing density for SC, BCC, FCC and HCP structures – X-ray diffraction: Laue‟s method – powder crystal method.

UNIT V QUANTUM MECHANICS 9 Hours

Quantum Physics: development of quantum theory – de Broglie wavelength – Schrodinger‟s wave equation – time dependent and time independent wave equations – physical significance. Application: particle in a box (1D) – degenerate and non-degenerate states. Electron Microscopy-SEM, TEM - principle and working – problem solving.

TOTAL: 45 HOURS

FURTHER READING:

Neutrino‟s – expanding universe

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

CO1: Realize the concept of properties of matter and apply the same for practical applications.
CO2: Identify the suitable laser source for fiber optic communication applications.
CO3: Determine the velocity of ultrasonic waves and apply the same for day today applications.
CO4: Classify the different types of crystal structures and analyze their properties.
CO5: Comprehend the efficacy of quantum equations in modern areas.

REFERENCES:

1. D.S.Mathur, Elements of Properties of matter, 5th edition, S.Chand & Company Ltd., New Delhi,2012.
2. Charles Kittel, Introduction to Solid State Physics, 8th edition, Wiley India Pvt. Ltd., New Delhi, 2012
3. Arthur Beiser, Shobhit Mahajan and S. Rai Choudhury, Concepts of Modern Physics, 6th edition, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2010.
4. B.K. Pandey and S. Chaturvedi, Engineering Physics, 1st edition, Cengage Learning India Pvt. Ltd., New Delhi, 2012.
5. Halliday and Resnick, Fundamentals of Physics, John Wiley and Sons, Inc, 2011.
6. Ian Morison, Introduction to Astronomy and Cosmology, John Wiley and Sons, Ltd, 2013.
7. http://nptel.ac.in/

1701EN101	TECHNICAL ENGLISH	L	T	P	C
	(Common to all B.E / B.Tech Degree Programmes)	3	0	0	3

COURSE OBJECTIVES:

1. To develop the ability to read and comprehend technical texts in the field of Engineering
2. To develop vocabulary building through the study of word construction
3. To develop ability to write formal definitions of technical terms and expression.
4. To recognize various grammatical structures that will aid the student improve his/her theoretical knowledge.

UNIT I **9 Hours**

Articles-Preposition-Subject-Verb-Object-Adjective-Adverb-Conjunction-Nouns- Usages of Have, has, had-Simple Present-Simple Past-Simple Future-Self introduction-Framing Questions

UNIT II **9 Hours**

Present Continuous-Past Continuous-Future Continuous-Describing a place, person or thing-Framing negative questions-Gerund-Listening to Articles, speeches and audios

UNIT III **9 Hours**

Present perfect-past perfect-future perfect-writing short paragraph-sentence pattern- Infinitive-Tag questions-Reading newspaper cutting

UNIT IV **9 Hours**

Present perfect continuous –Past perfect continuous-Future perfect continuous-writing an Essay in 100 words-Types of sentences-Prefix-suffix-word formation-Dialogue writing.

UNIT V **9 Hours**

Active voice-passive voice-impersonal passive voice –Synonyms and Antonyms-phrasal verbs- Punctuation-Common Errors-Letter writing.

TOTAL: 45 HOURS

FURTHER READING:

Letters from a Father to His Daughter- Jawaharlal Nehru

COURSE OUTCOMES:

On the successful completion of the course, Students will be able to

CO1: Read and comprehend technical texts in the field of Engineering

CO2: Acquire vocabulary building and write effectively in technical writing

CO3: Write formal definitions of technical terms and expression in both verbal and written form.

CO4: Understand grammatical structures and use flawless English in the professional documents

REFERENCES:

1. Meenakshi Raman, Sangeetha Sharma, "***Technical Communication : English Skills for Engineers"*** Oxford University Press: New Delhi, 2016.
2. Rizvi Ashrav.M, "***Effective Technical Communication***" Tata McGraw Hill: New Delhi, 2017
3. Herbert, A.J, "***Structure of Technical English***", London English Language Society. https://archive.org/details/in.ernet.dli.2015.136456
4. J.D. O'Connor, Better ***English Pronunciation*** Paperback, 2nd edition, 162 pages, Published September 16th 2013 by Cambridge University Press,October 23rd 1967
5. Nehru, Jawaharlal. ***Letters from a Father to His Daughter***, Puffin Books, 2004
6. ***Technical English*** by faculty of English –published by EGS Pillay press 2017

1701CH104	APPLIED CHEMISTRY (Common to B.E. – ECE & EEE Programmes)	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1. Recall the terminologies of electrochemistry and explain the function of batteries and fuel cells
2. Choose appropriate instrumentation technique for interpreting analytical data.
3. Understand the fundamentals of corrosion, its types and polymers with its applications with its electrochemical reactions

UNIT I ELECTROCHEMISTRY 9 Hours

Cell terminology-Electrochemical cells- Electrolytic cells- Cell reactions- Daniel cell-Difference between electrolytic cells and electrochemical cells. Reversible cells and irreversible cells -types- EMF series and its applications - Nernst equation (derivation and problems).Single electrode potential - Hydrogen electrode - Calomel electrode - Glass electrode - pH measurement using glass electrode.

UNIT II CORROSION AND ITS CONTROL 9 Hours

Corrosion – types-chemical, electrochemical corrosion (galvanic, differential aeration) - Factors influencing corrosion -corrosion control – material selection and design aspects - electrochemical protection – sacrificial anode method and impressed current cathodic method. Protective coatings: Electroplating of gold and electroless plating of nickel. Paints - Constituents and Functions.

UNIT III NONCONVENTIONAL ENERGY RESOURCES AND STORAGE DEVICES 9 Hours

Introduction- nuclear energy- nuclear fission, nuclear fusion- nuclear chain reactions- breeder reactor- Nuclear Reactor-solar energy conversion- solar cells- wind energy. Batteries and fuel cells: Types of batteries- alkaline battery- lead storage battery nickel- cadmium battery- lithium battery- fuel cell H2 -O2 fuel cell- applications

UNIT IV POLYMER AND ITS APPLICATION 9 Hours

Introduction: Classification of polymers – Natural and synthetic; Thermoplastic and Thermosetting. Functionality – Degree of polymerization. Addition (Free Radical Mechanism) condensation and copolymerization. Fabrication of Plastics. Application –Conducting polymer.

UNIT V INSTRUMENTAL TECHNIQUES OF CHEMICAL ANALYSIS 9 Hours

Laws of photochemistry - Grothus–Draper law, Stark–Einstein law and Lambert-Beer Law. Electromagnetic spectrum - UV-visible and IR spectroscopy – principles, instrumentation (Block diagram only) - Applications. Colorimetry- principles, instrumentation (Block diagram only) estimation of iron. Flame photometry – principles, instrumentation (Block diagram only) estimation of sodium.

TOTAL: 45 HOURS

FURTHER READING:

1. Alloys-ferrous and nonferrous alloys
2. Cambridge structural database (protein data bank)-noting data bank
3. Unique properties of nano material- introduction to quantum materials, quantum dots, supramolecular materials and molecular crystal engineering – molecular machines and devices-Logic gate using electronics material for molecular electronic.

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

CO1: Construct an electrochemical cell and measure its potential
CO2: Identify the components and processes in batteries and infer the selection criteria for commercial battery systems with respect to different applications
CO3: Utilize electrochemical data to formulate an electrochemical half-cell and cell reactions for corrosion control processes
CO4: Differentiate the polymers used in day to day life based on its source, properties and applications
CO5: Identify the applications of analytical methods for the estimation of elements in aqueous media

REFERENCES:

1. Ashima Srivastava and Janhavi N N., "Concepts of Engineering Chemistry", ACME Learning Private Limited., New Delhi, 2010.
2. Ravikrishnan A., "Engineering Chemistry", Sri Krishna Hi-tech Publishing Company Pvt. Ltd. Chennai, 2016.
3. RenuBapna and Renu Gupta., "Engineering Chemistry", Macmillan India Publisher Pvt Ltd, 2010.
4. Willard Merritt and Dean Settle, Instrumental methods of analysis, CBS publishers, Seventh edition, 2012.
5. DaraS.S, Umare S.S."Engineering Chemistry", S. Chand & Company Ltd., New Delhi., 2010.
6. https://www.ccdc.cam.ac.uk/solutions/csd-system/components/csd/
7. https://link.springer.com/chapter/10.1007/978-3-642-28030-6_2
8. www.santarosa.edu/~yataiiya/4D/QuantumDotsMk2.ppt
9. onlinelibrary.wiley.com/doi/10.1002/9780470661345.smc107/pods

10.https://en.wikipedia.org/wiki/Molecular_electronics.
11.Jain and Jain, "Engineering Chemistry", Sixteenth edition, Dhanpatrai publications, 2012.

1701GE101 BASIC ELECTRICAL AND INSTRUMENTATION ENGINEERING

L	T	P	C
3	0	0	3

(B.E. Electronics & Communication Engineering)

COURSE OBJECTIVES:

1. To acquire the basic concepts of electric circuits.
2. To understand the construction and operation of various AC & DC machines and transformer.
3. To learn the behavior of measurement systems and different sensors.

UNIT I ELECTRICAL CIRCUITS AND AC MACHINES 11 Hours

Definition of voltage, current, power & energy - Ohms law - Kirchhoff"s law & its applications simple problems - Series & parallel circuits - Generation of alternating EMF, RMS value, average value, peak factor and form factor - Construction of single phase induction motor -Types – Applications - Principle and operation of three phase induction motor – Construction – Types - Equivalent circuit - Principle of alternator - Construction details – Types - Equation of induced EMF- Voltage regulation.

UNIT II DC MACHINES AND APPLICATIONS 8 Hours

Constructional details of DC machines- Principle and operation of D.C. generator - EMF and torque equations - Characteristic of DC generators - Applications - Principle and operation of D.C. motor -Types of DC motors and their characteristics – Simple problems.

UNIT III SINGLE PHASE AND POLY-PHASE TRANSFORMERS 11 Hours

Introduction to transformers types, core, winding, insulation, induced voltage, transformer on open circuit, ideal transformer, dot convention, equivalent circuit of practical transformer, regulation and efficiency from approximate equivalent circuit - Losses in a transformer: calculation of eddy current and hysteresis losses, open circuit and short circuit tests - Parallel operation of single phase transformers - Two and three phase transformations, transformer connection for three phase circuits using three identical transformers.

UNIT IV INSTRUMENTATION SYSTEMS 9 Hours

Measurement systems and architecture, Errors in measurements, standards - Used in measurements - Charge amplifiers - Used with piezoelectric transducers - Integrating coulomb meter – DC and AC null measurements - DC voltage and current measurements - AC voltage and current measurements - Magnetic field and phase measurements - Measurement of force, torque and pressure.

UNIT V SENSORS AND APPLICATIONS 8 Hours

Survey of sensor input mechanisms - Resistive sensors - Voltage generating sensors - Sensors based on variable magnetic coupling - Variable capacitance sensors - Fiber optic sensors - Ionizing radiation sensors – Electro - Chemical Sensors – Mechano - Optical sensors.

TOTAL: 45 HOURS

FURTHER READING:

1. Magnetic Circuits, Synchronous motors, Speed control of DC motor, Autotransformer.
2. Applications of various sensors and electrical apparatus to engineering industries.

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

CO1: Understand the basic concepts of electric circuits.
CO2: Explain the working of AC & DC machines and its applications.
CO3: Describe the principles of operation of Transformers
CO4: Identify the types of measurements for instrumentation systems
CO5: Select suitable sensors used for various applications

REFERENCES:

1. B.L.Theraja, A.K.Theraja," Electrical Technology" Volume-II , S.Chand & Company Ltd 2014.
2. Robert B. Northrop "Introduction To Instrumentation And Measurements" 2nd Edition, Taylor & FrancisGroup, 2005.
3. T. K. Nagsarkar and M. S. Sukhija, Basic of Electrical Engineering, Oxford Press, 2011.
4. J. A. Edminister, Electric Circuits, Schaum's Series, 4th edition, McGraw-Hill, 2003
5. Doebelin E.O. and Manik D.N., "Measurement Systems", 6th Edition, TMH Education Pvt. Ltd., 2011.
6. Renganathan, S.," Transducer Engineering", Allied Publishers, New Delhi, 2003
7. Patranabis, D., "Sensors and Transducers", 2nd Edition, Prentice Hall of India.2010.
8. http://nptel.ac.in/

1701GEX02	ENGINEERING GRAPHICS	L	T	P	C
	(Common to all B.E. / B.Tech Degree Programmes)	2	2	0	3

COURSE OBJECTIVES:

1. To develop in students, graphic skills for communication of concepts, ideas and design of Engineering products.
2. To expose them to existing national standards related to technical drawings.

CONCEPTS AND CONVENTIONS (Not for Examination) 2 Hours

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

UNIT I PLANE CURVES AND FREE HAND SKETCHING 10 Hours

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves, Scales: Construction of Diagonal and Vernier scales.

Visualization concepts and Free Hand sketching: Visualization principles –Representation of Three Dimensional objects – Layout of views- Free hand sketching of multiple views from pictorial views of Objects

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES 10 Hours

Orthographic projection- principles-Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III PROJECTION OF SOLIDS 10 Hours

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method and auxiliary plane method.

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 10 Hours

Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones. Development of lateral surfaces of solids with cut-outs and holes.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS 10 Hours

Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions and miscellaneous problems. Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method.

COMPUTER AIDED DRAFTING (Demonstration Only) 8 Hours

Basics commands of AutoCAD- two dimensional drawing, editing, layering and dimensioning - coordinate Systems-Drawing practice - orthographic views of simple solids using AutoCAD.

FURTHER READING:

Applications of engineering graphics in students‟ discipline

TOTAL: 60 HOURS

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

CO1: Perform free hand sketching of basic geometrical constructions and multiple views of objects.
CO2: Do orthographic projection of lines and plane surfaces.
CO3: Draw projections and solids and development of surfaces.
CO4: Prepare isometric and perspective sections of simple solids.
CO5: Demonstrate computer aided drafting.

REFERENCES:

1. Gopalakrishna K.R., “Engineering Drawing” (Vol. I&II combined), Subhas Stores, Bangalore,2007.
2. Luzzader, Warren.J. and Duff,John M., “Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
3. Shah M.B., and Rana B.C., “Engineering Drawing”, Pearson, 2nd Edition, 2009.
4. Venugopal K. and Prabhu Raja V., “Engineering Graphics”, New Age International (P) Limited, 2008.
5. Natrajan K.V., “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2009.
6. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
7. Bhatt N.D. and Panchal V.M., “Engineering Drawing”, Charotar Publishing House, 50th Edition, 2010.

PUBLICATION OF BUREAU OF INDIAN STANDARDS:

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.
2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
4. IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

SPECIAL POINTS APPLICABLE TO UNIVERSITY EXAMINATIONS ON ENGINEERING GRAPHICS:

1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.

1701GEX03	PROGRAMMING IN C	L	T	P	C
	(Common to all B.E. / B.Tech Degree Programmes)	3	0	0	3

COURSE OBJECTIVES:

1. To prepare students to comprehend the fundamental concepts
2. To demonstrate fine grained operations in number system
3. To gain exposure in programming language using C
4. To develop programming skills using the fundamentals and basics of C Language

UNIT I BASIC CONCEPTS **8 Hours**

Organization and Classifications of Computer- Generations of Computers- Number System- Problem Solving Techniques – Algorithm Design– Flowchart–Pseudocode

UNIT II INTRODUCTION TO C LANGUAGE **10 Hours**

Overview of C - Constants, Variables and Data Types- Compilation and Linking - Operators and Expressions- Decision Making and Branching – Looping statements

UNIT III ARRAYS AND STRINGS **9 Hours**

Arrays-One Dimensional Array- Declaration and Initialization-Two Dimensional Array-Declaration and Initialization- Programs using Arrays- Strings- String Handling Functions, Programs using Strings- Managing I/O Operations

UNIT IV FUNCTIONS & STRUCTURES **10 Hours**

Functions-Function Prototypes-Declaring, Defining and Calling Functions-Call by value and Call by Reference-Recursive Functions-Structures- Declaration and Definition -Accessing Structure Members-Arrays of Structures-Unions- Programs using Structures and Unions

UNIT V POINTERS & FILES **8 Hours**

Pointers-Dynamic Memory Allocation-Arithmetic Operations using Pointers, Files – File Manipulation-I/O Operations, Preprocessor Directives, Storage Classes

TOTAL: 45 HOURS

FURTHER READING:

Object Oriented Programming Approach.

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

CO1: Describe basic concepts of computers
CO2: Paraphrase the operations of number system
CO3: Describe about basic concepts of C-Language
CO4: Understand the code reusability with the help of user defined functions
CO5: Analyze the structure concept, union, file management and preprocessor in C language

REFERENCES:

1. E. Balagurusamy,"Programming in ANSI C", McGraw Hill Education India Private Limited; Seventh Edition, 2017.
2. Pradip Dey, Manas Ghosh , "Computer Fundamentals and Programming in C", Second Edition, Oxford University Press, 2013.
3. Ashok N. Kamthane, "Programming in C", Pearson Education India, 3rd Edition, 2015.
4. Yashavant P. Kanetkar, "Let Us C", BPB Publications, 15th Revised and Updated Edition, 2016.
5. http://nptel.ac.in/

1701HS151	PHYSICS AND CHEMISTRY LABORATORY-I	L	T	P	C
	(Common to all B.E. / B.Tech Degree Programmes)	0	0	2	1

COURSE OBJECTIVES:

1. The Objective of this course is to make the students gain practical knowledge to co-relate with the theoretical studies
2. To achieve perfectness in experimental skills
3. To bring confidence and ability to develop and fabricate engineering and technical equipments.
4. To train the students to analyses the water sample
5. To make the student to acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis

PHYSICS

LIST OF EXPERIMENTS:

1. Determine the moment of inertia of the disc and calculate the rigidity modulus of a given wire using torsion pendulum (symmetrical masses method).
2. Find the elevation of the given wooden beam at the midpoint by loading at the ends and hence calculate the Young"s modulus of the material by uniform bending.
3. Determine the coefficient of viscosity of the given liquid by Poiseulle"s method.
4. From the interference fringes from the air wedge setup and calculate the thickness of the given wire.
5. By applying the principle of diffraction, determine the wavelength of given laser light and the average particle size of lycopodium powder using laser source.
6. Determine the
   (i) Wavelength of ultrasonic in a liquid medium
   (ii) Velocity of ultrasonic waves in the given liquid
   (iii) Compressibility of the given liquid using ultrasonic interferometer.

CHEMISTRY

LIST OF EXPERIMENTS:

1. Determination of total, temporary & permanent hardness of water by EDTA method
2. Determination of strength of given hydrochloric acid using pH meter
3. Estimation of iron content of the given solution using potentiometer
4. Estimation of sodium present in water using flame photometer
5. Corrosion experiment – weight loss method
6. Determination of molecular weight of a polymer by viscometry method
7. Conductometric titration of strong acid Vs strong Base

TOTAL: 45 HOURS

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

CO1: Realize the concept of properties of matter and apply the same for practical applications.
CO2: Identify the suitable laser source for fiber optic communication applications.
CO3: Determine the velocity of ultrasonic waves and apply the same for day today applications.
CO4: Classify the different types of crystal structures and analyze their properties.
CO5: Comprehend the efficacy of quantum equations in modern areas.
CO6: Identify the pH of the solution.
CO7: Find the iron content of the water sample using potentiometer.
CO8: Explain and demonstrate the conductance of the solution.
CO9: Interpret the hardness and metal ions present in the water.

REFERENCES:

1. D.S.Mathur, Elements of Properties of matter, 5th edition, S.Chand & Company Ltd., New Delhi,2012.
2. Charles Kittel, Introduction to Solid State Physics, 8th edition, Wiley India Pvt. Ltd., New Delhi, 2012.
3. Arthur Beiser, Shobhit Mahajan and S. Rai Choudhury, Concepts of Modern Physics, 6th edition, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2010.
4. B.K. Pandey and S. Chaturvedi, Engineering Physics, 1st edition, Cengage Learning India Pvt. Ltd., New Delhi, 2012.
5. Halliday and Resnick, Fundamentals of Physics, John Wiley and Sons, Inc, 2011.
6. Ian Morison, Introduction to Astronomy and Cosmology, John Wiley and Sons, Ltd, 2013.
7. Daniel R. Palleros, "Experimental organic chemistry" John Wiley & Sons, Inc., New Yor (2001).
8. Furniss B.S. Hannaford A.J, Smith P.W.G and Tatchel A.R., "Vogel"s Textbook of practical organic chemistry", LBS Singapore (1994).
9. Jeffery G.H., Bassett J., Mendham J.and Denny vogel"s R.C, "Text book of quantitative analysis chemical analysis", ELBS 5th Edn. Longman, Singapore publishers, Singapore, 1996.
10. Kolthoff I.M., Sandell E.B. et al. "Quantitative chemical analysis", Mcmillan, Madras 1980.

1701GEX51	PROGRAMMING IN C LABORATARY	L	T	P	C
	(Common to all B.E. / B.Tech. Degree Programmes)	0	0	2	1

COURSE OBJECTIVES:

1. To prepare students to comprehend the fundamental concepts
2. To demonstrate fine grained operations in number system
3. To gain exposure in programming language using C
4. To develop programming skills using the fundamentals and basics of C Language.

LIST OF EXPERIMENTS:

1. Working with word and style sheets
2. Write a C program to implement basic concepts
3. Write a C program to implement Decision Making and Branching statements
4. Write a C program to implement looping statements
5. Write a C program to implement Arrays
6. Write a C program to implement Strings
7. Write a C program to implement pointers
8. Write a C program to implement Structures
9. Write a C program to work with files in C

TOTAL: 30 HOURS

ADDITIONAL EXPERIMENTS:

1. Write a c program to remove the occurrence of "the" word from entered string.
2. Create two files test1.txt and test2.txt and write a C program to read the file text1.txt character by character on the screen and paste it at the end of test2.txt

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

CO1: Understand basic concepts of computers
CO2: Implement basic concepts of c-language
CO3: Implement arrays, strings and pointers.
CO4: Implement the basics of structures, unions, file management and preprocessor in C language

REFERENCES:

1. E. Balagurusamy,"Programming in ANSI C", McGraw Hill Education India Private Limited; Seventh Edition, 2017.
2. Pradip Dey, Manas Ghosh , "Computer Fundamentals and Programming in C", Second Edition, Oxford University Press, 2013.
3. Ashok N. Kamthane, "Programming in C", Pearson Education India, 3rd Edition, 2015.
4. Yashavant P. Kanetkar, "Let Us C", BPB Publications, 15th Revised and Updated Edition, 2016.
5. http://nptel.ac.in/

E.G.S. PILLAY ENGINEERING COLLEGE

(Autonomous)

Approved by AICTE, New Delhi | Affiliated to Anna University, Chennai

Accredited by NAAC with „A" Grade | Accredited by NBA (CSE, EEE, MECH)

NAGAPATTINAM – 611 002

B.E. Electronics and Communication Engineering

Full Time Curriculum and Syllabus

First Year **Second Semester**

Course	Course Name	L	T	P	C	Maximum		
						C	E	Tot
Theory Course								
1701MA20	Engineering Mathematics II	3	2	0	4	4	6	100
1701PH202	Semiconductor Physics and Devices	3	0	0	3	4	6	100
1701CH201	Environmental Studies	3	0	0	3	4	6	100
1701GE201	Basic Civil and Mechanical Engineering	3	0	0	3	4	6	100
1701EC201	Circuit Theory	3	2	0	4	4	6	100
	Language Elective	3	0	0	3	10	-	100
Laboratory Course								
1701GEX5	Communication Skills Lab	0	0	2	1	5	5	10
1701GEX5	Workshop Practice	0	0	2	1	5	5	10
1701HS251	Physics and Chemistry Laboratory - II	0	0	2	1	5	5	10

L – Lecture | T – Tutorial | P – Practical | C – Credit | CA Continuous Assessment | ES – End Semester

1701MA201	ENGINEERING MATHEMATICS II	L	T	P	C
	(Common to all B.E / B.Tech Degree Programmes)	3	2	0	4

COURSE OBJECTIVES:

1. To develop an understanding of the standard techniques of Complex variable theory to apply in areas such as heat conduction, elasticity, fluid Dynamics and flow of electric current
2. To train the students with the concepts of Vector calculus needed for problems in all Engineering Disciplines
3. To make the Students apply Laplace Transform to create a new domain in which it is easier to handle the problem that is being investigated

UNIT I ANALYTIC FUNCTIONS **9 Hours**

Analytic functions – Cauchy Riemann Equations – Properties – Determination of Analytic function using Milne Thomson‟s method, Conformal Mappings – Mappings of w= z + a, az, 1/z – Bilinear Transformation – Application of Analytic Functions.

UNIT II COMPLEX INTEGRATION **9 Hours**

Cauchy‟s fundamental theorem (statement only) – Application of Cauchy‟s Integral formula – Laurent‟s series – Classification of singularities – Cauchy‟s Residue theorem (statement only) – Contour integration.

UNIT III MULTIPLE INTEGRAL **9 Hours**

Double integration – Cartesian and polar coordinates – Change the order of Integration – Applications: Area of a curved surface using double integral – Triple integration in Cartesian co-ordinates – Volume as triple integral.

UNIT IV VECTOR CALCULUS **9 Hours**

Gradient, Divergence and Curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration: Green‟s theorem in a plane, Gauss divergence theorem and Stokes‟ theorem (excluding proofs) – Applications of the above theorems to find surface area of a closed region and volume of cube and parallel piped.

UNIT V LAPLACE TRANSFORM **9 Hours**

Laplace Transform Conditions for existence – Transform of Elementary Functions – Basic Properties Transform of Unit step function and Impulse function Transform of Periodic function – Inverse Laplace Transform Convolution Theorem (excluding Proof) – Initial and Final value Theorems – Solution of Linear ODE of Second order with constant coefficient using Laplace Transform techniques.

TOTAL: 45 + 15 HOURS

FURTHER READING:

1. Volume of Cylindrical and spherical polar co ordinates.
2. Application of Integral theorems in finding Volume/Area of Hemispheres, cylinders etc.

COURSE OUTCOMES:

On the Successful completion of the course, Students will be able to

CO1: Construct Analytic functions and trace the image of a region using transformation.
CO2: Solve complex integrals.
CO3: Apply multiple integral technique to find area and volume.
CO4: Compute surface and volume integral in vector field.
CO5: Apply Laplace Transform in solving Boundary value problems of second order ODE.

REFERENCES:

1. Veerarajan R., Engineering Mathematics , updated second edition for Semester I and II, 2017.
2. Grewal. B.S, “Higher Engineering Mathematics , 44th Edition, Khanna Publications, Delhi, 2014.
3. Bali N. P and Manish Goyal, Text book of Engineering Mathematics , Sixth edition, Laxmi Publications Pvt. Ltd., 2014.
4. Glyn James, Advanced Modern Engineering Mathematics , 3rd Edition, Pearson Education, 2012.
5. P.Kandasamy, K. Gunavathy and K. Thilagavathy, Engineering Mathematics, Volume II, S. Chand & Co., New Delhi, 2009.
6. Ramana B.V, “Higher Engineering Mathematics , Tata McGraw Hill Publishing, New Delhi, 2007.
7. Veerarajan R., Engineering Mathematics”, fifth Edition, Tata Mc Graw Hill Publishing Company, New Delhi, 2006.
8. M K Venkataraman, Engineering mathematics, Volume I, 2nd ed., National Publishing Co. 2003.
9. nptel.ac.in/courses/111105035, www.nptelvideos.in/2012/11/Mathematics.html
10. www.learnerstv.com/Free-maths-video lectures - ltv348-page1.htm

1701PH202	SEMICONDUCTOR PHYSICS AND DEVICES (Common to B.E. - ECE & EEE Programmes)	L 3	T 0	P 0	C 3

COURSE OBJECTIVES:

1. To explain the properties of conducting, semiconducting and dielectric materials
2. To understand the working mechanism of junction diodes
3. To impart knowledge in optical and magnetic materials

UNIT I QUANTUM THEORY OF SOLIDS 9 Hours

Emission of electron: types of thermionic emission – principle – Richardson equation – secondary emission principle work function – Fermi-Dirac distribution function and its temperature dependence significance of Fermi energy – density of energy states – calculation of density of electrons and Fermi energy at 0K – average energy of electrons at 0K – Problem solving.

UNIT II SEMICONDUCTOR PHYSICS 9 Hours

Intrinsic semiconductors: the law of mass action – expression for density of electrons and holes – determine of carrier concentration band gab energy. Extrinsic semiconductors: carrier concentration in p-type and n-type semiconductors. Hall Effect: theory experimental determination of Hall voltage – applications – Problem solving.

UNIT III JUNCTION DIODE CHARACTERISTICS 9 Hours

Introduction – pn junction diode – volt-ampere characteristics – diode current equation – static and dynamic resistances – space charge diffusion capacitance – junction diode switching times. Diode circuit with DC voltage source. Applications: full wave rectifier capacitor filters clamper circuits.

UNIT IV DIELECTRICS 9 Hours

Introduction: fundamental definitions in dielectrics – expressions for electronic and ionic polarizations orientation polarization (qualitative) – space charge polarization – Langevin Debye equation – frequency and temperature effects on polarization – expression for internal field (cubic structure) – Clausius – Mosotti equation dielectric loss-applications of dielectrics problem solving.

UNIT V MAGNETIC MATERIALS 9 Hours

Magnetic materials: basic definitions – properties of Dia, Para and Ferro magnetic materials – explanation of hysteresis curve based on domain theory – hard and soft magnetic materials, Ferrites , Spinels – applications. Magnetic storage device: principle working giant magneto resistance.

TOTAL: 45 HOURS

FURTHER READING:

1. Motion of an electron in uniform and non-uniform magnetic fields-electric and magnetic fields in a crossed configuration.

COURSE OUTCOMES:

On the Successful completion of the course, Students will be able to

CO1: Identify different types of emission of electrons and significance of Fermi function
CO2: Explore the carrier concentration and its variation with temperature of different semiconducting materials
CO3: Analyze the I-V characteristics of a junction diode
CO4: Investigate the various polarization mechanisms in dielectrics
CO5: Select appropriate optical and magnetic materials for data storage devices

REFERENCES:

1. Jacob Millman, Christos C Halkias and Satyabrata Jit, Electronic Devices and Circuits", McGraw Hill Education (India) Private Limited, New Delhi, 2014.
2. Willam D.Callister, Materials Science and Engineering an Introduction , John Wiley and Sons, Inc., 2010.
3. Halliday and Resnick, Fundamentals of Physics , John Wiley and Sons, Inc., 2011.
4. R.S.Sedha, "A textbook of Applied Electronics , S.Chand & Company Ltd., New Delhi, 2010.
5. S.O.Pillai, Solid State Physics , New Age International Publications, New Delhi, 2010.
6. M.N.Avadhanu and P.G.Kshirsagar, A Text Book of Engineering Physics , S.Chand & Company Ltd., New Delhi, 2011.

1701CH201	ENVIRONMENTAL STUDIES	L	T	P	C
	(Common to all B.E. / B.Tech Degree Programmes)	3	0	0	3

COURSE OBJECTIVES:

1. Realize the interdisciplinary and holistic nature of the environment.
2. Understand how natural resources and environment affect the quality of life and stimulate the quest for sustainable development.
3. Recognize the socio-economic, political and ethical issues in environmental science.

UNIT I ECOSYSTEMS AND BIODIVERSITY 10 Hours

Concept of an ecosystem structure and function of an ecosystem producers, consumers and decomposers Oxygen cycle and Nitrogen cycle energy flow in the ecosystem ecological succession processes Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) Introduction to biodiversity definition: genetic, species and ecosystem diversity value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – hot – spots of biodiversity threats to biodiversity: habitat loss, poaching of wildlife, man – wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Documentation of the medicinal plants in your native place.

UNIT II NATURAL RESOURCES 10 Hours

Forest resources: Use and over – exploitation, deforestation, case studies – timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and overutilization of surface and ground water, dams-benefits and problems Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer – pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and nonrenewable energy sources, use of alternate energy sources. Energy Conversion processes – Biogas – production and uses, anaerobic digestion; case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles. Documentation of the effect of modern Agriculture in your nearby Village.

UNIT III ENVIRONMENTAL POLLUTION 9 Hours

Definition – Source, causes, effects and control measures of: (a) Air pollution – Mitigation procedures Control of particulate and gaseous emission, Control of SO_X, NO_x, CO and HC) – Technology for capturing CO_2 (metallo- organic frame works) (b) Water pollution – Waste water treatment processes. (c) Soil pollution – soil waste management: causes, effects and control measures of municipal solid wastes – (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – role of an individual in prevention of pollution – pollution case studies. Documentation study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 8 Hours

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – environmental ethics: Issues and possible solutions – 12 Principles of green chemistry consumerism and waste products – environment protection act – Air act – Water act Wildlife protection act – Forest conservation act – The Biomedical Waste (Management and Handling) Rules; 1998 and amendments – scheme of labeling of environmentally friendly products (Ecomark) central and state pollution control boards – disaster management: floods, earthquake – Public awareness. Analyze the recent steps taken by government of India to prevent pollution (Green India and Clean India).

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 8 Hours

Population growth, variation among nations population explosion family welfare programme environment and human health – human rights – value education – HIV / AIDS – women and child welfare Environmental impact analysis (EIA) – GIS – remote sensing – role of information technology in environment and human health – Case studies. Documentation study of the Human health and the environment in nearby Hospital (Statistical report).

TOTAL: 45 HOURS

FURTHER READING:

Human rights: E waste and biomedical waste Identification of adulterants in food materials

COURSE OUTCOMES:

On the Successful completion of the course, Students will be able to

CO1: Describe the importance of ecosystem and its conservation.
CO2: Differentiate various natural resources and the urgent need to conserve the natural resources.
CO3: Explain the different types of pollution and its effects.
CO4: Describe the various environmental protection acts.
CO5: Explain the major diseases, women, child development and the impacts of population explosion.

REFERENCES:

1. Trivedi. R.K., Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards", Vol. I and II, Enviro Media, 3rd edition, BPB publications, 2010.
2. Cunningham, W.P.Cooper, T.H. Gorhani, "Environmental Encyclopedia , Jaico Publishing House, Mumbai, 2001.
3. Dharmendra S. Sengar, Environmental law , Prentice hall of India PVT LTD, New Delhi, 2007.
4. Rajagopalan. R, Environmental Studies-From Crisis to Cure , Oxford University Press, 2005.
5. Benny Joseph, Environmental Science and Engineering", Tata McGraw-Hill, New Delhi, 2006.
6. https://en.wikipedia.org/wiki/Carbon_capture_and_storage
7. Ravikrishnan. A., Environmental Science and Engineering , Sri Krishna Hi-tech Publishing Company Pvt. Ltd.

1701GE201	BASIC CIVIL AND MECHANICAL ENGINEERING (Common to B.E. / B.Tech. CSE, ECE & IT)	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1. To impart basic knowledge on Civil and Mechanical Engineering.
2. To explain the materials used for the construction of civilized structures.
3. To understand the fundamentals of construction of structure.
4. To explain the component of power plant units and detailed explanation to IC engines their working principles.
5. To explain the R & AC system.

A – CIVIL ENGINEERING

UNIT I SURVEYING AND CIVIL ENGINEERING MATERIALS 9 Hours

Surveying: Objects types classification principles.

Civil Engineering Materials: Bricks stones sand – cement concrete steel sections

UNIT II BUILDING COMPONENTS AND STRUCTURES 9 Hours

Foundations: Types, Bearing capacity Requirement of good foundations.

Superstructure: Brick masonry – stone masonry – beams – columns – lintels – roofing – flooring plastering – Mechanics Internal and external forces stress strain elasticity.

B – MECHANICAL ENGINEERING

UNIT III POWER PLANT ENGINEERING AND PUMPS 9 Hours

Introduction, Classification of Power Plants – Working principle of steam, Gas, Diesel, Hydro-electric and Nuclear Power plants – Merits and Demerits – Pumps and turbines – working principle of Reciprocating pumps (single acting and double acting) Centrifugal Pump.

UNIT IV IC ENGINES 9 Hours

Internal combustion engines as automobile power plant Working principle of Petrol and Diesel Engines Four stroke and two stroke cycles Comparison of four stroke and two stroke engines Boiler as a power plant.

UNIT V REFRIGERATION AND AIR CONDITIONING SYSTEM 9 Hours

Terminology of Refrigeration and Air Conditioning. Principle of vapour compression and absorption system Layout of typical domestic refrigerator Window and Split type room Air conditioner.

TOTAL: 45 HOURS

FURTHER READING:

1. Mechanics of solids.
2. Structural Design.
3. Thermal Engineering, Fluid mechanics, Heat and mass transfer.

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

CO1: Explain the survey and usage of construction material and proper selection of construction materials.
CO2: Know about the building structures.
CO3: Identify the components of power plant.
CO4: Demonstrate working principles of petrol and diesel engine.
CO5: Explain the components of refrigeration and air conditioning.

REFERENCES:

1. Ramamrutham S., Basic Civil Engineering , Dhanpat Rai Publishing Co. (P) Ltd., New Delhi, 1999.
2. Seetharaman S., "Basic Civil Engineering , Anuradha Agencies, 2005.
3. Venugopal K. and Prahu Raja V., Basic Mechanical Engineering , Anuradha Publishers, Kumbakonam, 2000.
4. Shantha Kumar S R J., "Basic Mechanical Engineering , Hi-tech Publications, Mayiladuthurai, 2000.
5. ,Shanmugam G and Palanichamy M S, Basic Civil and Mechanical Engineering", Tata McGraw Hill Publishing Co., New Delhi, 1996.

1701EC201	CIRCUIT THEORY	L	T	P
	(B.E. Electronics & Communication Engineering)	3	2	0

COURSE OBJECTIVES:

1. To study the basic laws on circuits and calculate the voltage and current in it using basic theorems.
2. To apply the concept of transients and resonance in series and parallel circuit.
3. To explore graph theory techniques applied to network topologies.

UNIT I BASICS OF CIRCUIT ANALYSIS 9 Hours

Basic components and electric circuits, voltage and current laws, Basic mesh and nodal analysis, source transformation techniques, Star delta transformation techniques, Phase relationship for R, L and C. Impedance, Admittance for R, L and C elements.

UNIT II NETWORK TOPOLOGIES 9 Hours

Concept of Duality, Dual network, Graphs of a network, Trees, twig, link and branches, Incidence matrix, Tie-set matrix formation and cut-set matrix formation of a graph.

UNIT III NETWORK THEOREMS AND APPLICATIONS 9 Hours

Linearity – Thevenin's theorem – Norton's theorem – Super position theorem – Maximum power transfer theorem Reciprocity theorem Compensation theorem Tellegen's theorem Millman's theorem.

UNIT IV TRANSIENTS 9 Hours

Differential equations – Laplace Transform – teady state and transient response: DC response of RL, RC and RLC circuit Sinusoidal response of RL, RC and RLC circuits.

UNIT V RESONANCE AND COUPLED CIRCUITS 9 Hours

Resonance: Natural frequency and Damping Ratio – Series Resonance – Parallel Resonance – Quality Factor. Coupled Circuits: Self – inductance – Mutual inductance, Dot conversion – Coupling Coefficient Ideal Transformer Tuned Coupled Circuits.

TOTAL: 45 + 15 HOURS

FURTHER READING:

Simulation of Circuits and Evaluation of its parameters – Basic Concepts and Definitions, Analysis of Simple Circuits, Nodal and Mesh Equations Circuit Theorems, Natural Response, Forced and Total Response in RL and RC Circuits.

COURSE OUTCOMES:

On the Successful completion of the course, Students will be able to

CO1: Evaluate the voltage, current and power for ac and dc electric circuit using basic laws.
CO2: Evaluate the voltage, current of electric circuit using Graph theory techniques.
CO3: Design simple network for the complex network by exploring circuit theorems.
CO4: Design and test the dc and ac transient circuits using test signals.
CO5: Design and test circuit for a desired cut off frequency using resonant and coupled circuits.

REFERENCES:

1. William Hayt, JV Jack, E Kemmerly and Steven M Durbin, Engineering Circuits Analysis , Tata McGraw-Hill, 2013.
2. Joseph Edminister and Mahmood Nahri, "Theory and Problems of Electric Circuits , Tata McGraw-Hill, 2008.
3. A Sudhakar, S Shyammohan and Palli, Circuits and Network (Analysis and synthesis) , Tata McGraw- Hill, 2010.
4. L Robert Boylested, Experiments in Circuit Analysis to Accompany Introductory Circuit Analysis , PHI, 2002.
5. M .Russell, Mersereau and Joel R. Jackson, "Circuit Analysis - A System Approach , Pearson Education, 2009.
6. Steven T. Karris, Circuit Analysis I with MATLAB Applications , Orchard Publications, 2004.

1701GEX52	COMMUNICATION SKILLS LAB (Common to all B.E. / B.Tech Degree Programmes)	L 0	T 0	P 2	C 1

COURSE OBJECTIVES:

This Lab focuses on using multi-media instruction for language development to meet the following targets:

1. To improve the students‟ fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts
2. Further, they would be required to communicate their ideas relevantly and coherently in writing.
3. To prepare all the students for their placements.

LIST OF EXPERIMENTS: The following course content to conduct the activities is prescribed for the Communication Skills Lab:

1. **Activities on Fundamentals of Inter-personal Communication and Building Vocabulary -** Starting a conversation - responding appropriately and relevantly - using the right body language - Role Play in different situations & Discourse Skills- using visuals - Synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, business vocabulary, analogy, idioms and phrases, collocations & usage of vocabulary.
2. **Activities on Reading Comprehension -** General Vs Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading & effective googling.
3. **Activities on Writing Skills -** Structure and presentation of different types of writing - letter writing/ Resume writing/ e-correspondence/ Technical report writing/ Portfolio writing - planning for writing - improving one's writing.
4. **Activities on Presentation Skills -** Oral presentations (individual and group) through JAM sessions / seminars / PPTs and written presentations through posters/ projects/ reports/ e-mails/ assignments etc.
5. **Activities on Group Discussion and Interview Skills -** Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation- Concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference & video-conferencing and Mock Interviews.

TOTAL: 30 HOURS

ADDITIONAL EXPERIMENTS:

Phonetics

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

CO1: Accomplishment of sound vocabulary and its proper use contextually.
CO2: Flair in Writing and felicity in written expression
CO3: Enhanced job prospects.
CO4: Effective Speaking Abilities.

REFERENCES:

1. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009
2. Advanced Communication Skills Laboratory Manual by Sudha Rani, D, Pearson Education 2011.
3. Technical Communication by Paul V. Anderson, 2007. Cengage Learning pvt. Ltd. New Delhi
4. English Vocabulary in Use series, Cambridge University Press 2008.
5. Management Shapers Series by Universities Press (India) Pvt Ltd., Himayatnagar, Hyderabad 2008.
6. English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata Mc Graw Hill 2009.
7. Books on TOFEL/ GRE/ GMAT/ CAT/ IELTS by Barron's/ DELTA/ Cambridge University Press.

1701GEX53	WORKSHOP PRACTICE	L	T	P	C
	(Common to all B.E. / B.Tech Degree Programmes)	0	0	2	1

COURSE OBJECTIVES:

1. To provide hands on training for fabrication of components using sheet metal and welding equipment / tools.
2. To develop skill for using carpentry and fitting tools to make simple components and metal joints.
3. To provide hands on training for preparing the green sand mould using foundry tools.
4. To provide training for making simple house hold electrical & pipe line connections using suitable tools.
5. To develop the skill to make / operate/utilize the simple engineering components.

LIST OF EXPERIMENTS

1. Forming of simple object in sheet metal using suitable tools (Example: Dust Pan / Soap Box) (or) making simple object using Metal Spinning Machine. (Example: Aluminum Cup). **4 Hours**
2. Prepare V (or) Half round (or) Square (or) Dovetail joint from the given mild Steel flat. **4 Hours**
3. Fabrication of a simple component using thin and thick plates. (Example: Book rack) **2 Hours**
4. Making a simple component using carpentry power tools. (Example: Electrical switch Box/Tool box/ Letter box. **2 Hours**
5. Construct a household pipe line connections using pipes, Tee joint, Four way joint, elbow, union, bend, Gate way and Taps (or) Construct a pipe connections of house application centrifugal pump using pipes, bend, gate valve, flanges and foot valve. **4 Hours**
6. Prepare a green sand mould using solid pattern/split pattern. **4 Hours**
7. Study of gas welding equipment and its demonstration **2 Hours**
8. Soldering Practice for simple printed circuit board. **4 Hours**
9. Construct a domestic electrical wire connections using indicator, one way switch with calling bell, two way switch with lamp, one way switch with fan regulator and one way switch with socket. **4 Hours**

TOTAL: 30 HOURS

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

CO1: Fabricate simple components using sheet metal & welding equipment/tools.
CO2: Make simple components / joints using carpentry and fitting tools.
CO3: Prepare green sand mould using suitable tools.
CO4: Make simple house hold electrical & pipe line connections using suitable tools.
CO5: Make / operate / utilize the simple engineering components.

1701HS251	PHYSICS AND CHEMISTRY LABORATORY-II	L	T	P	C
	(Common to all B.E. / B.Tech Degree Programmes)	0	0	2	1

COURSE OBJECTIVES:

1. The Objective of this course is to make the students gain practical knowledge to co-relate with the theoretical studies.
2. To achieve perfectness in experimental skills.
3. To bring confidence and ability to develop and fabricate engineering and technical equipments.
4. To make the student acquire practical skills in the wet chemical and instrumental methods for quantitative estimation of hardness, alkalinity, metal ion content, corrosion in metals and cement analysis.

PHYSICS

LIST OF EXPERIMENTS:

1. Using lees disc apparatus, determine the coefficient of thermal conductivity of a bad conductor.
2. Find the band gap value of the given semiconductor diode. Based on the band gap value, identify the given semiconductor.
3. With the aid of spectrometer, find the angle of Prism and refractive index of the medium.
4. Determine the wavelengths of polychromatic source in the visible region using spectrometer grating.
5. Find the depression at the midpoint of the given wooden beam subjected to non-uniform bending and determines the Young‟s modulus of the material of the beam.
6. Find the given unknown resistance using Carey-Foster‟s Bridge.

CHEMISTRY

LIST OF EXPERIMENTS:

1. Conductometric Precipitation titration of $BaCl_2$ Vs Na_2SO_4
2. Estimation of dissolved oxygen in a water sample/sewage by Winklers method.
3. Estimation of chloride content in water by argentometric method.
4. Conductometric titration of mixture of acids.
5. Comparison of alkalinities of the given water samples.

Additional Experiments:

1. Estimation of heavy metals in the given solution by EDTA method.
2. Determination of concentration of unknown colored solution using spectrophotometer.

TOTAL: 30 HOURS

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

CO1 : Realize the concept of properties of matter and apply the same for practical applications.
CO2 : Identify the suitable laser source for fiber optic communication applications.
CO3 : Determine the velocity of ultrasonic waves and apply the same for day today applications.
CO4 : Classify the different types of crystal structures and analyze their properties.
CO5 : Comprehend the efficacy of quantum equations in modern areas.
CO6 : Illustrate the EMF of the Redox reaction.
CO7 : Compare the Alkalinity of given water Sample with their standards.
CO8 : Identify the Concentration of metal ion present in water sample.
CO9 : Outline the precipitation titration using Conductivity meter.
CO10: Interpret the dissolved oxygen present in the water.

REFERENCES:

1. D.S.Mathur, Elements of Properties of matter, 5th edition, S.Chand & Company Ltd., New Delhi,2012.
2. Charles Kittel, Introduction to Solid State Physics, 8th edition, Wiley India Pvt. Ltd., New Delhi, 2012.
3. Arthur Beiser, Shobhit Mahajan and S. Rai Choudhury, Concepts of Modern Physics, 6th edition, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2010.
4. B.K. Pandey and S. Chaturvedi, Engineering Physics, 1st edition, Cengage Learning India Pvt. Ltd., New Delhi, 2012.
5. Halliday and Resnick, Fundamentals of Physics, John Wiley and Sons, Inc, 2011.
6. Ian Morison, Introduction to Astronomy and Cosmology, John Wiley and Sons, Ltd, 2013.
7. Laboratory Manual on Engineering Chemistry, S.K. Bhasin, S. Rani, Dhanpat Rai Publishing Company, New Delhi, 2011.
8. Daniel R. Palleros, “Experimental organic chemistry” John Wiley & Sons, Inc., New Yor (2001).
9. Furniss B.S. Hannaford A.J, Smith P.W.G and Tatchel A.R., “Vogel‟s Textbook of practical organic chemistry”, LBS Singapore (1994).
10. Jeffery G.H., Bassett J., Mendham J.and Denny vogel‟s R.C, “Text book of quantitative analysis chemical analysis”, ELBS 5th Edn. Longman, Singapore publishers, Singapore, 1996.
11. Kolthoff I.M., Sandell E.B. et al. “Quantitative chemical analysis”, Mcmillan, Madras 1980.

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NAGAPATTINAM–611002

B.E.Electronics and CommunicationEngineering

Full Time Curriculum and Syllabus

Second Year– Third Semester

Course Code	Course Name	L	T	P	C	Maximum Marks		
						CA	ES	Total
Theory Course								
1701MA301	Linear Algebra and Partial Differential Equations	3	2	0	4	40	60	100
1702CS304	Data Structures and C++	3	0	0	3	40	60	100
1702EC301	Network Analysis and Synthesis	3	2	0	4	40	60	100
1702EC302	Engineering Electromagnetics	3	0	0	3	40	60	100
1702EC303	Digital Circuits and Systems	3	0	0	3	40	60	100
1702EC304	Electronics Circuits	3	0	0	3	40	60	100
Laboratory Course								
1702EC351	Digital Electronics Laboratory	0	0	4	2	50	50	100
1702EC352	Electronic Circuits Laboratory	0	0	4	2	50	50	100
1702CS351	Data Structures Laboratory	0	0	2	1	50	50	100
1704GE351	Life Skills: Business English	0	0	2	-	100	-	100
	Total	**18**	**4**	**8**	**25**	**500**	**500**	**1000**

L–Lecture |T–Tutorial |P–Practical |C–Credit |CA –Continuous Assessment | ES–End Semester

1701MA301	ENGINEERING MATHEMATICS III	L	T	P	C
		3	2	0	4
	(Common to B.E / B.Tech-All branches)				

Course Objectives:

1. To introduce Fourier series analysis and applications in Engineering, apart from its use in solving boundary value problems.
2. To acquaint the student with Fourier transform techniques used in wide variety of situations.
3. To introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes and to develop Z transform techniques for discrete time systems.

Unit I	PARTIAL DIFFERENTIAL EQUATIONS	9+3Hours

Formation of partial differential equations – Singular integrals — Solutions of standard types of first order partial differential equations – Lagrange's linear equation — Linear partial differential equations of second order with constant coefficients of homogeneous type.

Unit II	FOURIER SERIES	9+3 Hours

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Parseval's identity – Harmonic analysis.

Unit III	APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS	9+3 Hours

Classification of PDE – Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two dimensional equation of heat conduction.

Unit IV	FOURIER TRANSFORMS	9+3 Hours

Statement of Fourier integral theorem – Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity

Unit V	Z – TRANSFORMS AND DIFFERENCE EQUATIONS	9+3 Hours

Z - transforms – Elementary properties – Inverse Z – transform (using partial fraction and residues) – Convolution theorem – Formation of difference equations – Solution of difference equations using Z – transform.

Total:	45 + 15 Hours

Further Reading:

1. Linear partial differential equations of higher order
2. Solution of non-homogeneous partial differential equations

Course Outcomes:

After completion of the course, Student will be able to

1. Compute the solution of partial differential equations (K2)
2. Use Fourier series analysis which is central to many applications in engineering (K2)
3. Solve boundary value problem using partial differential equation.(K3)
4. Apply Fourier transform techniques used in wide variety of situations.(K3)
5. Apply Z transform techniques for discrete time systems. (K3)

References:

1. Veerarajan. T., "Transforms and Partial Differential Equations", Second reprint, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2012.
2. Grewal. B.S., "Higher Engineering Mathematics", 42nd Edition, Khanna Publishers, Delhi, 2012.
3. Narayanan.S., ManicavachagomPillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students" Vol. II & III, S.Viswanathan Publishers Pvt Ltd. 1998.
4. Bali.N.P and Manish Goyal, "A Textbook of Engineering Mathematics", 7th Edition, Laxmi Publications Pvt Ltd , 2007.
5. Ramana.B.V., "Higher Engineering Mathematics", Tata Mc-GrawHill Publishing Company Limited, New Delhi, 2008.
6. Glyn James, "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education, 2007.
7. Erwin Kreyszig, "Advanced Engineering Mathematics", 8th Edition, Wiley India, 2007.
8. Ray Wylie. C and Barrett.L.C, "Advanced Engineering Mathematics" Tata Mc Graw Hill Education Pvt Ltd, Sixth Edition, New Delhi, 2012.
9. nptel.ac.in/courses/111105035, www.nptelvideos.in/2012/11/Mathematics.html
10. www.learnerstv.com/Free-maths-video lectures - ltv348-page1.html

1702CS304	Data Structures and C++	L	T	P	C
		3	0	0	3
	(Common to B.E / B.Tech-All branches)				

Course Objectives:

1. To comprehend the fundamentals of object oriented programming, particularly in C++.
2. To use object oriented programming to implement data structures.
3. To introduce linear, non-linear data structures and their applications.

Unit I **DATA ABSTRACTION & OVERLOADING** **9Hours**

Overview of C++ – Structures – Class Scope and Accessing Class Members – Reference Variables – Initialization – Constructors – Destructors – Member Functions and Classes – Friend Function – Dynamic Memory Allocation – Static Class Members – Container Classes and Integrators – Proxy Classes – Overloading: Function overloading and Operator Overloading.

Unit II **INHERITANCE & POLYMORPHISM** **9Hours**

Base Classes and Derived Classes – Protected Members – Casting Class pointers and Member Functions – Overriding – Public, Protected and Private Inheritance – Constructors and Destructors in derived Classes – Implicit Derived – Class Object To Base – Class Object Conversion – Composition Vs. Inheritance – Virtual functions – This Pointer – Abstract Base Classes and Concrete Classes – Virtual Destructors – Dynamic Binding.

Unit III **LINEAR DATA STRUCTURES** **9 Hours**

Abstract Data Types (ADTs) – List ADT – array-based implementation – linked list implementation — singly linked lists –Polynomial Manipulation - Stack ADT – Queue ADT - Evaluating arithmetic expressions

Unit IV **NON-LINEAR DATA STRUCTURES** **9 Hours**

Trees – Binary Tree-Binary search trees -Tree traversal -Expression manipulation -Symbol table construction - AVL trees: Rotation, Insertion, Deletion,–Red black tree – Graph and its representations – Graph Traversals – Representation of Graphs – Breadth-first search – Depth-first search - Connected components.

Unit V **SORTING and SEARCHING** **9 Hours**

Sorting Techniques-Selection, Bubble, Insertion, Merge, Heap, Quick, and Radix sort -Address calculation - Linear search -Binary search -Hash table methods.

Total: **45 Hours**

Further Reading:

- B-Trees, Splay trees
- Floyd - Warshall algorithm.

Course Outcomes:

After completion of the course, Student will be able to

1. **Identify the model of Abstract Data Type, calculation of algorithm efficiency and designing ofrecursive algorithms.**
2. Design algorithms to solve real life problems using data structures.
3. Analyze various sorting and searching algorithms.
4. Recognize the usage of Non-Linear Data structures such as Binary Search tree, AVL search treeand Heap tree in applications.
5. Solve real life problems using minimum spanning tree and shortest path algorithms.

References:

1. Deitel and Deitel, “C++, How To Program”, Seventh Edition, Pearson Education, 2013.
2. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C++”, Fourth Edition, Addison-Wesley, 2013.
3. Bhushan Trivedi, “Programming with ANSI C++, A Step-By-Step approach”, Oxford University Press, 2010.
4. Goodrich, Michael T., Roberto Tamassia, David Mount, “Data Structures and Algorithms in C++”, 7th Edition, Wiley. 2016.
5. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", Third Edition, Mc Graw Hill, 2009.
6. Bjarne Stroustrup, “The C++ Programming Language”, 3rd Edition, Pearson Education, 2007.
7. Ellis Horowitz, Sartaj Sahni and Dinesh Mehta, “Fundamentals of Data Structures in C++”, Galgotia Publications, 2007.

1702EC301		Network Analysis and Synthesis	L	T	P	C
			3	1	0	4

Course Objectives:

1: Apply the knowledge of basic circuital law and simplify the network using reduction techniques

2: Analyze the circuit using Kirchhoff's law and Network simplification theorems

3: Infer and evaluate transient response, Steady state response, network functions

4: Obtain the maximum power transfer to the load , and Analyze the series resonant and parallel resonant circuit

5: Evaluate two-port network parameters , design attenuators and equalizer

Unit I	INTRODUCTION TO GRAPH THEORY	9+3 Hours

Linear Graphs in Electrical Networks, Basic Definitions, Incidence, Loop and cut-set matrices, Fundamental Loop and Fundamental Cut-Set Matrices, Graph Theoretic version of KCL and KVL, Loop Impedance and Node Admittance Matrices, Duality in Electrical Networks

Unit II	TWO PORT NETWORK	9+3 Hours

Network functions - Poles and Zeros of network functions - Complex frequency - Two port parameters Z,Y,H and ABCD - Scaling network functions -T and π equivalent circuits - Bridged networks - Analysis of ladder and lattice networks - Coupled circuits as two port network - Tuned circuits

Unit III	TRANSIENT RESPONSE OF RLC CIRCUITS	9+3 Hours

Transient response of RL,RC,RLC, circuit for DC input and AC input with sinusoidal excitation.

Unit IV	TRANSFER FUNCTION SYNTHESIS	9+3 Hours

Properties of LC,RL,RC driving point functions, Synthesis of driving point LC,RC and RL functions - Foster and Cauer forms- Synthesis of transfer admittance, transfer impedance with a one ohm termination - Synthesis of constant-resistance network.

Unit V	DESIGN OF FILTER	9+3 Hours

Design of filters -Low pass filters, high pass filters, band pass filters, band reject filters, Butterworth filters, m-derived filters, constant k-filters

	Total:	45+15 Hours

Further Reading:

Interrelationships between the parameters, Lattice networks - Image parameters, Stability of active networks, Simulation of general and ladder network , Simulation of RL, RC, LC network , Simulation offilters design, Simulation of Attenuators & Equalizers.

Course Outcomes:

After completion of the course, Student will be able to

1. Analyze the electric circuit using network theorems
2. Understand and Obtain Transient & Forced response
3. Determine Sinusoidal steady state response; understand the real time applications of maximum power transfer theorem and equalizer
4. Understand the two–port network parameters, are able to find out two-port network parameters &DC response for interconnection of two-port networks and RLC circuits.
5. Synthesize of Initial and final value theorem, Heaviside's expansion theorem.

References:

1. Franklin F.Kuo, "Network Analysis and Synthesis (5th Edition ,2012)" Wiley International;2010

2. Andreas Antoniou," Digital filters (Analysis, Design and Application)", McGraw-Hill; 2nd edition (May 15, 2000)

3. M.E.Van Valkenberg, "Introduction to Modern Network Synthesis", Wiley Eastern.

4. Umesh Sinha "Network Analysis and Synthesis"Satya Prakashan Publishers , 4th Edition 2013

5. David A Bell,"Electric Circuits Oxford Press, ", (7thEdition, 2011).

1702EC302	ENGINEERING ELECTROMAGNETICS	L	T	P	C
		3	0	0	3

Course Objectives:

1. To impart knowledgeonthebasicsofstaticelectricandmagneticfieldandtheassociated laws.
2. To give insight into the propagation of EM waves and also to introduce the methods in computational electromagnetic.
3. To analyze the time varying fields.

Unit I	STATIC ELECTRIC FIELDS	9 Hours

Co-ordinate system – Rectangular – Cylindrical and spherical co-ordinate system – Line – Surface and volume integrals – Definition of curl – Divergence and gradient – Meaning of stokes theorem and divergence theorem – Coulomb's law in vector form – Definition of electric field intensity – Principle of superposition – Electric field due to discrete charges – Electric field due to continuous charge distribution – Electric field due to charges distributed uniformly on an infinite and finite line – Electric field on the axis of a uniformly charged circular disc – Electric field due to an infinite uniformly charged sheet – Electric scalar potential – Relationship between potential and electric field – Potential due to infinite uniformly charged line – Potential due to electrical dipole – Electric flux Density – Gauss law – Proof of gauss law – Applications.

UNIT II	STATIC MAGNETIC FIELDS	9 Hours

The biot-savart law in vector form – Magnetic field intensity due to a finite and infinite wire carrying a current I – Magnetic field intensity on the axis of a circular and rectangular loop carrying a current I – Ampere's circuital law and simple applications – Magnetic flux density – The Lorentz force equation for a moving charge and applications – Force on a wire carrying a current I placed in a magnetic field – Torque on a loop carrying a current I – Magnetic moment – Magnetic vector potential.

UNIT III	ELECTRIC AND MAGNETIC FIELDS IN MATERIALS	9 Hours

Poisson's and Laplace's equation – Electric polarization – Nature of dielectric materials – Definition of capacitance – Capacitance of various geometries using Laplace's equation – Electrostatic energy and energy density – Boundary conditions for electric fields – Electric current – Current density – Point form of ohm's law – Continuity equation for current – Definition of inductance – Inductance of loops and solenoids – Definition of mutual inductance – Simple examples – Energy density in magnetic fields.

UNIT IV	TIME VARYING ELECTRIC AND MAGNETIC FIELDS	9 Hours

Faraday's law – Maxwell's second equation in integral form from faraday's law – Equation expressed in point form – Displacement current – Ampere's circuital law in integral form – Modified form of ampere's circuital law as Maxwell's first equation in integral form – Equation expressed in point form – Maxwell's four equations in integral form and differential form – Pointing vector and the flow of power – Power flow in a co-axial cable – Instantaneous average and complex pointing vector.

UNIT V	ELECTROMAGNETIC WAVES	9 Hours

Derivation of wave equation – Uniform plane waves – Maxwell's equation in phasor form – Wave equation in phasor form – Plane waves in free space and in a homogenous material – Wave equation for a conducting medium – Plane waves in lossy dielectrics – Propagation in good conductors – Skin effect – Linear elliptical and circular polarization – Reflection of plane wave from a conductor – Normal incidence – Reflection of plane Waves by a perfect dielectric – Normal and oblique incidence – Dependence on polarization – Brewster angle.

Total:	45 Hours

Further Reading:

Vector analysis - Vector Calculus -Principle of Superposition theorem-Nature of magnetic materials – Magnetization and permeability – Magnetic boundary conditions.

Course Outcomes:

After completion of the course, Student will be able to

1. Explain the fundamentals of electromagnetic.
2. Analyze field potentials due to static changes and static magnetic fields.
3. Explain how materials affect electric and magnetic fields.
4. Analyze the relation between the fields under time varying situations.
5. Discuss the principles of propagation of uniform plane waves.

References:

1. Hayt, W H. and Buck, J. A., "Engineering Electromagnetics", 7th Edition, TMH,2007.

2. Jordan, E. C, and Balmain, K. G., "Electromagnetic Waves and Radiating Systems", 4th Edition, Pearson Education/PHI, 2006.
3.Mathew N. O. Sadiku, "Elements of Engineering Electromagnetics", 4th Edition, Oxford University Press, 2007.
4.Narayana Rao, N., "Elements of Engineering Electromagnetics", 6th Edition, Pearson Education, 2006.
5.Ramo, Whinnery and Van Duzer., "Fields and Waves in Communication Electronics", 3rd Edition, John Wiley and Sons, 2003.

1702EC303		DIGITAL CIRCUITS AND SYSTEMS	L	T	P	C
			3	0	0	3
Course Objectives:						
	1.To train the students in basics of digital functions					
	2.To impart the students in the designing ability of combinational and sequential circuits					
	3.To educate the students about different types of memory and programmable devices					
	4.To teach the students about software skill in VHDL/Verilog HDL					

Unit I	**BOOLEAN ALGEBRA AND LOGIC GATES**	**9 Hours**

Boolean Algebra: Number systems - Boolean postulates and laws – De-Morgan"s Theorem - Principle of Duality - Boolean expression - Minimization of Boolean expressions — Minterm – Maxterm - Sum of Products (SOP) – Product of Sums (POS) – Karnaugh map Minimization – Quine - Mc Cluskey method of minimization.

Logic Gates: AND, OR, NOT, NAND, NOR, Exclusive–OR and Exclusive–NOR Implementations of Logic Functions using gates, NAND–NOR implementations – Multi level gate implementations - Multi output gate implementations. TTL and CMOS Logic and their characteristics – Tristate gates

Unit II	**COMBINATIONAL LOGICS**	**9 Hours**

Introduction - Design procedure – Half adder – Full Adder – Half subtractor – Full subtractor – Parallel binary adder, parallel binary Subtractor – Fast Adder - Carry Look Ahead adder – Serial Adder/Subtractor - BCD adder – Binary Multiplier – Binary Divider - Multiplexer/ Demultiplexer – decoder - encoder – parity generators - parity checker – code converters - Magnitude Comparator

Unit III	**SYNCHRONOUS SEQUENTIAL LOGICS**	**9 Hours**

Latches, Flip-flops - SR, JK, D, T, and Master-Slave – Characteristic table and equation –Application table – Edge triggering – Level Triggering – Realization of one flip flop using other flip flops – serial adder/subtractor- Synchronous counters – Synchronous Up/Down counters – Programmable counters – Design of Synchronous counters: state diagram- State table –State minimization –State assignment - Excitation table and maps-Circuit implementation - Modulo–n counter, Registers – shift registers - Universal shift registers

Unit IV	**ASYNCHRONOUS SEQUENTIAL LOGICS**	**9 Hours**

Design of fundamental mode and pulse mode circuits – Asynchronous Ripple or serial counter – Asynchronous Up/Down counter - State Machines – Problems in Asynchronous Circuits – Static and Dynamic Hazards - Design of Hazard Free Switching circuits

Unit V	**PROGRAMMABLE LOGIC DEVICES AND HDL PROGRAMMING**	**9 Hours**

Programmable Logic Devices: Classification of memories – ROM - ROM organization - PROM – EPROM – EEPROM –EAPROM, RAM –Programmable Logic Devices – Programmable Logic Array (PLA) - Programmable Array Logic (PAL) – Field Programmable Gate Arrays (FPGA) - Implementation of combinational logic circuits using ROM, PLA, PAL

Verilog HDL Programming: Introduction **–** Data flow model – behavioral model – structural model – HDL programs for combinational logic – HDL program for sequential logic

	Total:	**45 Hours**

Further Reading:	
	1. Design of seven segment display using basic logic gates

Course Outcomes:	
	After completion of the course, Student will be able to
	1. Use different methods which are used to simplify the Boolean functions
	2. Demonstrate different types of combinational circuits to satisfy the user requirements
	3. Implement various synchronous sequential circuits

	4. Practice several types of asynchronous counters
	5. Explain the basics of memory and programmable logic devices
	6. Discuss the HDL Program for combinational and sequential circuits

References:

1. Ronald J. Tocci, Neal S. Widmer & Gregory L. Moss, "Digital Systems: Principles and Applications", 10th Edition, Pearson Prentice Hall, 2007
2. M. Morris Mano, "Digital Design", 4th Edition, Prentice Hall of India Pvt. Ltd., 2008 / Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2003
3. Joseph Cavanagh, "Verilog HDL: Digital Design and Modeling", Taylor & Francis, 2007
4. John F.Wakerly, "Digital Design", Fourth Edition, Pearson/PHI, 2008
5. John.M Yarbrough, "Digital Logic Applications and Design", Thomson Learning, 2006
6. Charles H.Roth. "Fundamentals of Logic Design", 6th Edition, Thomson Learning, 2013
7. Donald P.Leach and Albert Paul Malvino, "Digital Principles and Applications", 6th Edition, TMH, 2006
8. Thomas L. Floyd, "Digital Fundamentals", 10th Edition, Pearson Education Inc, 2011
9. Donald D.Givone, "Digital Principles and Design", TMH, 2003
10. Ronald J. Tocci, Neal S. Widmer & Gregory L. Moss, "Digital Systems: Principles and Applications", 10th Edition, Pearson Prentice Hall, 2007

1702EC304		ELECTRONIC CIRCUITS	L	T	P	C
			3	0	0	3

Course Objectives:

1. To familiar with the theory, construction, and operation of Basic electronic devices.
2. To Learn about biasing of BJTs and MOSFETs
3. To Study high frequency response of all amplifiers
4. To understand the analysis and design of Feedback amplifiers, LC and RC oscillators, amplifiers, multivibrators, and time base generators.

Unit I	ELECTRONIC DEVICES	9 Hours

BJT:NPN-PNP-Current Equations-Input and Output characteristics of CE,CB,CC-Hybrid π Model- h parameter model-FET: JFETs – Characteristics-MOSFET- Characteristics – D –MOSFET- E-MOSFET- MESFET- Schottky Barrier Diode – Varactor Diode –Zener Diode – Tunnel Diode – Gunn Diode - LDR- UJT-SCR-LED-LCD- Optocoupler- Solar Cell

Unit II	TRANSISTOR BIASING AND SMALL SIGNAL LOW FREQUENCY MODEL	9 Hours

DC Load line, operating point, Various biasing methods for BJT-Design-Stability-Bias compensation, Thermal stability, Design of biasing for JFET, Design of biasing for MOSFET-BJT: Analysis of transistor amplifier CE,CC&CB Configuration using h parameters, Simplified HybridModel for CB, CE & CC configurations, Comparison of transistor amplifier configurations, Darlington Pair. FET: Voltage Gain, Small Signal Equivalent Circuit model, Transconductance, T Equivalent Circuit Model

Unit III	HIGH FREQUENCY MODELS	9 Hours

BJT: Behaviour of Transistor at High Frequency, The High Frequency T Model, The Hybrid pi Common Emitter Transistor Model, - CB & CE Short Circuit Current Frequency response, Frequency Response of the CE Amplifier. FET: The Gate Capacitive effect, High Frequency MOSFET Model, Unity Gain Frequency, Frequency Response of CS Amplifier.

Unit IV	FEEDBACK AMPLIFIERS AND OSCILLATORS	9 Hours

Feedback amplifiers - Current Series, Voltage Shunt, Current shunt and Voltage Series-Classification, Barkhausen Criterion - Mechanism for start of oscillation and stabilization of amplitude, General form of an Oscillator. Analysis of LC oscillators - Hartley, Colpitts, Clapp, Franklin, Armstrong, Tuned collector oscillators, RC oscillators - phase shift – Wienbridge - Twin-T Oscillators, Quartz Crystal Construction

Unit V	TUNED AMPLIFIERS AND WAVE SHAPING CIRCUITS	9 Hours

Coil losses, unloaded and loaded Q of tank circuits, small signal tuned amplifiers - Analysis of capacitor coupled single tuned amplifier – double tuned amplifier-Stagger tuned amplifiers – large signal tuned amplifiers – Class C tuned amplifier – Efficiency and applications of Class C tuned amplifier-RC & RL Integrator and Differentiator circuits-Diode clippers, Diode comparator – Clampers-Collector coupled and Emitter coupled Astable multivibrator – Monostable multivibrator – Bistable multivibrators - Schmitt trigger circuit.	
Total:	**45 Hours**
Further Reading:	
1.UJT saw tooth waveform generator 2. Blocking Oscillator 3.Time base circuits	
Course Outcomes:	
After completion of the course, Student will be able to	
1. Explain the theory, construction, and operation of basic electronic devices.	
2. Analyze parametric values for different biasing methods of BJT and FET.	
3. Analyze the behaviour of Bipolar Junction Transistors and Field Effect Transistors at different frequency conditions.	
4. Design and analyze feedback amplifiers and oscillators.	
5. Design of tuned amplifiers and Multivibrators	
References:	
1. Jacob Millman, C. Halkias and Satyabrata Jit Electronic Devices and Circuits, 3rd Edition, Tata McGraw-Hill, 2011	
2. David A. Bell, “Electronic Devices and Circuits”, Fifth Edition, Oxford University Press, 2008.	
3. Donald A Neaman, “Semiconductor Physics and Devices”, Third Edition, Tata Mc GrawHill Inc. 2007.	
4. Donald .A. Neamen, Electronic Circuit Analysis and Design –2nd Edition,Tata Mc Graw	
5. Hill, 2009.	
6. Adel .S. Sedra, Kenneth C. Smith, “Micro Electronic Circuits”, 6th Edition, Oxford University Press, 2010	
7. Robert L. Boylestad and Louis Nasheresky, “Electronic Devices and Circuit Theory”, 10th Edition, Pearson Education / PHI, 2008	
8. Jacob Millman, C. Halkias and Satyabrata Jit Electronic Devices and Circuits, 3rd Edition, Tata McGraw-Hill, 2011	

1702EC351	**DIGITAL ELECTRONICS LABORATORY**	**L**	**T**	**P**	**C**
		0	**0**	**4**	**2**
	(Common to B.E / B.Tech – CSE, IT & ECE)				
Course Objectives:					
1. To impart the students in the designing ability of combinational and sequential circuits					
2. To educate the students in the designing ability of synchronous and asynchronous sequential circuits To educate the students about different types of memory and programmable devices					
3. To teach the students about software skill in VHDL/Verilog HDL					
List of Experiments:					
1. Verification of Boolean Theorems using basic gates					
2. Design and implementation of code converters using logic gates					
3. Design and implementation of 4 bit binary Adder/ Subtractor and BCD adder					
4. Design and implementation of Multiplexer and De-multiplexer using logic gates					
5. Design and implementation of encoder and decoder using logic gates					
6. Design and implementation of parity generator and checker					
7. Design and implementation of Magnitude Comparator					
8. Construction and verification of 4 bit ripple counter and Mod-10 / Mod-12 Ripple counters					
9. Design and implementation of 3-bit synchronous up/down counter					
10. Implementation of SISO, SIPO, PISO and PIPO shift registers using Flip- flops					
11. Design of combinational circuits using HDL					
12. Design of sequential circuits using HDL					

					Total:	**45 Hours**
Additional Experiments:						
	1. Design and Implementation of seven segment display using basic logic gates					
	2. One mini project using logic gates					
Course Outcomes:						
	After completion of the course, Student will be able to					
	1. Demonstrate different types of combinational circuits to satisfy the user requirements					
	2. Implement various synchronous sequential circuits					
	3. Design several types of asynchronous counters					
	4. Write the HDL Program for combinational circuits					
	5. Write the HDL Program for sequential circuits					
References:						
1. Ronald J. Tocci, Neal S. Widmer & Gregory L. Moss, "Digital Systems: Principles and Applications", 10th Edition, Pearson Prentice Hall, 2007						
2. M. Morris Mano, "Digital Design", 4th Edition, Prentice Hall of India Pvt. Ltd., 2008 / Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2003						
3. Joseph Cavanagh, "Verilog HDL: Digital Design and Modeling", Taylor & Francis, 2007						
4. John F.Wakerly, "Digital Design", Fourth Edition, Pearson/PHI, 2008						
5. John.M Yarbrough, "Digital Logic Applications and Design", Thomson Learning, 2006						
6. Charles H.Roth. "Fundamentals of Logic Design", 6th Edition, Thomson Learning, 2013						
7. Donald P.Leach and Albert Paul Malvino, "Digital Principles and Applications", 6th Edition, TMH, 2006						
8. Thomas L. Floyd, "Digital Fundamentals", 10th Edition, Pearson Education Inc, 2011						
9. Donald D.Givone, "Digital Principles and Design", TMH, 2003						

1702EC352		**ELECTRONICS CIRCUITS LABORATORY**	**L**	**T**	**P**	**C**
			0	**0**	**4**	**2**
		(Common to B.E / B.Tech – CSE, IT & ECE)				
Course Objectives:						
	1. To Be exposed to the characteristics of basic electronic devices					
	2. To Study the characteristic of CE,CB and CS Amplifier					
	3. To gain hands on experience in designing electronic circuits.					
	4. To learn simulation software used in circuit design.					
List of Experiments:						
1. Characteristics of PN Junction diode and Zener Diode, FET,SCR						
2. Input and Output Characteristics of CE/CB Configuration						
3. Design and analysis of CE/CB/CS, Darlington Amplifier						
4. Design of Series and Shunt feedback amplifiers-Frequency response, Input and output impedance calculation.						
5. Design of RC Phase shift oscillator and Wien Bridge Oscillator						
6. Design of Hartley Oscillator and Colpitts Oscillator						
7. Design of Single Tuned Amplifier						
8. Design of Clipper, Clamper,RC Integrator, Differentiator and Multivibrator circuits						
9. Simulation of CE,CS amplifiers, Twin-T Oscillator and Wein Bridge Oscillator						
10. Simulation of Double and Stagger tuned Amplifier						
11. Simulation of Monostable Multivibrator						
Additional Experiments:						
	1. Design of Power inverter.					
	2. Design of Function Generator					
Course Outcomes:						
	After completion of the course, Student will be able to					
	1. Able to Learn the characteristicsand frequency response of basic electronic devices					
	2. Able to Analyze various types of feedback amplifiers					
	3. Able to Design oscillators, tuned amplifiers, wave-shaping circuits and multivibrators.					
	4. Able to Simulate amplifiers and oscillators using Spice					

References:	
1.	Donald A Neaman, "Semiconductor Physics and Devices", Third Edition, Tata Mc GrawHill Inc. 2007.
2.	Donald .A. Neamen, Electronic Circuit Analysis and Design –2nd Edition,Tata Mc Graw Hill, 2009.
3.	Adel .S. Sedra, Kenneth C. Smith, "Micro Electronic Circuits", 6th Edition, Oxford University Press, 2010
4.	Jacob Millman, C. Halkias and Satyabrata Jit Electronic Devices and Circuits, 3rd Edition, Tata McGraw-Hill, 2011

1702CS351		**DATA STRUCTURES LABORATORY**	**L**	**T**	**P**	**C**
			0	**0**	**4**	**2**

Course Objectives:

1. Learn C++ programming language.
2. Be exposed to the different data structures
3. Be familiar with applications using different data structures

List of Experiments:

1. Basic Programs for C++ Concepts
2. Array implementation of List Abstract Data Type (ADT)
3. Linked list implementation of List ADT
4. Cursor implementation of List ADT
5. Stack ADT - Array and linked list implementations
6. The next two exercises are to be done by implementing the following source files
   - i. Program source files for Stack Application 1
   - ii. Array implementation of Stack ADT
   - iii. Linked list implementation of Stack ADT
   - iv. Program source files for Stack Application 2
   - v. An appropriate header file for the Stack ADT should be included in (i) and (iv)
7. Implement any Stack Application using array implementation of Stack ADT (by implementing files (i) and (ii) given above) and then using linked list
8. Implementation of Stack ADT (by using files (i) and implementing file (iii))
9. Implement another Stack Application using array and linked list implementations of Stack ADT (by implementing files (iv) and using file (ii), and then by using files (iii) and (iv)
10. Queue ADT – Array and linked list implementations
11. Search Tree ADT - Binary Search Tree
12. Implement an interesting application as separate source files and using any of the searchable ADT files developed earlier. Replace the ADT file alone with other appropriate ADT files. Compare the performance.

Total: 45 Hours

Additional Experiments:

1. Hash table implementation
2. Graph traversals

Course Outcomes:

After completion of the course, Student will be able to

1. After completion of the course, Student will be able to
2. **2.** Identify the model of Abstract Data Type, calculation of algorithm efficiency and designing of recursive algorithms.
3. Design algorithms to solve real life problems using data structures.
4. Analyze various sorting and searching algorithms.
5. Recognize the usage of Non-Linear Data structures such as Binary Search tree, AVL search tree and Heap tree in applications.

References:

1. F.RichardGilberg, A.Behrouz. Forouzan, Data Structures, A Pseudocode Approach with C. Thomson, 2007.
2. M. A. Weiss, Data Structures and Algorithm Analysis in C, Pearson Education, 2009.
3. Y.Langsam, M. J.Augenstein and A. M.Tenenbaum, Data Structures using C, Pearson Education,2004.
4. A. M.AhoHopcroft and J.D. Ullman, Data Structures and Algorithms, Pearson education, 2000.

1704GE351		LIFE SKILLS: VERBAL ABILITY	L	T	P	C
			0	0	2	-

Course Objectives:	
	1. To develop the students basic soft skills and enable them to get a job.
	2. To develop the students' interpersonal skills and to enable them to respond effectively
	3. To develop the students selling skills and to enable them to apply in their interview process.
	4. To develop the students' Corporate Etiquettes and enable them to respond effectively
	5. To develop the students' learning by practice of giving different situations.

Unit I	**Introduction to Soft Skills**	**9 Hours**
Soft Skills an Overview - Basics of Communication – Body Language – Positive attitude –Improving Perception and forming values – Communicating with others.		
Unit II	**Team vs Trust**	**9 Hours**
Interpersonal skills – Understanding others – Art of Listening - Group Dynamics – Networking - Individual and group presentations - Group interactions – Improved work Relationship .		
Unit III	**Selling Oneself**	**9 Hours**
How to brand oneself – social media – job hunting – Resume writing – Group Discussion – Mock G.D - .Interview skills – Mock Interview		
Unit IV	**Corporate Etiquettes**	**9 Hours**
What is Etiquette – Key Factors – Greetings – Meeting etiquettes – Telephone etiquettes – email etiquettes – Dining etiquettes – Dressing etiquettes – Rest room etiquettes – Life etiquettes		
Unit V	**Learning by Practice**	**9 Hours**
1. My family. Myself. 2. Meeting people. Making Contacts.3. A city. Getting about town. 4. Our flat. Home life.5Travelling. Going abroad.6. Going through Customs.7. At a hotel.8. Shopping. 9. Eating out.10. Making a phone call.11A modern office.12 Discussing business.		
	Total:	**45 Hours**

Assessment Pattern:	
	Two assignments will be conducted (25 * 2) - 50 marks
	Pragmatic Assessment - 50 Marks

Course Outcomes:	
	After completion of the course, Student will be able to
	1. Students are enabled to communicate effectively in their business environment.
	2. Learners are ensured that they improve their interpersonal skills which is mandatory in a corporate world
	3. Students are trained to brand themselves to acquire a job .
	4. Students are trained to involve in corporate etiquettes
	5. Students are learnt to survive in the different situations

References:

1. Dr.k.Alex, "soft skills "Third Edition, S.Chand & Publishing Pvt Limited, 2009
2. Aruna koneru, 'Professional Communication' Second Edition, Tata McGraw-Hill Education, 2008
3. D.K.Sarma,'You & Your Career 'First Edition Wheeler Publishing & Co Ltd, 1999
4. Shiv Khera 'You Can Win' Third Edition Mac Millan Publisher India Pvt Limited, 2005

E.G.S. PILLAY ENGINEERING COLLEGE

(Autonomous)

Approved by AICTE, New Delhi | Affiliated to Anna University, Chennai

Accredited by NAAC with „A" Grade | Accredited by NBA (CSE, EEE, MECH)

NAGAPATTINAM – 611 002

B.E. Electronics and Communication Engineering

Full Time Curriculum and Syllabus

Second Year Fourth Semester

Course Code	Course Name	L	T	P	C	Maximum		
						C	E	Tot
Theory Course								
1701MA403	Probability and Random Processes	3	2	0	4	40	60	100
1702EC402	Signals and Systems	3	2	0	4	40	60	100
1702EC403	Analog Integrated Circuits	3	0	0	3	40	60	100
1702EC404	Microprocessors and Microcontrollers	3	0	0	3	40	60	100
1702EC405	Transmission Lines and Waveguides	3	0	0	3	40	60	100
1702EC406	Control Systems	3	0	0	3	40	60	100
Laboratory Course								
1702EC451	Analog Integrated Circuits Laboratory	0	0	4	2	50	50	100
1702EC452	Microprocessors and Microcontrollers Laboratory	0	0	4	2	50	50	100
1704GE451	Life Skills: Verbal Ability	0	0	2	-	100	-	100

L – Lecture | T – Tutorial | P – Practical | C – Credit | CA Continuous Assessment | ES – End Semester

1701MA401	PROBABILITY AND RANDOM PROCESSES	L	T	P	C
		3	2	0	4
	(B.E- ECE)				

Course Objectives:

1. To analyze the concepts of probability, random variables and distribution functions.
2. To acquire skill in handling situation with more than one random variable with time function.
3. To analyze the concept of signals and system.

Unit I	**PROBABILITY**	**9+3Hours**

Probability- Theorems on Probability- Conditional Probability Baye s Theorem- Discrete and continuous random variables Moments Moment generating functions Real Time Problems

Unit II	**ONE DIMENSIONAL RANDOM VARIABLE**	**9+3 Hours**

Discrete Distributions: Binomial, Poisson, Geometric - Continuous Distributions: Uniform, Exponential, Normal distributions- Application of Distribution in Engineering Problems

Unit III	**TWO - DIMENSIONAL RANDOM VARIABLES**	**9+3 Hours**

Joint distributions Marginal and conditional distributions Covariance Correlation and Linear regression

Unit IV	**MARKOV PROCESSES AND MARKOV CHAINS**	**9+3 Hours**

Classification Stationary process Markov process Markov chains transition probabilities Limiting distributions Poisson process.

Unit V	**SPECTRAL DENSITIES AND LINEAR SYSTEMS WITH RANDOM INPUTS**	**9+3 Hours**

Auto correlation-cross correlation-power spectral density-cross spectral density-Properties-Wiener-Khintchine relation-relationship between cross power spectrum and corre lation function. Linear time invariant system-system transfer function-Linear system with random inputs-White noise.

Total:	**45 + 15 Hours**

Further Reading:

Probabilistic manner which evolve with time

Discrete time Markov chains in modeling Electronic systems.

Course Outcomes:

After completion of the course, Student will be able to

1. To apply basic probability techniques to analyze the performance of Electronic systems.(K3)
2. To apply standard distributions in describing real life phenomena.(K3)
3. To solve problems involving more than one random variable.(K3)
4. To apply probability technique which evolve with respect to time.(K3)
5. To interpret the response of random input to linear time invariant systems. (K3)

References:

1. O.C. Ibe, Fundamentals of Applied Probability and Random Processes, Elsevier, 1st Indian Reprint, 2007
2. D. Gross and C.M. Harris, Probability and random processes, WileyStudent edition, 2004.
3. Peebles. P.Z., Probability, Random Variables and Random Signal Principles , Tata Mc Graw Hill, 4th Edition, New Delhi, 2002.
4. Yates. R.D. and Goodman. D.J., Probability and Stochastic Processes , 2nd Edition, Wiley India Pvt. Ltd., Bangalore, 2012.
5. Stark. H., and Woods. J.W., Probability and Random Processes with Applications to Signal Processing , 3rd Edition,Pearson Education, Asia, 2002.
6. Miller. S.L. and Childers. D.G., Probability and Random Processes with Applications to Signal Processing and Communications , Academic Press, 2004.
7. www.indiastudychannel.com
8. nptel.ac.in/courses/111105035, www.nptelvideos.in/2012/11/Mathematics.html
9. www.learnerstv.com/Free-maths-video lectures - ltv348-page1.html

1702EC402		SIGNALS AND SYSTEMS	L	T	P	C
			3	1	0	4

Course Objectives:

1. To understand the basic properties of Signals and Systems and the various methods of Classification
2. Tolearn Laplace Transform &Fourier transform and their properties
3. To know Z transform & DTFT and their properties.
4. To characterize LTI systems in the Time domain and various Transform domains

Unit I	**CLASSIFICATION OF SIGNALS AND SYSTEMS**	**9+3 Hours**

Classification of Signals- Continuous time signals - Discrete time signals - Periodic and Aperiodic signals - Even and odd signals - Energy and power signals -Deterministic and random signals -Complex exponential and Sinusoidal signals. Classification of Systems: Continuous time systems- Discrete time systems - Linear system - Time Invariant system causal system - BIBO system - Systems with and without memory - LTI system Classification of Systems

Unit II	**ANALYSIS OF CONTINUOUS TIME SIGNALS**	**9+3 Hours**

Fourier series analysis-spectrum of Continuous Time (CT) signals- Fourier and Laplace Transforms in CT Signal Analysis - Properties.

Unit III	**LTI CT SYSTEM**	**9+3 Hours**

Impulse response - Frequency response Convolution Integral - Analysis and characterization of LTI system using Laplace transform Solution of Differential equation with initial conditions zero state response and zero input response.

Unit IV	**ANALYSIS OF DISCRETE TIME SIGNALS**	**9+3 Hours**

Baseband Sampling - DTFT Properties of DTFT - Z Transform Properties of Z Transform Inverse Z transform

Unit V	**LTI DISCRETE TIME SYSTEMS**	**9+3 Hours**

Impulse response - Convolution sum- Analysis and characterization of DT system using Z transform Difference Equations-Block diagram

Total:	**45+15 Hours**

Further Reading:

Programs using mathematical computing tool for CT and DT system analysis using LT and ZT

Course Outcomes:

After completion of the course, Student will be able to

1. Analyze the properties of signals & systems
2. Apply Laplace transform, Fourier transform in signal analysis
3. Apply Z transform and DTFT in signal analysis for Discrete time signals
4. Analyze continuous time LTI systems using Fourier and Laplace Transforms
5. Analyze discrete time LTI systems using Z transform.

References:

1. Allan V.Oppenheim, S.Wilsky and S.H.Nawab, Signals and Systems , Pearson, 2007.
2. B. P. Lathi, Principles of Linear Systems and Signals , Second Edition, Oxford, 2009.
3. R.E.Zeimer, W.H.Tranter and R.D.Fannin, Signals & Systems - Continuous and Discrete , Pearson, 2007.
4. John Alan Stuller, An Introduction to Signals and Systems , Thomson, 2007.
5. Hwei. P.Hsu, Schaum s Outlines: Signals and Systems**,** Pearson Education, 2002.

1702EC403	ANALOG INTEGRATED CIRCUITS	L	T	P	C
		3	0	0	3

Course Objectives:

1. To Learn the fundamental concepts behind transistor biasing and to differentiate small signal and large signal circuit models
2. To Learn the concepts of Analog to digital and Digital to Analog converters for microelectronics
3. To Study the performance metrics of Multistage and Power amplifiers
4. To Understand the working of signal generating and wave shaping circuits

Unit I	BASICS OF OPERATIONAL AMPLIFIERS	9 Hours

Operational Amplifiers, DC and AC characteristics, Typical op-amp parameters: Finite gain, finite bandwidth, Offset voltages and currents, Common-mode rejection ratio, Power supply rejection ratio, Slew rate, Applications of Op-amp: Precision rectifiers. Summing amplifier, Integrators and differentiators, Log and antilog amplifiers. Instrumentation amplifiers, voltage to current converters

Unit II	ACTIVE FILTERS	9 Hours

Second order filter transfer function (low pass, high pass, band pass and band reject), Butterworth, Chebyshev and Bessel filters. Switched capacitor filter. notch filter, All pass filters, self-tuned filters

Unit III	ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTERS	9 Hours

Opamp as a comparator, Schmitt trigger, Astable and monostable multivibrators, Triangular wave generator, Multivibrators using 555 timer, Data converters: A/D and D/A converters

Unit IV	PHASE LOCKED LOOP	9 Hours

PLL- basic block diagram and operation, Four quadrant multipliers. Phase detector, VCO, Applications of PLL:Frequency synthesizers, AM detection, FM detection and FSK demodulation

Unit V	CMOS DIFFERENTIAL AMPLIFIERS	9 Hours

DC analysis and small signal analysis of differential amplifer with Restive load, current mirror load and current source load, Input common-mode range and Common-mode feedback circuits. OTAs vs Opamps. Slew rate, CMRR, PSRR. Two stage amplifiers, Compensation in amplifiers (Dominant pole compensation).

Total:	45 Hours

Further Reading:

Collector Emitter Feedback Bias, Bootstrap Darlington Circuit, Effect of Emitter or a Source Bypass Capacitor on Low frequency response, Comparison of Power Amplifiers, BJT Digital Logic Inverter, CMOS Digital Logic Inverter, BiCMOS Cascade Amplifier, Current Mirror Circuits, CMOS Logic Gate Circuits, Power BJTs, Power MOSFETs.

Course Outcomes:

After completion of the course, Student will be able to

1. Infer the DC and AC characteristics of operational amplifiers and its effect on output and their compensation techniques
2. Elucidate and design the linear and non linear applications of an opamp and special application Ics.
3. Explain and compare the working of multi vibrators using special application IC 555 and general purpose opamp
4. Classify and comprehend the working principle of data converters
5. Illustrate the function of application specific ICs such as Voltage regulators, PLL and its application in communication.

References:

1. *S.Franco, Design with Operational Amplifiers and Analog Integrated Circuits (3/e) TMH, 2003*
2. *Sedra and Smith, Microelectronics Circuits, Oxford Univ. Press, 2004*
3. *Coughlin, Driscoll, OP-AMPS and Linear Integrated Circuits, Prentice Hall, 2001.*
4. John D Ryder, —Electronic fundamentals and Applications: Integrated and Discrete systems‖ 5th Edition, PHI, 2003
5. Donald .A. Neamen, Electronic Circuit Analysis and Design 2nd edition, Tata McGraw Hill, 2009

1702EC404		Microprocessors and Microcontrollers	L	T	P	C
			3	0	0	3
		(Common to B.E / B.Tech ECE,CSE & IT)				

Course Objectives:

1. To understand the architecture and functions of 8085 processor
2. To understand the Architecture of 8086 microprocessor
3. To understand the concepts of 8051 microcontroller
4. To learn the design aspects of I/O and Memory Interfacing circuits.
5. To gain the basic knowledge about advanced processors

Unit I	INTRODUCTION TO MICROPROCESSORS	9 Hours

Evolution Of Microprocessors - 8-Bit Processor - 8085 Architecture Register Organization - Instruction Set Timing Diagram- Addressing Modes Interrupts- Interrupt Service Routines- Assembly Language Programming Using 8085.

Unit II	THE 8086 MICROPROCESSOR	9 Hours

Introduction to 8086 Microprocessor architecture Addressing modes - Instruction set and assembler directives Assembly language programming Modular Programming - Linking and Relocation - Stacks - Procedures Macros Interrupts and interrupt service routines - 8086 signals.

Unit III	MICROCONTROLLER	9 Hours

Architecture of 8051 Special Function Registers(SFRs) - I/O Pins Ports and Circuits - Instruction set - Addressing modes - Assembly language programming.

Unit IV	I/O INTERFACING	9 Hours

Memory Interfacing and I/O interfacing - Parallel communication interface Serial communication interface D/A and A/D Interface - Timer Keyboard /display controller Interrupt controller DMA controller Programming and applications Case studies: Traffic Light control, LED display , LCD display, Keyboard display interface and Alarm Controller.

Unit V	ARCHITECTURE OF ADVANCED PROCESSORS	9 Hours

Multiprocessor configurations Intel 80286 Internal Architectural Register Organization Internal Block Diagram Architectural features and Register Organization of i386, i486 and Pentium processors. ARM architecture.

Total:	45 Hours

Further Reading:

Intel Core i3, i5 and i7

Course Outcomes:

After completion of the course, Student will be able to

1. Design and implement the functionality of 8085 microprocessor
2. Design and implement the functionality of 8086 microprocessor
3. Design and implement 8051 microcontroller based systems
4. Design I/O circuits. Design Memory Interfacing circuits
5. Acquire the architecture concepts of advanced processors.

References:

1. Ramesh Gaonkar "Microprocessor Architecture, Programming, and Applications with the 8085"- 5th edition Penram International Publishing-2000.
2. A. K. Ray & K. M. Bhurchandi, Advanced Microprocessors and peripherals- Architectures, Programming and Interfacing , TMH, 2002 reprint.
3. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, The 8051 Microcontroller and Embedded Systems: Using Assembly and C , Second Edition, Pearson education, 2011.
4. Barry B. Brey, The Intel Microprocessors, 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, PentiumPro Processor, PentiumII, PentiumIII, PentiumIV, Architecture, Programming & Interfacing , 6th Edition, Pearson Education/PHI, 2002.
5. https://www.intel.in
6. https://www.arm.com

1702EC405		TRANSMISSION LINES AND WAVEGUIDES	L	T	P	C
			3	0	0	3

Course Objectives:

1. To introduce the various types of transmission lines and to discuss the losses associated.

	2. To give thorough understanding about impedance transformation and matching.
	3. To use the Smith chart in problem solving.
	4. To impart knowledge on filter theories and waveguide theories.
	5. To introduce the various types of transmission lines and to discuss the losses associated.

Unit I	**TRANSMISSION LINE THEORY**	**9 Hours**

General solution of transmission line – The two standard forms for voltage and current of a line terminated by an impedance – Physical significance of the equation and the infinite line – Reflection coefficient – Wavelength and velocity of propagation – Waveform distortion – Distortion less transmission line – The telephone cable – Inductance loading of telephone cables Input impedance of lossless lines Reflection on a line not terminated by Z_O – Transfer impedance – Reflection factor and reflection loss.

Unit II	**IMPEDANCE MATCHING IN TRANSMISSION LINES**	**9 Hours**

Standing waves and standing wave ratio on a line – One eighth wave line – Quarter wave line and impedance matching – The half-wave line Smith chart Application of the smith chart Conversion from impedance to reflection co-efficient and vice-versa Impedance to admittance conversion and vice-versa Input impedance of a lossless line terminated by an impedance Single stub matching and double stub matching.

Unit III	**FILTERS AND GUIDED WAVES**	**9 Hours**

Constant K Filters - Low pass, High pass band, pass band elimination filters - m -derived sections Waves between parallel planes of perfect conductors Transverse electric and transverse magnetic waves Characteristics of TE and TM waves Transverse electromagnetic waves – Velocities of propagation – Component uniform plane waves between parallel planes Attenuation of TE and TM waves in parallel plane guides Wave impedances.

Unit IV	**RECTANGULAR WAVEGUIDES**	**9 Hours**

Transverse magnetic waves in rectangular wave guides Transverse electric waves in rectangular waveguides Characteristics of TE and TM waves Cutoff wavelength and phase velocity Impossibility of TEM waves in waveguides Dominant mode in rectangular waveguide Attenuation of TE and TM modes in rectangular waveguide Wave impedance Characteristic impedance Excitation of modes.

Unit V	**CIRCULAR WAVE GUIDES AND RESONATORS**	**9 Hours**

Bessel functions – Solution of field equations in cylindrical co-ordinates – TM and TE waves in circular guides Wave impedances and characteristic impedance Dominant mode in circular waveguide – Excitation of modes – Microwave cavities – Rectangular cavity resonators – Circular cavity resonator – Semicircular cavity resonator – Q factor of a cavity resonator for TE_{101} mode.

	Total:	**45 Hours**

Further Reading:

Transmission line equations at radio frequencies - Characteristic impedance of symmetrical networks- The circle diagram for the dissipation less line composite filters.

Course Outcomes:

After completion of the course, Student will be able to

1. Discuss the propagation of signals through transmission lines.
2. Analyze signal propagation at Radio frequencies.
3. Explain radio propagation in guided systems.
4. Classify the Guided Wave solutions -TE, TM, and TEM.
5. Utilize cavity resonators.

References:

1. J. D. Ryder, "Networks, Lines and Fields", PHI, 2nd Edition, 2010.
2. E.C. Jordan & K.G. Balmain "Electromagnetic Waves and Radiating Systems" Prentice Hall of India 2nd edition 2003.
3. Ramo, Whineery and Van Duzer, Fields and Waves in Communication Electronics , John Wiley, 2003.

4. David M.Pozar: Microwave Engineering 2nd Edition John Wiley 2000.
5. David K. Cheng, Field and Waves in Electromagnetism , Pearson Education, 1989.
6. B.Somanathan Nair, Transmission Lines and Wave guides, Sanguine Technical publishers, 2006.

1702EC406		CONTROL SYSTEMS	L	T	P	C
			3	0	0	3

Course Objectives:

1. In this course it is aimed to introduce to the students the principles and applications of control systems.
2. To the basic concepts of block diagram reduction, time domain analysis solutions to time invariant systems.
3. In deals with the different aspects of stability analysis of systems in frequency domain and time domain.
4. To understand the application of control system.
5. In this course it is aimed to introduce to the students the principles and applications of control systems.

Unit I	**INTRODUCTION OF CONTROL SYSTEMS**	**9 Hours**

Basic concept of control systems - Open loop and closed loop control systems and their differences - Block diagram algebra - Representation by signal flow graph - Reduction using Mason s gain formula - Feedback characteristics and effect of feedback

Unit II	**TIME RESPONSE ANALYSIS**	**9 Hours**

Time response analysis - Time response of first order system - Transient response of second order system - Time domain specification - steady state response - Steady state error - Effect of proportional derivatives - Proportional integral system

Unit III	**FREQUENCY RESPONSE ANALYSIS**	**9 Hours**

Frequency response - Frequency domain specification - stability analysis from bode plot , polar plot , nyquist plot - Compensation techniques - Lag , Lead , lead-lag controllers design in frequency domain .

Unit IV	**STABILITY ANALSIS AND ROOT LOCUS TECHNIQUES**	**9 Hours**

Concept of stability - Routh Hurwitz criterion - Nyquist stability criterion - Routh locus concept - construction of root locus

Unit V	**APPLICATIONS OF CONTROL SYSTEMS**	**9 Hours**

Aircraft flight control systems - Director(military) - Embedded instrumentation - Fire control system - Guidance , navigation and control - Laser ignition - Weight shift control

Total:	**45 Hours**

Further Reading:

Modern control systems.

Course Outcomes:

After completion of the course, Student will be able to

1. Knowledge on open loop and closed loop control system, concept of feedback in control systems.
2. Transfer function representation through block diagram algebra and signal flow graph , time response analysis .
3. Frequency response analysis through bode plot, polar plot , nyquist plot and basics of state space analysis.

References:

1. Automatic control systems, third edition, Benjamin C. Kuo.
2. Control and Dynamical Systems, Karl Johan Aström ˚ Richard M. Murray, Version v2.10c (March 4, 2010), PRINCETON UNIVERSITY PRESS.
3. Modern Control Systems, TWELFTH EDITION, Richard C. Dorf University of California, Davis, Robert H. Bishop Marquette University.

1702EC451	ANALOG INTEGRATED CIRCUITS LABORATORY	L	T	P	C
		0	0	3	2

Course Objectives:

1. To expose the students to linear and integrated circuits
2. To understand the basics of linear integrated circuits and available ICs
3. To understand characteristics of operational amplifier
4. To apply operational amplifiers in linear and nonlinear applications.
5. To acquire the basic knowledge of special function IC
6. To use PSPICE software for circuit design

List of Experiments:

1. Inverting, Non inverting and Differential amplifiers.
2. Integrator and Differentiator.
3. Instrumentation Amplifier
4. Active low-pass, High-pass and band-pass filters.
5. Astable & Monostable multivibrators and Schmitt Trigger using op-amp
6. Phase shift and Wien bridge oscillators using op-amp.
7. Astable and monostable multivibrators using NE555 Timer
8. PLL characteristics and its use as Frequency Multiplier
9. DC power supply using LM317 and LM723
10. Mini project using Op-Amp and Specialized IC s

SIMULATION USING SPICE

11. Analog multiplier
12. CMOS Inverter, NAND and NOR

Total: 45 Hours

Additional Experiments:

1. Buck-Boost Converter
2. Design a circuit for Lisajious Figure

Course Outcomes:

After completion of the course, Student will be able to

1. Design oscillators and amplifiers using operational amplifiers
2. Design filters using Opamp and perform experiment on frequency response
3. Analyse the working of PLL and use PLL as frequency multiplier
4. Design DC power supply using ICs
5. Analyse the performance of oscillators and multivibrators using SPICE

References:

1. Adel. S. Sedra, Kenneth C. Smith, Microelectronic Circuits Theory an Applications ,5th Edition, Oxford University, 2006.
2. Jacob Millman, C. Halkias and Satyabrata Jit, Electronic Devices and Circuits, 3rd Edition, Tata McGraw-Hill, 2011.

1702EC452	Microprocessors and Microcontrollers Laboratory	L	T	P	C
		0	0	4	2
	(Common to B.E / B.Tech ECE,CSE & IT)				

Course Objectives: **The student should be made to:**

1. Write ALP for arithmetic and logical operations in 8085, 8086 and 8051
2. Differentiate Serial and Parallel Interface
3. Interface different I/Os with Microprocessors& Microcontrollers
4. Be familiar with MASM

List of Experiments:

8085 Programs using kits

1. Basic arithmetic and Logical operations
2. Sorting and Searching the given data.

8086 Programs using kits with MASM

3. Floating point operations

8051 Experiments using kits

4. Basic arithmetic and Logical operations

5. Square and Find 2 s complement of a number			
6. Code conversion			
Peripherals and Interfacing Experiments			
7. Traffic light control			
8. Stepper motor and DC Motor control			
9. Key board and Display			
10. Serial interface and Parallel interface			
11. Printer Interfacing			
12. A/D and D/A interface and Waveform Generation			
		Total:	**45 Hours**
Additional Experiments:	https://www.intel.in		
	Basic experiments using Arduino processor		
Course Outcomes:			
	After completion of the course, Student will be able to		
	1. Write ALP Programmes for fixed and Floating Point and Arithmetic		
	2. Interface different I/Os with processor		
	3. Generate waveforms using Microprocessors&Execute Programs in 8051		
	4. Explain the difference between simulator and Emulator		
References:			
	1. Ramesh Gaonkar "Microprocessor Architecture, Programming, and Applications with the 8085"- 5th edition Penram International Publishing-2000.		
	2. A. K. Ray & K. M. Bhurchandi, Advanced Microprocessors and peripherals- Architectures, Programming and Interfacing , TMH, 2002 reprint.		

1704GE451		**LIFE SKILLS: VERBAL ABILITY**	**L**	**T**	**P**	**C**
			0	**0**	**2**	**-**
Course Objectives:						
	1. To help students comprehend and use vocabulary words in their day to day communication.					
	2. To apply appropriate reading strategies for interpreting technical and non-technical documents used in job-related settings.					
	3. To ensure students will be able to use targeted grammatical structures meaningfully and appropriately in oral and written production.					
	4. To enable the students to arrange the sentences in meaningful unit and to determine whether constructions rely on active or passive voice					
	5. To Apply the principles of effective business writing to hone communication skills					
Unit I	**VOCABULARY USAGE**					**9 Hours**
Introduction - Synonyms and Antonyms based on Technical terms Single word Substitution Newspaper, Audio and video listening activity.						
Unit II	**COMPREHENSION ABILITY**					**9 Hours**
Skimming and Scanning Social Science passages Business and Economics passages latest political and current event based passages Theme detection Deriving conclusion from passages						
Unit III	**BASIC GRAMMAR AND ERROR DETECTION**					**9 Hours**
Parallelism – Redundancy Ambiguity Concord - Common Errors Spotting Errors Sentence improvement Error Detection FAQ in Competitive exams.						
Unit IV	**REARRANGEMENT AND GENERAL USAGE**					**9 Hours**
Jumble Sentences Cloze Test - Idioms and Phrases Active and passive voice Spelling test.						
Unit V	**APPLICATION OF VERBAL ABILITY**					**9 Hours**
Business Writing - Business Vocabulary - Delivering Good / Bad News - Media Communication - Email Etiquette Report Writing - Proposal writing Essay writing Indexing Market						

surveying.		
	Total:	**45 Hours**
Further Reading:		
	Modern control systems.	
Course Outcomes:		
	After completion of the course, Student will be able to	
	1. Students are enabled to use new words in their day to day communication.	
	2. Students are capable to gather information swiftly while reading passages	
	3. Students are proficient during their oral and written communication.	
	4. Students are equipped to rearrange the sentences and able to identify the voice of the sentence	
	5. Students use their knowledge of the best practices to craft effective business documents	
References:		

1. Arun Sharma and Meenakshi Upadhyav, How to Prepare for Verbal Ability and Reading Comprehension for CAT, McGrawHill Publication, Seventh Edition 2017
2. R S Aggarwal and Vikas Aggarwal , Quick Learning Objective General English ,S.Chand Publishing House, 2017
3. Dr.K.Alex , Soft Skills, S.Chand Publishing House, Third Revise Edition, 2014
4. Raymond Murphy, Essential English Grammar in Use, Cambridge University press, New Delhi, Third Edition , 2007

E.G.S.PILLAYENGINEERINGCOLLEGE

(Autonomous)

Approved by AICTE, New Delhi|Affiliated to AnnaUniversity, Chennai Accredited byNAAC with „A"Grade|Accredited byNBA (CSE, EEE, MECH)

NAGAPATTINAM–611002

B.E. Electronics and Communication Engineering

Full Time Curriculum and Syllabus

Third Year– Fifth Semester

Course Code	Course Name	L	T	P	C	Maximum Marks		
						CA	ES	Total
Theory Course								
1702EC501	Analog Communication	3	0	0	3	40	60	100
1702EC502	Antenna and Wave Propagation	3	0	0	3	40	60	100
1702EC503	Digital Signal Processing	3	2	0	4	40	60	100
1702EC504	Computer Networks	3	0	0	3	40	60	100
	Professional Elective – I	3	0	0	3	40	60	100
	Professional Elective – II	3	0	0	3	40	60	100
Laboratory Course								
1702EC551	Analog Communication Laboratory	0	0	4	2	50	50	100
1702EC552	Digital Signal Processing Laboratory	0	0	4	2	50	50	100
	Technical Seminar	0	0	2	1	100	-	100
	Life Skills: Aptitude – I	0	0	2	1	100	-	100
	Total	**18**	**2**	**12**	**25**	**540**	**460**	**1000**
Professional Elective – I								
1703EC501	Nano Electronics	3	0	0	3	40	60	100
1703EC502	Automotive Electronics	3	0	0	3	40	60	100
1703EC503	Micro Electronics	3	0	0	3	40	60	100
1703EC504	Biomedical Engineering	3	0	0	3	40	60	100

1703EC505	Robotic Vision	3	0	0	3	40	60	100
Professional Elective – II								
1703EC506	Computer Architecture and Organization	3	0	0	3	40	60	100
1703EC507	Advanced Microcontrollers	3	0	0	3	40	60	100
1703EC508	Measurement and Instrumentation	3	0	0	3	40	60	100
1703EC509	Virtual Instrumentation	3	0	0	3	40	60	100
1702CSX01	Operating Systems	3	0	0	3	40	60	100

L–Lecture|T–Tutorial|P–Practical|C–Credit|CA –ContinuousAssessment| ES–EndSemester

1702EC501		**ANALOG COMMUNICATION**	**L**	**T**	**P**	**C**
			3	**0**	**0**	**3**

Course Objectives:

1. To provide an introduction on different analog modulation and demodulation systems.
2. To study various types of noise and analyze the noise performance of various receiver.
3. To learn Pulse analog modulation and demodulation techniques.

Unit I **AMPLITUDE MODULATION SYSTEMS** **9 Hours**

Need for modulation – Classifications of modulation techniques-Generation and detection: AM, DSBSC, SSB-SC, VSB-Comparison of Amplitude modulation systems- AM transmitters-AM receivers-Super heterodyne receiver.

Unit II **ANGLE MODULATION SYSTEMS** **9 Hours**

Frequency modulation: Narrowband and wideband FM- Phase Modulation- Generation of FM signal: Direct FM, indirect FM- Demodulation of FM signals -FM stereo multiplexing- FM transmitters- FM receivers-Receiver parameter.

Unit III **RANDOM PROCESS** **9 Hours**

Random variables-Random process-Auto correlation process-Power spectral density-Stationary process-Wiener–Khinchin theorem, Transmission of random process through LTI system, WSS ergodic process-Gaussian Process.

Unit IV **NOISE IN COMMUNICATION SYSTEM** **9 Hours**

Noise calculation-Noise figure-Noise temperature-Noise equivalent bandwidth-Narrowband noise-Noise in AM receiver,Noise in DSBSC receiver-Noise in SSB receiver-Noise in FM receiver-Capture and threshold effect-Pre-emphasis and de-emphasis in FM system-Comparison of noise performance of AM and FM systems.

Unit V **PULSE ANALOG MODULATION** **9 Hours**

PAM-PWM-PPM-Time Division Multiplexing-PFM- Pulse Time Modulation systems: generation –detection-Sampling of Band limited Low pass signals-ideal and practical sampling- Anti aliasing and reconstruction filters

Total: 45 Hours

Further Reading:

Working principle of MODEM, AM /FM broadcasting, Design of AM and FM radio, Television Receivers.

Course Outcomes:

After completion of the course, Student will be able to

1. Derive the mathematical model for time domain representation, spectrum and methods of generation and detection of different AM systems.
2. Derive the mathematical model for time domain representation, spectrum and methods of generation and detection of angle modulation systems.
3. Analyze and characterize the different types of random process.
4. Compare noise in AM and FM systems.
5. Analyze the bandwidth requirements and noise performance for Pulse analog modulation

References:

1. J.G. Proakis, "Digital Communications", McGraw Hill, 5th edition, 2007
2. Simon Haykin, Communication Systems, John Wiley, 2001.
3.Jack Quinn, 'Digital Data Communication", Prentice Hall; 1st edition,-199)
3. P.Michael Fitz, Fundamentals of Communication System, Tata McGraw-Hill -2008.
4. P.Rama Krishna rao, Analog Communication, Tata McGraw-Hill -2011
5. Taub and Schilling, Principles of communication systems, Tata McGraw-Hill, 1995.
6. Bruce Carlson et al, Communication systems, McGraw-Hill,2002.
7. Roddy and Coolen, Electronic communication, PHI, 2003.

1702EC502		ANTENNAS AND WAVE PROPOGATION	L	T	P	C
			3	0	0	3

Course Objectives:

1.To introduce the fundamental principles of antenna theory and various types of antennas.
2.Applying the principles of antennas to the analysis, design, and measurements of antennas.
3.To introduce the propagation of radio waves.

Unit I	FUNDAMENTALS OF RADIATION	9 Hours

Definition of antenna parameters – Gain, Directivity, Effective aperture, Radiation Resistance, Band width, Beam width, Input Impedance. Matching – Baluns, Polarization mismatch, Antenna noise temperature, Radiation from oscillating dipole, Half wave dipole. Folded dipole, Yagi array.

Unit II	ANTENNA ARRAYS	9 Hours

N element linear array, Pattern multiplication, Broadside and End fire array – Concept of Phased arrays, Adaptive array, Basic principle of antenna Synthesis-Binomial Arrays, Tchebychev polynomial

Unit III	APERTURE AND SLOT ANTENNAS	9 Hours

Radiation from rectangular apertures, Uniform and Tapered aperture, Horn antenna , Reflector antenna , Aperture blockage , Feeding structures , Slot antennas ,Microstrip antennas – Radiation mechanism – Application ,Numerical tool for antenna analysis

Unit IV	SPECIAL ANTENNAS	9 Hours

Principle of frequency independent antennas –Spiral antenna, Helical antenna, Log periodic. Modern antennas- Reconfigurable antenna, Active antenna, Dielectric antennas, Electronic band gap structure and applications, Antenna Measurements-Test Ranges, Measurement of Gain, Radiation pattern, Polarization, VSWR

Unit V	PROPAGATION OF RADIO WAVES	9 Hours

Modes of propagation , Structure of atmosphere , Ground wave propagation , Tropospheric propagation , Duct propagation, Troposcatter propagation , Flat earth and Curved earth concept Sky wave propagation – Virtual height, critical frequency , Maximum usable frequency – Skip distance, Fading , Multi hop propagation

TOTAL: 45 PERIODS

Total:	45 Hours

Further Reading:

Concept and benefits of smart antennas, Fixed weight beamforming basics, Adaptive beamforming

Course Outcomes:

After completion of the course, Student will be able to

1. To introduce the fundamental principles of antenna theory and various types of wire antennas.
2. To design and analyze Antenna arrays
3. To know the applications of some basic and practical configurations such as dipoles, loops, and broadband, aperture type and horn antennas.
4. Applying the principles of antennas to the analysis, design, and measurements of antennas
5. To introduce different modes of propagation of radio waves

References:

1.John D Kraus, Ronald J Marhefka, Ahmad S Khan, Antennas for All Applications, 3rd Edition, TheMcGraw Hill Companies. 2010.
2.K. D. Prasad, “Antenna & Wave Propagation”, SatyaPrakashan, New Delhi
3.John D Kraus, “ Antenna& Wave Propagation”, 4th Edition, McGraw Hill, Communications and Networking, Morgan Kaufmann Publishers, An Imprint of Elsevier, 2008.
4.C.A. Balanis, “Antenna Theory - Analysis and Design", John Wiley.
5.Vijay K Garg, Wireless Communications and Netwoking, Morgan Kaufmann Publishers, An Imprint of Elsevier, 2008.

17EC503		**Digital Signal Processing**	**L**	**T**	**P**	**C**
			3	**2**	**0**	**4**
		B.E – ECE				

Course Objectives:	
	1. To study about a programmable Digital signal processor.
	2. To learn discrete Fourier transform, properties and its computation
	3.To know the characteristics of IIR filter and to learn the design of IIR filters for filtering undesired signals.
	4. To know the characteristics ofFIR filter and to learn the design of FIR filter for filtering undesired signals.
	5. To understand Finite word length effects and DSP Applications.

Unit I	**DISCRETE FOURIER TRANSFORM**	**9 Hours**
Discrete Signals and Systems- A Review – Introduction to DFT – Properties of DFT – Circular Convolution - Filtering methods based on DFT – FFT Algorithms –Decimation in time Algorithms, Decimation in frequency Algorithms – Use of FFT in Linear Filtering.		
Unit II	**IIR FILTER DESIGN**	**9 Hours**
Structures of IIR – Analog filter design – Discrete time IIR filter from analog filter – IIR filter design by Impulse Invariance, Bilinear transformation, Approximation of derivatives – (LPF, HPF, BPF, BRF)filter design using frequency translation.		
Unit III	**FIR FILTER DESIGN**	**9 Hours**
Structures of FIR – Linear phase FIR filter – Fourier Series - Filter design using windowing techniques(Rectangular Window, Hamming Window, Hanning Window), Frequency sampling techniques – Finite word length effects in digital Filters: Errors, Limit Cycle, Noise Power Spectrum.		
Unit IV	**FINITE WORDLENGTH EFFECTS AND DSP APPLICATIONS**	**9 Hours**
Fixed point and floating point number representations – Quantization- Truncation and Rounding errors - Quantization noise – quantization error – Overflow error – Round off noise power - limit cycle oscillations due to product round off and overflow errors –DSP applications -Multirate signal processing: Decimation, Interpolation, Adaptive Filters.		
Unit V	**DIGITAL SIGNAL PROCESSORS**	**9 Hours**
Introduction – TMS320c5X Architecture – Features – Addressing Formats – Functional modes - Introduction to Commercial DSP Processors –TMS320C64XX, TMS320 C54X.		
	Total:	**45+15 Hours**

Further Reading:	http://www.ti.com/processors/dsp/overview.html
	Spectrum estimation.
	Linear estimation and prediction

Course Outcomes:	
	After completion of the course, Student will be able to
	1. gain the knowledge about DSP Processors.
	2.apply DFT for the analysis of digital signals & systems.
	3. design of IIR filters for filtering undesired signals.
	4. design of FIR filters for filtering undesired signals.
	5. characterize finite Word length effect on filters and to design the Multirate Filters and Adaptive Filters.

References:

1. J.G. Proakis and D.G. Manolakis, ‘Digital Signal Processing Principles, Algorithms and Applications’, Pearson Education, New Delhi, PHI. 2003.

2. S.K. Mitra, ‘Digital Signal Processing – A Computer Based Approach’, McGraw Hill Edu, 2013.

4. B.Venkataramani and M.Bhaskar, "Digital Signal Processors – Architecture, Programming and Applications" – Tata McGraw – Hill Publishing Company Limited. New Delhi, 2003.
3. Robert Schilling & Sandra L.Harris, Introduction to Digital Signal Processing using Matlab", Cengage Learning,2014.
5. R. Lakshmi Rekha, "Digital Singal Processing" – ALR Publications – 2016.

1702EC504		COMPUTER NETWORKS	L	T	P	C
			3	0	0	3
		(Common to B.E / B.Tech – CSE, IT & ECE)				

Course Objectives:

1. To understand networking concepts and basic communication model
2. To understand network architectures and components required for data communication.
3. To analyze the function and design strategy of physical, data link, network layer and transport layer
4. To acquire basic knowledge of various application protocol for internet security issues and services.

Unit I	**INTRODUCTION AND CONCEPTS OF NETWORKS**	**9 Hours**

Networks – Categories of Networks –Network hardware– Network software– Network Architecture – TCP/IP reference models – Network LAN technologies - Transmission media.

Unit II	**DATA LINK LAYER AND PHYSICAL LAYER**	**9 Hours**

Data link layer: Functionality of data link layer- Data link control and protocols – Error Detection and Error Correction - MAC – Ethernet- Wireless LAN- Broadband wireless – Bluetooth – Data link layer switching – **Physical layer:** Basis for data communication- Wireless transmission- Transmission media- Multiplexing- Channel capacity- switching

Unit III	**NETWORK LAYER**	**9 Hours**

Network layer – Functionality of network layer- Network addressing- Network routing- Routing algorithms- Internetworking- Quality of service- Network layer protocols- Switching concepts – Circuit switching – Packet switching- Network layer design issues.

Unit IV	**TRANSPORT LAYER**	**9 Hours**

Functionality of transport layer- Transport layer service – Elements of transport protocols- Transmission control protocol– Congestion control and avoidance – User datagram protocol- Delay tolerant networking- Transport for Real Time Applications (RTP).

Unit V	**APPLICATIONS AND SECURITY**	**9 Hours**

Applications protocols– Client and server model- Network services- DES- RSA- Web security- Recent trends, development and issues

Total:	**45 Hours**

Further Reading:

1. Socket Programming
2. Connectionless Transport " UDP

Course Outcomes:

After completion of the course, Student will be able to

1. Able to trace the flow of information from one node to another node in the network
2. Able to Identify the components required to build different types of networks
3. Able to understand the functionalities needed for data communication into layers
4. Able to choose the required functionality at each layer for given application
5. Able to understand the working principles of various application protocols and fundamentals of security issues and services available.

References:

1. Achyut S Godbole,AtulHahate, " Data Communications and Networks", Second edition 2011
2. Andrew S.Tannenbaum David J. Wetherall, "Computer Networks" Fifth Edition , Pearson Education 2011
3. Douglas E. Comer, ―Internetworking with TCP/IP (Volume I) Principles, Protocols and Architecture‖, Sixth Edition, Pearson Education, 2013.
4. Forouzan, " Data Communication and Networking", Fifth Edition , TMH 2012.
5. James F. Kurose, Keith W. Ross, "Computer Networking: A Top-down Approach, Pearson Education, Limited, sixth edition,2012.

6. Larry L. Peterson & Bruce S. Davie, "Computer Networks – A systems Approach", Fifth Edition, Morgan Kaufmann, 2012
7. William Stallings, ―Data and Computer Communications‖, Tenth Edition, Pearson Education, 2013

1702EC551		ANALOG COMMUNICATION LABORATORY	L	T	P	C
			0	0	4	2

Course Objectives:	**The student should be made to:**
	1. Understand the basics of analog communication.
	2. Study the different modulators.
	3. Know the noise performance in communication system.

List of Experiments:		
1. Generation and Demodulation of AM.		
2. Generation and Demodulation of FM.		
3. FM modulation using PLL.		
4. Study of PAM,PWM and PDM		
5. Study of FDM and TDM.		
6. Generation of AM using MATLAB.		
7. Generation of FM using MATLAB.		
8. Study of Super heterodyne receiver.		
9. Performance analysis of noise in Communication system.		
10. Removal of noise in AM and FM.		
	Total:	**45 Hours**

Additional Experiments:	Pace Maker Circuit
	Industrial Instrumentation amplifier
Course Outcomes:	
	After completion of the course, Student will be able to
	1. Design of AM and FM Circuits.
	2. Design of AM and FM Circuits using MATLAB.
	3. Determine the different multiplexing technique.
	4. Design of Super Heterodyne receiver.
	5. Compute the noise performance in communication system.

1702EC552		DIGITAL SIGNAL PROCESSING LAB	L	T	P	C
			0	0	4	2
		(Common to B.E / B.Tech – ECE,CSE & IT)				

Course Objectives:	**The student should be made to:**
	1. To make the students understand the behavior and response of the filter using different methods
	2. To study the output response of the system, sampling rate conversion and FFT spectrum
	3. To know the generation of the signals and arithmetic operations using TMS320C5X DSP Processor.

List of Experiments:
1. Generation of Signals
2. Properties of Discrete time Systems-Linearity, Stability, Causality &Time Variance.
3. Sampling of an audio signal with different sampling rate and reconstruct the sampled signal.
4. Computation of DFT of a signal using basic equation and FFT & power spectrum estimation using DFT
5. Design and Simulation of IIR filters.
6. Design and Simulation of FIR filters
7. Multirate signal processing-Down sampling , Up sampling , Decimation and Interpolation

8. Arithmetic operations in DSPs			
9. Generation of waveforms using DSPs			
10. Computation of convolution and correlation between signals using DSPs			
11. Implementation of IIR Filters using DSPs			
12. Implementation of FIR Filters using DSPs			
		Total:	**45 Hours**
Additional Experiments:	https://www.texasinstruments.in		
	Basic experiments using ADSP processor		
Course Outcomes:			
	After completion of the course, Student will be able to		
	1. Design of digital filter and Generation of various signals, Analysis of signal and system properties.		
	2. Computation of circular and linear convolution.		
	3. Determine the frequency transformation and Analysis of sampling rate.		
	4. Design of digital filters.		
	5. Analyze the power spectral density of the system.		

		TECHNICAL SEMINAR	**L**	**T**	**P**	**C**
			0	**0**	**2**	**1**
Course Objectives:		**The student should be made to:**				
		1. To develop self-learning skills of utilizing various technical resources to make a technical presentation.				
		2. To promote the technical presentation and communication skills.				
		3. To impart the knowledge on intonation, word and sentence stress for improving communicative competence, identifying and overcoming problem sounds.				
		4. To promote the ablility for Interacting and sharing attitude.				
		5. To encourage the commitment-attitude to complete tasks.				

The students are expected to make two presentations on advanced topics (recent trends) related to III or IV semester subjects. A faculty guide is to be allotted and he / she will guide and monitor the progress of the student and maintain attendance also. Students are encouraged to use various teaching aids such as power point presentation and demonstrative models

Evaluation Scheme: **Continuous Assessment (100)**

Distribution of marks for Continuous Assessment:

Presentation I (40) Report (10)
Presentation II (40) Report (10)

Total Marks (100)

		Total:	**45 Hours**
Course Outcomes:			
	After completion of the course, Student will be able to		
	1. Identify and utilize various technical resources available from multiple field.		
	2. Improve the technical presentation and communication skills.		
	3. Improve communicative competence.		
	4. Interact and share their technical knowledge.		
	5. Understand and adhere to deadlines and commitment to complete the assignments.		

		LIFE SKILLS: APTITUDE - I	**L**	**T**	**P**	**C**
			0	**0**	**2**	**1**
		B.E – ECE				

Course Objectives:

1. To brush up problem solving skill and to improve intellectual skill of the students
2. To be able to critically evaluate various real life situations by resorting to Analysis Of key issues and factors
3. To be able to demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions.
4. To enhance analytical ability of students
5. To augment logical and critical thinking of Student

Unit I	**INTRODUCTION TO NUMBER SYSTEM, BASIC SHORTCUTS OF ADDITION, MULTIPLICATION, DIVISION**	**5 Hours**

Classification of numbers – Types of Numbers - Divisibility rules - Finding the units digit - Finding remainders in divisions involving higher powers - LCM and HCF Models - Fractions and Digits – Square, Square roots – Cube, Cube roots – Shortcuts of addition, multiplication, Division.

Unit II	**Ratio and proportion, Averages**	**5 Hours**

Definition of Ratio - Properties of Ratios - Comparison of Ratios - Problems on Ratios - Compound Ratio - Problems on Proportion, Mean proportional and Continued Proportion Definition of Average - Rules of Average - Problems on Average - Problems on Weighted Average - Finding average using assumed mean method.

Unit III	**Percentages, Profit And Loss**	**5 Hours**

Introduction Percentage - Converting a percentage into decimals - Converting a Decimal into a percentage - Percentage equivalent of fractions - Problems on percentages - Problems on Profit and Loss percentage- Relation between Cost Price and Selling price - Discount and Marked Price - Two different articles sold at same Cost Price - Two different articles sold at same Selling Price - Gain% / Loss% on Selling Price.

Unit IV	**Coding and decoding, Direction sense**	**5 Hours**

Coding using same set of letters - Coding using different set of letters - Coding into a number - Problems on R-model - Solving problems by drawing the paths - Finding the net distance travelled - Finding the direction - Problems on clocks - Problems on shadows - Problems on direction sense using symbols and notations.

Unit V	**Number and letter series Number and Letter Analogies, Odd man out**	**5 Hours**

Difference series - Product series - Squares series - Cubes series - Alternate series - Combination series - Miscellaneous series - Place values of letters - Definition of Analogy - Problems on number analogy - Problems on letter analogy - Problems on verbal analogy - Problems on number Odd man out - Problems on letter Odd man out - Problems on verbal Odd man out

Total:	**30 Hours**

ASSESSMENT PATTERN :

1. Two tests will be conducted (25 * 2) - 50 marks
2. Five assignments will be conducted (5*10) - 50 Marks

Course Outcomes:

After completion of the course, Student will be able to

1. Learners should be able to understand number and solving problems least time using various shortcut
2. Solve problems on averages; compare two quantities using ratio and proportion.
3. Calculate concept of percentages, implement business transactions using profit and loss.
4. Workout concepts of Coding and Decoding, ability to visualize directions and understand the logic behind a sequence.
5. Learners should be able to find a series the logic behind a sequence.

References:

1. Arun Sharma, 'How to Prepare for Quantitative Aptitude for the CAT', 7th edition, McGraw Hills publication, 2016.
2. Arun Sharma, 'How to Prepare for Logical Reasoning for CAT', 4th edition, McGraw Hills publication, 2017.
3. R S Agarwal, 'A modern approach to Logical reasoning', revised edition, S.Chand publication, 2017.
4. R S Agarwal, 'Quantitative Aptitude for Competitive Examinations', revised edition, S.Chand publication, 2017.
5. Rajesh Verma, "Fast Track Objective Arithmetic", 3rd edition, Arihant publication, 2018.
6. B.S. Sijwalii and Indu Sijwali, "A New Approach to REASONING Verbal & Non-Verbal", 2nd edition, Arihnat publication, 2014.

1703EC501	NANO ELECTRONICS	L	T	P	C
		3	0	0	3
	(Common to B. E / B. Tech – CSE, IT & ECE)				

Course Objectives:

1. To be exposed of basic electronics and quantum electronics.
2. To be familiar with basic Nano electronics devices and Plasmonics.
3. To learn about optoelectronics and Spintronics.
4. To know various architecture methodologies

Unit I	INTRODUCTION TO ELECTRONICS AND QUANTUM DEVICES:	9 Hours

Classification Of Solids-Energy Level-Intrinsic and Extrinsic Semiconductor-Conduction In Metal And Semiconductor-Semiconductor Diodes-Basic Principle Of Led-Charge And Spin In Single Quantum Dots-Coulomb Blockade-Electrons In Mesoscopic Structures-Single Electron Transfer Devices (Sets)-Electron Spin Transistor –resonant tunnel diodes ,tunnel FETs-quantum interference transistors devices(QUITs)-quantum dot cellular automata(QCAs)-quantum bits(qubits).

Unit II	NANOELECTRONICS DEVICES AND PLASMONICS:	9 Hours

Electronic transport in 1,2 and 3 dimensions-quantum confinement –energy sub bands –effective mass-diode conduction-mean free path in 3D-ballistic conduction –phase coherence length –quantized conductance-buttiker-landauer formula-electron transport in pn junctions-short channel nano transistor - single photon transistor using surface plasmon-nanowire surface plasmons-interaction with matter-channel plasmon-polarising guiding by sub wavelength metal groves-surface plasmon polarizations and localized surface plasmon.

Unit III	OPTOELECTRONIC CRYSTAL ANS ITS FABRICATION:	9 Hours

Linear optonic crystal –maxwells equations bloch's theorem transmission spectra –non linear optics in linear optonic crystals slab –nonlinear optonic crystal and its application-fabrication of optonic crystals structures(1D,2D&3D)-applications;1D crystals -coupler waveguide-high-Q cavities –optonic crystal fiber-4 tunable optonic crystal filters.

Unit IV	SPINTRONICS:	9 Hours

Spin tunnelling devices-magnetic tunnel junction –tunnelling spin polarization –giant tunnelling using MgO tunnel barriers-tunnel-based spin injectors-spin injections and spin transport in hybrid nanostructures –spin filters -spin diodes –magnetic tunnel transistor-spin relaxation and spin dephasing-memory devices and sensors-ferroelectric random access memory-MRAMS-field sensors –multferro electric sensors-spintronic biosensors

Unit V	NANOELETRONIC ARCHITECTURES AND COMPUTATIONS	9 Hours

Architecture principles-mono and multi processor systems-parallel data processing –power dissipation and parallelism –classic systolic arrays –molecular devices-properties –self-organization –size dependent limitations,computation:montecarlo simulations –computational methods and simulations from ab initio multiscale modelling –modelling of nanodevices

Total:	45 Hours

Further Reading:

1. Quantum Dots for fiber optic communication
2. Quantum cellular automata

Course Outcomes:

After completion of the course, Student will be able to

1. Explain the theory, principle of basic electronics and quantum electronics.
2. Explain the characteristics of Nano electronics and Plasmonic devices.
3. Summarize the various type's Optoelectronic crystals and its working principle.
4. Explain the characteristics, theory and construction of Spintronics devices.
5. Design an architecture Nanoelectronics system design

References:

1. W.Rainer,Nano electronics and information technology,wiley, 3rd 2012.
2. K.E.Drexlex,Nanosystems,Wiley, revised edition 2014
3. M.C.Gupta,J.Balloto the Handbook of photonics. CRC Press Taylor and Francis Group, 2nd edition 2006.
4. J.M.Martinez-Durat,RaulJ.Martin-palma."Nanotechnology for microelectronics and optoelectronics", 1st edition, 2006, Elsevier.
5. V.Kochelp,M.stroscio,''Introduction to nanoelectronics,Cambridge university press(2013).
6. RainerWaser,''Nano electronics and information technology;advanced electronic material and novel devices'',Wiley-VCH(2010).

1703EC502		AUTOMOTIVE ELECTRONICS	L	T	P	C
			3	0	0	3

Course Objectives:	
	To learn Automotive mechanical, transmission and braking systems and to update the latest trends followed in the industry.

Unit I	**AUTOMOTIVE MECHANICAL SYSTEMS: VEHICLE SYSTEMS**	**9 Hours**
Power Train System (Air System, Fuel System (Carburettor& Diesel Fuel Injection, Ignition System, Exhaust System and other Auxiliary Systems (Cooling, Lubrications & Electrical Systems)), Transmission System (Front, Rear &4 wheel Drive, Manual, Automatic Transmission, Differential). Braking System (Drum, Disc, Hydraulic, Pneumatic), Steering System (Rack and Pinion, Power Steering).		
Unit II	**ELECTRONICS IN AUTOMOTIVE SYSTEMS**	**9 Hours**
Need for Electronics in Automotive Systems: Performance (Speed, Power, and Torque), Control (Emission, Fuel Economy, Drivability, and Safety) & Legislation (Environmental legislation for pollution & Safety Norms). Overview of Vehicle Electronic Systems: Basic electrical components and their operation in an automobile: Power train subsystem (Starting systems, Charging systems - Ignition systems – Electronic fuel control), Chassis subsystem (ABS, TCS, & ESP) – Comfort and safety subsystems (Night Vision, Airbags, Seatbelt Tensioners, Cruise Control-Lane-departure-warning, Parking).		
Unit III	**INTEGRATED DEVELOPMENT ENVIRONMENT**	**9 Hours**
Introduction to Integrated development environment (IDE) – Getting started, HW / SW configuration (boot service, Host – target interaction) – Booting reconfiguration – Managing IDE – Target servers, agents, Cross development, debugging – Introduction to an IDE for lab board – RTOS, PC based debugger		
Unit IV	**EMBEDDED SYSTEM IN AUTOMOTIVE APPLICATIONS**	**9 Hours**
Engine management systems – Gasoline / Diesel systems, various sensors used in system – Electronic transmission control - Vehicle safety system – Electronic control of braking and traction – Body electronics – Infotainment systems – Navigation systems – System level tests – Software calibration using engine and vehicle dynamometers – Environmental tests for Electronic Control Unit - Application of Control elements and control methodology in Automotive System		
Unit V	**EMBEDDED SYSTEM COMMUNICATION PROTOCOLS**	**9 Hours**
Introduction to control networking – Communication protocols in embedded systems – SPI, I2C, USB – Vehicle communication protocols – Introduction to CAN, LIN, FLEXRAY, MOST, KWP2000		
	Total:	**45 Hours**

Further Reading:	Heat Combustion – Fast moving acceleration –ABS – Fuel Injector
Course Outcomes:	
	After completion of the course, Student will be able to
	1. Describe various mechanical systems in an automobile
	2. Illustrate different types of electronic systems in an automobile
	3. Outline the various stages of Integrated development environment to design an embedded system
	4. Explain the various embedded systems used in automotive applications
	5. Compare Vehicle Communication Protocols (K3).

References:

1. JoergSchaeuffele, Thomas Zurawka, ―Automotive Software Engineering Principles, Processes, Methods and Tools‖, SAE International, 2005.
2. BOSCH Automotive Handbook, 6th Edition, 2014.
3. Jean J.Labrosse, ―µC/OS-II Real Time Kernel,CMP Books‖, 2nd edition, 2002.
4. Denton. T, ―Automobile Electrical and Electronic Systems‖, 4th edition, 2012.
5. Ronald K. Jurgen, ―Automotive Electronics Handbook‖, McGraw Hill Publications, 1999.
6. Nicholas Navit, ―Automotive Embedded System Handbook‖, CRC Press, Taylor and Francis Group, 2009.

1703EC503		MICROELECTRONICS	L	T	P	C
			3	0	0	3
		(Common to B. E / B. Tech – CSE, IT & ECE)				

Course Objectives:

1. To be exposed of basics of semiconductor and applications.
2. To be familiar with advanced semiconductors and its applications.
3. To study the different types of amplifiers and its types.
4. To know about fabrication methodologies and circuit designing.

Unit I	INTRODUCTION TO MICROELECTRONICS:	9 Hours

Basic physics of semiconductor-diode models and circuits-physics of MOS transistor-MOS amplifiers – operational amplifiers- semiconductor theory- diodes –bipolar junction transistor(BJT)-BJT amplifiers-field effect transistor –FET amplifiers.

Unit II	MOSFET AND IC AMPLIFIERS:	9 Hours

Devices structure and physical operation-VI characteristics-biasing in MOS amplifier circuits-small signal operation and models-SPICE MOSFET-IC design philosophy-comparison of MOSFET and BJT-current sources –current mirrors-current steering circuits-high frequency response.

Unit III	MULTI STAGE AMPLIFIER AND FEEDBACK:	9 Hours

MOS differential pair –small signal operation of MOS differential pair-BJT differential pair-other non ideal characteristics and differential pair-differential amplifier with active words-multistage amplifiers-general feedback structure-four basic feedback topologies-series,shunt feedback-determining the loop gain- stability problems-effect of feedback in amplifiers poles-frequency compensation.

Unit IV	MICROELECTRONICS FABRICATION:	9 Hours

Clean room technology-silicon wafer production-thermal oxidation –lithography –advanced lithography – etching-diffusion process and ion implementation-thin film deposition –packaging –yields processing-CMOS & BIPOLAR process integration in practice-photo lithography-CVD epitaxy-plasma etching.

Unit V	MICROELECTRONIC DEVICES AND CIRCUITS:	9 Hours

Modelling-uniform semiconductor equilibrium-Uniform excitation of semiconductors- Non uniform Situations:The Five basic equations-Non uniform Carrier Injection :Flow Problems –Non uniformly Doped Semiconductors-Junction Diodes-Bipolar Junction Transistors-The MOS capacitor-Field effect Transistors-Single Transistor Linear Amplifiers Stags-Differential Amplifiers Stages-High Frequency Analysis of Linear Amplifiers.

	Total:	45 Hours

Further Reading:

1. Commercial applications of Microelectronic circuits.
2. FINFET

Course Outcomes:

After completion of the course, Student will be able to

1.Explain the theory, principle of semiconductors and its devices.

2.Learn the characteristics of advanced semiconductors and its applications

3.Discuss the working principle and characteristics of different types of amplifiers.

4.Explain the fabrication methodology of microelectronics components and devices

5.Explain the various characteristics of microelectronics devices and circuits

References:

1. Claudio talarico, A.S.Sedra and K.C.Smith, “Microelctronics”5/e,oxford university press 2003.

2.Richard C.Jaeger “Introduction to microelectronic fabrication”2nd edition, Prentice Hall 2002.

3. Cliton G.Fonsand “Microelectronic devices and Circuits” Tata McGraw-2006.

4. Behzadrazavi “Fundamentals of microelectronics”, John wiley India pvt,ltd, 2008.

5.Microelectronics – analysis and design,sundaram Natarajan. Tata McGraw hill.2007

1703EC504		BIOMEDICAL ENGINEERING	L	T	P	C
			3	0	0	3

Course Objectives:

1. To gain knowledge about the various physiological parameters and the methods of recording and also the method of transmitting these parameters.
2. To study about the various assist devices used in the hospitals and Biotelemetry.
3. To gain knowledge about various recently developed diagnostic and therapeutic techniques.

Unit I	PHYSIOLOGIC SYSTEM AND BIO-POTENTIAL RECORDING	9 Hours

The origin of Bio-potentials, Bio potential electrodes, Endocrine System, Nervous system, Vision system, Respiratory System, ECG, EEG, EMG,PCG, lead systems and recording methods, typical waveforms and signal characteristics.

Unit II	BIOLOGICAL AMPLIFIERS AND NON- ELECTRICAL PARAMETER MEASUREMENT	9 Hours

Biological amplifier, Blood flow meter, Cardiac output, Respiratory measurement, Blood pressure, Temperature, Pulse, Blood Cell Counters.

Unit III	ASSIST DEVICES AND DIATHERMY	9 Hours

Cardiac pacemakers, DC Defibrillator, Dialysis, Shortwave, Ultrasonic and Microwave type and their applications, Surgical Diathermy

Unit IV	BIOTELEMETRY AND ITS APPLICATIONS	9 Hours

Introduction to Biotelemetry, Component of Biotelemetry, Application of Biotelemetry, Radio pill, Electrical safety.

Unit V	RECENT TREND IN IMAGING SYSTEM AND MEDICAL INSTRUMENTS	9 Hours

X-Ray machines and Digital radiography, Biological effect of NMR imaging and Ultrasound, Medical Thermography, Endoscope unit, Laser in medicine, Cryogenic application, Computer tomography

	Total:	45 Hours

Further Reading:

1. Human Anatomy
2. Biological Electrodes
3. Recent trend in medical application.

Course Outcomes:

After completion of the course, Student will be able to

1. Classify various Bio-Signals and Waveform in Medical Science
2. Explain the Biological amplifiers and Non electrical parameter measurement.
3. Identify the devices in Medical field for particular application
4. Discuss the application of Biotelemetry.
5. Illustrate recent trends in medical Science

References:

1. Leslie Cromwell, “Biomedical Instrumentation and Measurement”, Prentice Hall of India, New Delhi, 2007.
2. John G.Webster, “Medical Instrumentation Application and Design”, 3rd Edition, Wiley India Edition, 2007.
3. Khandpur, R.S., “Handbook of Biomedical Instrumentation”, TATA McGraw - Hill, New Delhi, 2003.
4. JosephJ.Carr and John M.Brown, “Introduction to Biomedical Equipment Technology”, John Wiley and Sons, New York, 2004.
5. Joseph D.Bronzino,”The Biomedical Engineering Hand Book”,Second Edition, CRC Press,2000.

1703EC505		ROBOTIC VISION	L	T	P	C
			3	0	0	3

Course Objectives:

1. To learn the image fundamentals and mathematical transforms necessary for robotic vision
2. To understand the image segmentation and edge detection methods
3. To study the concepts of optics and lens systems

Unit I	INTRODUCTION	9 Hours

Introduction to robotic vision- 2D image transform, image filtering , relationship with other related fields- image formation perspective projection- orthographic projection- brightness- lenses- image sensing- sensing color.

Unit II	IMAGE SEGMENTATION & EDGE DETECTION	9 Hours

Simple geometrical properties- area & position- orientation- projection- run length coding topological properties- sequential labeling algorithm- local counting & iterative modification. Image segmentation- thresholding- histogramming- merging and splitting algorithm- edges in images-differential operators- discrete approximations- edge detection and localization

Unit III	IMAGE RECOGNITION	9 Hours

Future Extraction, Transform Based, Sift, Image Classification, Bayes Classification, Svm, Deep Learning

Unit IV	VIDEO ANALYTICS	9 Hours

Video surveillance, four ground extraction, pedestrian deduction, video analytics for navigation, abounded objects deduction

Unit V	MACHINE LEARNING	9 Hours

Learning –Types of Machine Learning –Supervised Learning –The Brain and the Neuron –Design a Learning System – Perspectives and Issues in Machine Learning –Concept Learning Task –Concept Learning as Search – Finding a Maximally Specific Hypothesis –Version Spaces and the Candidate Elimination Algorithm –Linear Discriminants – Perceptron –Linear Separability –Linear Regression.

Total: 45 Hours

Further Reading:

Robot Vision in Industrial Assembly and Quality Control Processes-Multi-Task Active-Vision in Robotics-An Approach to Perception Enhancement in Robotized Surgery using Computer Vision

Course Outcomes:

After completion of the course, Student will be able to

1. Identify the basic concepts of robotic vision and image formation
2. Analyze the geometric and topological properties of binary images
3. Apply the edge detection and segmentation techniques on real time images
4. Diagnose the degree of complications involved in optics related to robotic vision
5. Analyze the applications of robotic vision systems

References:

1. C.Rafeal Gonzalez and E.Richard Woods, Digital Image Processing, Third Edition, Pearson Education 2008.
2. Christopher M.Bishop “Pattern Recognition and Machine Learning”, 2nd printing 2011 edition.
3. Richard Duda, Peter Hart, David Stork, “Pattern Classification”, Publisher: Wiley; Second edition 2007.
4. Berthold Klaus paul horn, Robot vision, The MIT Press, McGraw Hill, 2012
5. Ales Ude, Robot vision, In-teh,2010
6. Ramesh Jain, Rangachar Kasturi and Brian G. Schunck, Machine Vision, McGraw Hill, 2006.
7. Anil K. Jain, Fundamentals of Digital Image Processing, PHI, 2006.

17EC006		COMPUTER ARCHITECTURE AND ORGANIZATION	L	T	P	C
			3	0	0	3
		(Common to B.E / B.Tech – CSE, IT & ECE)				

Course Objectives:

1. Describe software and hardware interaction layers in computer architecture
2. Describe central processing unit
3. Describe various machine language instructions
4. Describe various addressing modes
5. Describe various instruction types and Instruction cycle

Unit I	INTRODUCTION OF COMPUTER ORGANIZATION AND DATA REPRESENTATION IN COMPUTER SYSTEM	9 Hours

Main Components of Computers, Standard Organization, Historical Developments, Computer Level Hierarchy, Von Neumann and Non-Von Neumann Model, Positional Numbering Systems, Signed Integer Representation, Fixed and Floating Point Representation, Character Codes, Codes for Data Recording and Transmission, Error Detection and Error Correction.

Unit II	SIMPLE COMPUTER AND INSTRUCTION SET ARCHITECTURE	9 Hours

Introduction, MARIE, Instruction Processing, Simple Program, Hardwired Control, Micro programmed Control, Real World Example of Computer Architecture, Instruction Formats, Instruction Types, Addressing, Instruction Level Pipelining, Real World Example of ISA.

Unit III	MEMORY AND STORAGE SYSTEM	9 Hours

Memory - Classification of memories – ROM - ROM organization - PROM – EPROM – EEPROM –EAPROM, RAM – RAM organization, Memory Hierarchy, Cache and Virtual Memory, Interfacing Memory to a Processor, Real World Example of Memory Management, Amdahl's Law, I/O Architecture, External Memory - Optical Disk, Magnetic Tape, RAID, Solid State Drives, Data Compression, Computer Peripherals, Operating System Support.

Unit IV	PARALLEL ORGANIZATION AND ALTERNATIVE ARCHITECTURE	9 Hours

Parallel Processing – Multiple Processor Organization, Cache Coherence and MESI Protocol, Multi Core Computer – Hardware and Software Performance Issues, Intel X86 Multicore Organization, RISC Machines, Flynn's Taxonomy, Parallel and Multiprocessor Architecture, Alternative Parallel Processing Approaches.

Unit V	SYSTEM SOFTWARE AND PERFORMANCE MEASUREMENTS	9 Hours

Operating Systems, Protected Environments, Programming Tools, Database Software, Transaction manager, Computer Performance Equation, Mathematical Preliminaries, Bench Marking, CPU Performance Optimization, Disk Performance.

	Total:	45 Hours

Further Reading:

1. Input–Output Design and Organization, Data Formats
2. Modern Computer Systems, Communication Channel Technology

Course Outcomes:

After completion of the course, Student will be able to

1. Describe historical overview of computer and Numerical Representation Techniques.
2. Illustrate different types of Fundamental Computer Organization and Instruction Set.
3. Outline the Basic Memory Concept and External Storing Devices.
4. Explain the various Processing in Emerged in Recent Years.
5. Compare the Various Performance Analysis and System Software.

References:

1.David Tarnoff, "Computer Organization and Design Fundamentals", First Edition, 2007.

2. M. Morris Mano, "Computer System Architecture", 3rd Edition, Publisher: Pearson 2011.

3.MostafaAbd-El-Barr, Hesham El-Rewini, "Fundamentals of Computer Organization and Architecture", Wiley Inter science, John Wiley & Sons, Inc Publication, 2005.

4.Irv Englander, "The Architecture of Computer Hardware, System Software, and Networking", John Wiley & Sons, Inc Publication, 2009.

1703EC507		ADVANCED MICROCONTROLLERS	L	T	P	C
			3	0	0	3

Course Objectives:

1. To study about concepts of PIC and 8031/8051Microcontrollers
2. To know about Motorola Microcontroller
3. To explore knowledge about applications of Microcontrollers
4. To understand various system design Techniques

Unit I	**8051/8031 MICROCONTROLLERS**	**9 Hours**

Introduction to single chip microcontrollers Intel MCS – 51 family features, 8051/8031 architecture, pin configuration, I/O ports and Memory organization. Instruction set and basic assembly language programming

Unit II	**PIC MICROCONTROLLER**	**9 Hours**

Introduction to PIC micro -controller ,CPU Architecture – Instruction set – interrupts- Timers- I2C Interfacing –UART- A/D Converter –PWM and introduction to C-Compilers

Unit III	**MOTOROLA 68HC11 MICROCONTROLLERS**	**9 Hours**

Instruction set addressing modes – operating modes- Interrupt system- Serial Communication Interface – A/D Converter.

Unit IV	**INTERFACING AND APPLICATIONS OF MICRO CONTROLLERS**	**9 Hours**

Interrupts, Timer/Counter and Serial Communication. Interfacing LCD Display – Key pad Interfacing, MCS applications: Square wave and pulse wave generation, LED, A/D Converter and D/A Converter interfacingto8051.

Unit V	**SYSTEMDESIGN– CASESTUDIES**	**9 Hours**

Generation of Gate signals for converters and Inverters-Motor Control–Controlling DC/ AC appliances–Measurement of frequency-Stand alone Data Acquisition System.

Total:	**45 Hours**

Further Reading:

1.RTC- Interface with Motorola Microcontroller, PWM
2.UART- Interface with 68HC11 Motorola Microcontroller

Course Outcomes:

After completion of the course, Student will be able to

1. know basics of 8031/8051 Microcontrollers
2. Explain fundamentals of PIC Controller
3. understand concepts of Motorola 68HC11 Microcontrollers
4. Illustrate system design techniques using Microcontroller
5. examine applications and interfacing of Microcontroller

References:

1. Muhammed Ali Mazidi and Janice Gillispie Mazidi – The 8051 Microcontroller and Embedded Systems Using Assembly and C,II edition , Pearson Education Inc, 2012.

2. Muhammad Ali Mazidi, Rolin D.Mckinlay, Danny Causey 'PIC Microcontroller and Embedded Systems using Assembly and CforPIC18', Pearson Education 2008.

3. John .B.Peatman , " Design with PIC Microcontroller , Prentice hall, 1997.

4. AjayV Deshmukh–Microcontrollers Theory and Applications, Tata McGraw-Hill, 2015

5. Gene .H.Miller ." Micro Computer Engineering ," Pearson Education , 2003

6. Rajkamal,".Microcontrollers-Architecture,Programming,Interfacing&System Design",2ed,Pearson,2012

7. IScott Mackenzie and Raphael C.W. Phan,"The Microcontroller", Pearson , Fourth edition 2012

1703EC508	MEASUREMENT AND INSTRUMENTATION	L	T	P	C
		3	0	0	3

Course Objectives:

1. Learn the use of DC and AC bridges for measuring R, L and C
2. Learn the use of different types of analog meters for measuring electrical quantities such as current, voltage, power, energy, power factor and frequency
3. Learn the applications of CRO, other electronic measuring devices, graphical programming palettes and tools in virtual instrumentation

Unit I **MEASUREMENT CONCEPTS** **9 Hours**

Principles of operation and construction of PMMC-Static and dynamic characteristics-units and standards of measurements-error analysis-moving coil, moving iron meters, multi meters-True RMS
Meters-Bridge measurements: Maxwell, Kelvin, Hay, Schering, Anderson and Wien bridge-Q meters .

Unit II **TRANSDUCERS** **9 Hours**

Classification of transducers-selecting a transducer-strain gauges-temperature transducer – LVDT Advantages and disadvantages-capacitive transducers-Piezo electric transducers – opto electronic transducers.

Unit III **FUNCTION GENERATORS** **9 Hours**

Function generators-RF signal generators-Sweep generators-Frequency synthesizer-wave analyzer-Harmonic distortion analyzer-spectrum analyzer-heterodyne wave analyzer-frequency counters- Time
Interval measurement- Measurement of voltage, current, phase and frequency using CRO.

Unit IV **VIRTUAL INSTRUMENTATION** **9 Hours**

Introduction- Block diagram of a virtual instrument physical quantities and analog interfaces- Hardware and soft ware user interface- Advantages over conventional instruments- Architecture of a virtual instruments and its relation to the operating system-overview of software-lab view- Graphical user interface-controls and indicators-labels and texts-data types – format-data flow programming – editing debugging and running a virtual instrument-graphical programming palettes and tools.

Unit V **MODERN MEASUREMENT TECHNIQUES** **9 Hours**

A/D &D/A converters-Elements of a digital data acquisition system-interfacing of transducers – multiplexing-Use of recorders in digital systems-digital recording system-liquid crystal display-computer controlled instrumentation-IEEE 488 bus-fiber optic measurements for power and system loss.

Total: 45 Hours

Further Reading:

Vector meters and distortion meters-Measurement of Pressure, Temperature, and velocity-Special typeof CRO-Front panel objects-functions and libraries-Optical time domains reflect meter.

Course Outcomes:

After completion of the course, Student will be able to

1. Design different Bridge configurations and their applications.
2. Design different Embedded Projects using Transducers and Sensors.
3. Analyze the working of different Equipments used in Instrumentation.
4. Design different Virtual Instruments using LabVIEW Software.
5. Interface different analog components to a Computer controlled Instrumentation System

References:

1. Ernest, Doeblin, Dhanesh and N.Manik, Measurement Systems - Application and Design, Tata McGraw - Hill, 2007

2. Sawhney A K, “Electrical And Electronic Measurements And Instrumentation” **Publisher:** Dhanpat Rai & Co. 2005.

3. Albert D.Helfrick and William D.Cooper, Modern Electronic Instrumentation and Measurement Techniques, PHI, 2003

4. B.C.Nakara, K.K.Chaudhry, Instrumentation Measurement and Analysis, Tata McGraw - Hill,2004.

5. Joseph J.Carr, Elements of Electronics Instrumentation and Measurement, PHI, 2003.

6. Alan. S. Morris, Principles of Measurements and Instrumentation, PHI, 2003

17EC009		VIRTUAL INSTRUMENTATION	L	T	P	C
			3	0	0	3

Course Objectives:

1. Analog ic and digital measurements principles
2. Understanding Virtual Instrument concepts
3. Creating Virtual Instruments for practical works

Unit I	**Introduction to Virtual Instrumentation:**	**9 Hours**

Historical perspective – advantage block diagram and architecture of a virtual instrument -Conventional Instruments versus Traditional Instruments - data-flow techniques, graphical programming in data flow, comparison with conventional programming.

Unit II	**VI programming techniques**	**9 Hours**

VIs and sub-VIs, loops and charts, arrays, clusters and graphs, case and sequence structures, formula nodes, local and global variables, State machine, string and file I/O, Instrument Drivers, Publishing measurement data in the web.

Unit III	**Data acquisition basics**	**9 Hours**

Introduction to data acquisition on PC, Sampling fundamentals, Input/Output techniques and buses. ADC, DAC, Digital I/O, counters and timers, DMA, Software and hardware installation, Calibration, Resolution, Data acquisition interface requirements

Unit IV	**VI Chassis requirements**	**9 Hours**

Common Instrument Interfaces: Current loop, RS 232C/ RS485, GPIB. Bus Interfaces: USB, PCMCIA, VXI, SCSI, PCI, PXI, Firewire. PXI system controllers, Ethernet control of PXI. Networking basics for office & Industrial applications, VISA and IVI

Unit V	**VI toolsets, Distributed I/O modules and Applications**	**9 Hours**

. Application of Virtual Instrumentation Instrument Control, Development of process database management system, Simulation of systems using VI, Development of Control system, Industrial Communication, Image acquisition and processing, Motion control. **Applications** DistributedI/O modules-Virtual Laboratory, Virtual Oscilloscope, Virtual function generator, Motioncontrol. Development of Virtual Instrument using GUI, Real-time systems, Embedded Controller, OPC, HMI /SCADA

Total:	**45 Hours**

Further Reading:

LabVIEW Graphical Programming

Course Outcomes:

After completion of the course, Student will be able to

1. Understand importance and applications of virtual instrumentation
2. Understand basic data acquisition techniques of virtual instrumentation
3. Develop real time applications of virtual instrumentation
4. Analog and digital measurements principles
5. Understand the tool sets of virtual instrumentation

References:

1. Robert H. Bishop,LabVIEW 2009 Student Edition, Pearson College Division, 2009.
2. N.Mathivanan, PC-based Instrumentation: Concepts and Practice, Eastern Economy Edition, PHI Learning private Ltd,2007.
3. Kevin sJames, PC Interfacing and Data Acquisition: Techniques for Measurement, Instrumentation and Control, Newness, 2000.
4. Jovitha Jerome, Virtual Instrumentation Using Lab VIEW, Eastern Economy Edition, PHI Learning Private, 2010.

1702CSX01		OPERATING SYSTEMS	L	T	P	C
			3	0	0	3
		(Common to B.E / B.Tech – ECE, CSE, IT)				

Course Objectives:	The student should be made to:
	1.Study the basic concepts and functions of operating systems.
	2.Understand the structure and functions of OS.
	3.Learn about Processes, Threads and Scheduling algorithms
	4.Understand the principles of concurrency and Deadlocks.
	5.Learn various memory management schemes
	6.Study I/O management and File systems.

Unit I	INTRODUCTION	5 Hours

Introduction- Operating System Structure – Operating System Operations – Process Management – Memory Management – Storage Management – Protection and Security – Distributed Systems –Computing Environments – System Structures: Operating System Services – User Operating System Interface – System Calls – Types of System Calls – System Programs. OS Generation and System Boot.

Unit II	PROCESS MANAGEMENT	12 Hours

Processes-Process Concept, Process Scheduling, Operations on Processes, Inter process Communication; Threads-Overview, Multicore Programming, Multithreading Models; Windows 7 -Thread and SMP Management. Process Synchronization - Critical Section Problem, Mutex Locks, Semophores, Monitors; CPU Scheduling and Deadlocks. Deadlock Characterization – Methods for handling Deadlocks -Deadlock Prevention – Deadlock avoidance – Deadlock detection – Recovery from Deadlocks

Unit III	MEMORY MANAGEMENT	10 Hours

Memory Management: Background – Swapping – Contiguous memory allocation –Paging – Segmentation – Segmentation with paging. Virtual Memory: Background –Demand paging – Process creation – Page replacement – Allocation of frames –Thrashing. Case Study: Memory management in Linux.

Unit IV	STORAGE MANAGEMENT	9 Hours

File System : File concept – Access methods – Directory structure – File system mounting – Protection. File-System Implementation : Directory implementation – Allocation methods – Free-space management – efficiency and performance – recovery. Case studies: File system in Linux – File system in Windows XP

Unit V	I/O SYSTEMS	9 Hours

I/O Systems – I/O Hardware – Application I/O interface – kernel I/O subsystem –streams – performance. Mass-Storage Structure: Disk scheduling – Disk management –Swap-space management – RAID – disk attachment – stable storage – tertiary storage. Case study: I/O in Linux.

	Total:	45 Hours

Further Reading:

Linux System, LINUX Multifunction Server, VMware on Linux Host and Adding Guest OS.

Course Outcomes:

After completion of the course, Student will be able to

1. Understand Operating System Structure, Operations and Services& Illustrate the operating system concepts and its functionalities.
2. Understand the Process Concept, Multithreaded Programming, Process Scheduling and Synchronization
3. Apply the Concepts of Virtual Memory Management and File Systems
4. Analyze the Secondary Storage and I/O Systems
5. Evaluate the different Protection and Security Mechanisms for Operating System

References:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 9th Edition, John Wiley and Sons Inc., 2012.

2.Andrew S. Tanenbaum, "Modern Operating Systems", Third Edition Prentice Hall of India Pvt. Ltd, 2010 (Case Study Topic).

3. Harvey M. Deitel, "Operating Systems", Pearson Education Pvt. Ltd, Second Edition, 2002.

4. William Stallings, "Operating System", Pearson Education, Sixth Edition, 2012.

E.G.S.PILLAYENGINEERINGCOLLEGE

(Autonomous)

Approved byAICTE,New Delhi|Affiliated to AnnaUniversity, Chennai Accredited byNAAC with „A"Grade|Accredited byNBA (CSE, EEE, MECH)

NAGAPATTINAM–611002

B.E. Electronics and Communication Engineering

Full Time Curriculum and Syllabus

Third Year– Sixth Semester

Course Code	Course Name	L	T	P	C	Maximum Marks		
						CA	ES	Total
Theory Course								
1701MGX01	Professional Ethics	2	0	0	2	40	60	100
1702EC601	VLSI Design	3	0	0	3	40	60	100
1702EC602	Digital Communication	3	0	0	3	40	60	100
1702EC603	Wireless Networks and Standards	3	0	0	3	40	60	100
1703EC814	Internet of Things (IoT)	3	0	0	3	40	60	100
	Professional(Open) Elective – IV	3	0	0	3	40	60	100
Laboratory Course								
1702EC651	VLSI Design Laboratory	0	0	2	1	50	50	100
1702EC652	Communication and Networks Laboratory	0	0	2	1	50	50	100
	Industrial Visits & Presentation	0	0	0	1	100	-	100
	Life Skills: Aptitude - II	0	0	2	1	100	-	100
	Total	**18**	**0**	**6**	**21**	**540**	**460**	**1000**
Professional (Open)Elective - III								
1703EC601	Information Theory and Coding	3	0	0	3	40	60	100
1703EC602	Digital Control Engineering	3	0	0	3	40	60	100

1703EC603	Network Security	3	0	0	3	40	60	100
1703EC604	Real Time Operating Systems	3	0	0	3	40	60	100
1703EC605	Soft Computing	3	0	0	3	40	60	100
Professional Elective – IV								
1703EC813	Cloud Computing	3	0	0	3	40	60	100
1703EC814	Internet of Things (IoT)	3	0	0	3	40	60	100
1703EC815	Big Data Analytics	3	0	0	3	40	60	100
1703EC816	Introduction to Web Technology	3	0	0	3	40	60	100
1703EC817	Grid Computing	3	0	0	3	40	60	100

L–Lecture|T–Tutorial|P–Practical|C–Credit|CA –ContinuousAssessment| ES–EndSemester

1701MGX01		**PROFESSIONAL ETHICS**	**L**	**T**	**P**	**C**
			3	**0**	**0**	**3**
Course Objectives:						
	1.To provide basic knowledge about engineering Ethics, Variety of moral issues and Moral dilemmas, Professional Ideals and Virtues					
	2.To provide basic familiarity about Engineers as responsible Experimenters, Research Ethics, Codes of Ethics, Industrial Standards, Exposure to Safety and Risk, Risk Benefit Analysis					
	3.To have an idea about the Collegiality and Loyalty, Collective Bargaining, Confidentiality, Occupational Crime, Professional, Employee, Intellectual Property Rights					
	4. To have an adequate knowledge about MNC's, Business, Environmental, Computer Ethics, Honesty, Moral Leadership, sample Code of Conduct.					
	5.To use the engineering principles to update and maintain the technical skills.					
Unit I	**I ENGINEERING ETHICS**					**9 Hours**
Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Professions and Professionalism – Professional Ideals and Virtues – Uses of Ethical Theories.						
Unit II	**II ENGINEERING AS SOCIAL EXPERIMENTATION**					**9 Hours**
Engineering as Experimentation – Engineers as responsible Experimenters – Research Ethics - Codes of Ethics – Industrial Standards - A Balanced Outlook on Law – The Challenger Case Study.						
Unit III	**ENGINEER'S RESPONSIBILITY FOR SAFETY**					**9 Hours**
Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis – Reducing Risk – The Government Regulator's Approach to Risk - Case Studies on Chernobyl, Bhopal MIC and Sterlite copper.						
Unit IV	**RESPONSIBILITIES AND RIGHTS**					**9 Hours**
Collegiality and Loyalty – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination.						

Unit V	**GLOBAL ISSUES**	**9 Hours**
Multinational Corporations – Business Ethics - Environmental Ethics – Computer Ethics - Role in Technological Development – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Honesty – Moral Leadership – Sample Code of Conduct.		
	Total:	**45 Hours**
Further Reading:		
	Case study on Hiroshima and Nagasaki	
Course Outcomes:		
	After completion of the course, Student will be able to	
	1. Helps to examine situations and to internalize the need for applying Ethical principles, values to tackle with various situations.	
	2. Develop a responsible attitude towards Global issues	
	3. Envision the societal impact on the products/ projects	
	4. Understanding the code of ethics and standards	
	5. Apply ethics in society, discuss the global issues related to engineering and realize the responsibilities and rights in the society	
References:		
1. Charles D Fleddermann, “Engineering Ethics”, Prentice Hall, New Mexico, 1999.		
2. John R Boatright, “Ethics and the Conduct of Business”, Pearson Education, 2003		
3. Edmund G Seebauer and Robert L Barry, “Fundamentals of Ethics for Scientists and Engineers”, Oxford University Press, 2001.		
4. Prof. (Col) P S Bajaj and Dr. Raj Agrawal, “Business Ethics – An Indian Perspective”, Biztantra, New Delhi 2004		
5. David Ermann and Michele S Shauf, “Computers, Ethics and Society”, Oxford University Press, (2003)		

1702EC601		**VLSI DESIGN**	**L**	**T**	**P**	**C**
			3	**0**	**0**	**3**
Course Objectives:						
	1. To understand the CMOS Fabrication Process and CMOS Circuits					
	2. To study CMOS Circuits using various Logic Styles					
	3. To provide basic knowledge about Clocking, Memory and VLSI Subsystem Design					
UNIT I	**FABRICATION OF CMOS IC AND PHYSICAL DESIGN**					**9 Hours**
An overview of Silicon Semiconductor technology- NMOS fabrication - CMOS fabrication: n-well, pwell- Twin tub and SOI Process- Layout design rules- Lambda Design Rules Stick Diagrams-VLSI Layout Design -Full Custom and Semi Custom Layout- Layout of Basic Structures - CMOS Logic Gates- Implementation of given logic function using CMOS logic-Basics of MEMS.						
UNIT II	**MOS CIRCUIT DESIGN PROCESS**					**9 Hours**
Pass Transistor and Transmission Gate Static CMOS design, Tri-State Circuits- Pseudo Nmos –dynamic CMOS logic Clocked CMOS logic Precharged domino logic- Keeper Circuits - Dual Rail- Cascode Voltage Switch Logic-Circuit Pit Falls						
UNIT III	**CMOS LOGIC STYLES**					**9 Hours**
National and International standardizing organizations – FCC, CISPR, ANSI, DOD, IEC, CENEEC, FCC CE and RE standards – CISPR, CE and RE Standards, IEC/EN, CS standards – Frequency assignment – spectrum conversation.						
UNIT IV	**CMOS MEMORIES AND CLOCKING**					**9 Hours**

Conventional CMOS Latches CMOS D Flip Fop SDFF - TSPC Flip Flop - CMOS Static RAM Dual Port SRAM - SRAM Arrays - DRAM and Floating Gate MOSFET - Flash Memory CMOS Clocking Styles Pipelined Systems		
UNIT V	**VLSI SUBSYSTEM DESIGN**	**9 Hours**
CMOS Mux - Equality Detector - Shift and Rotation Operation - Parity generators- Ripple Carry Adder-Carry Look Ahead Adder -Carry Skip Adder - Carry select - Carry save-Array - Braun/ Baugh Wooley -Modified Booth Encoded Multiplier		
	Total:	**45 Hours**
Further Reading:	Comparison of Logic Styles - Differential and Sense Amplifier Circuits Prescaler - Bit Slice – ALU CMOS Clock Generation and Distributions - BICMOS- FINFET Technology	
Course Outcomes:		
	After completion of the course, Student will be able to	
	1. Demonstrate CMOS Fabrication process and Layout Design.	
	2. Analyze MOS Circuit Design Process.	
	3. Design the circuits using Various Logic Styles	
	4. Reveal the operation of CMOS Memory and Clocking Strategies	
	5. Design building block of VLSI system.	
References:		
1. John P.Uyemura, "Introduction to VLSI circuits and systems", John Wiley & Sons, 2015		
2. Neil.H.EWeste David Harris CMOS VLSI Design: A Circuits and Systems Perspective, 4th edition, Pearson Addison Wesley, 2015.		
3. Kamran Eshraghian, Douglas A. Pucknell, Essentials of VLSI Circuits and Systems Prentice Hall of India, 2015.		
4. E. Fabricious, Introduction to VLSI Design, 1st edition, McGraw Hill, 2014		
5. Keng,Lablebick,"CMOS Digital Integrated Circuits", Tata McGraw Hill, 2014		

17EC602		**DIGITAL COMMUNICATION**	**L**	**T**	**P**	**C**
			3	**0**	**0**	**3**
Course Objectives:						
	1. To know the principles of amplitude modulation					
	2. To apply the concepts of Error control coding.					
	3. To understand the various Band pass signaling schemes.					
	4. To understand the principles of spread spectrum.					
UNIT I	**AMPLITUDE MODULATION**					**9 Hours**
Review of Fourier and Hilbert Transforms-Amplitude Modulation – AM, DSBSC, SSBSC, VSB– Spectral analysis of modulated signals–Demodulation – Square law, envelope detectors Super heterodyne receivers.						
UNIT II	**ERROR CONTROL CODING TECHNIQUES**					**9 Hours**
Channel coding theorem – Linear block codes – Hamming codes – Cyclic codes – Convolutional codes – Viterbi decoding.						
UNIT III	**INTRODUCTION AND INFORMATION THEORY**					**9 Hours**
Measure of information – Entropy – Source coding theorem – Discrete memory less channels– lossless, deterministic, noiseless, BEC, BSC – Mutual information – Channel capacity – Shannon Hartley law-Transform coding – LPC – Shannon-Fano coding, Huffman Coding, Run length coding, LZW algorithm.						
UNIT IV	**BANDPASS SIGNALING**					**9 Hours**
Comparison of base band and band pass signaling, Geometric representation of signals – ML detection - Correlator and matched filter detection- generation and detection of BPSK, BFSK, QPSK- BER and Power spectral Density Comparison- Structure of non-coherent receivers- generation and detection of						

BFSK, DPSK – Principles of QAM – Introduction to Band Pass Sampling theorem.		
UNIT V	**SYNCHRONISATION AND SPREAD SPECTRUM TECHNIQUES**	**9 Hours**
Importance of Sync hronisation – Carrier, frame and symbol/Chip synchronization techniques, Spread Spectrum - PN Sequences, Direct Sequence and Frequency Hopping Spread Spectrum Systems, BER Analysis, Processing gain and Jamming Margin, Spread spectrum in Cellular Systems.		
	Total:	**45 Hours**
Further Reading:	Frequency of Spread Spectrum – TDMA – FDMA – CDMA – OFDMA.	
Course Outcomes:		
	After completion of the course, Student will be able to	
	1. Design and implement the amplitude modulation	
	2. An ability to apply the concepts of Error control coding.	
	3. Capable of configuring Source coding schemes	
	4. Design and implement band pass signaling schemes.	
	5. Knowledge on the principle of spread spectrum.	
References:		
1. Simon Haykin, "Digital Communications", John Wiley, 2015.		
2. J.G Proakis, ―Digital Communication‖, 5/e, Tata Mc Graw Hill Company, 2008.		
3. Bernard Sklar, "Digital Communication", 2nd Edition, Pearson Education, 2006.		
4. Herbert Taub & Donald L Schilling , "Principles of Communication Systems", 3rd Edition, Tata McGraw Hill, 2008.		
5. H P Hsu, Schaum Outline Series- ―Analog and Digital Communications‖, TMH 2006 .		

17EC603		**WIRELESS NETWORKS AND STANDARDS**	**L**	**T**	**P**	**C**
			3	**0**	**0**	**3**
		(Common to B.E / B.Tech – CSE, IT & ECE)				
Course Objectives:						
	1. To study about Wireless networks, protocol stack and standards.					
	2. To study about fundamentals of Access Techniques and Control Protocols					
	3. To study about Localization, Positioning and Wireless Security					
Unit I	**Overview of Wireless Sensor Networks and Wireless Transmission**					**9 Hours**
Introduction of WSN, Basic Overview of the Technology, Range of Applications, Examples of WSN Applications, Frequencies for radio transmission, Signals, Antenna, Signal Propagation, Multiplexing, Modulation, Spread Spectrum.						
Unit II	**Multiple Access Techniques**					**9 Hours**
Introduction, Narrowband Channelized Systems, Spectral Efficiency, Wideband Systems, Comparisons of FDMA, TDMA, and DS-CDMA, Capacity of DS-CDMA System, Comparison of DS-CDMA vs. TDMA System Capacity, Frequency Hopping Spread Spectrum with M-ary frequency Shift Keying, Orthogonal Frequency Division Multiplexing (OFDM), Multicarrier DS-CDMA (MC-DS-CDMA), Random Access Methods, Idle Signal Casting Multiple Access, Packet Reservation Multiple Access, Error Control Schemes for Link Layer.						
Unit III	**Routing and Transport Control Protocols for Wireless Sensor Networks**					**9 Hours**
Introduction, Data Dissemination and Gathering, Routing Challenges and Design Issues in Wireless Sensor Networks, Routing Strategies in Wireless Sensor Networks, Traditional Transport Control Protocols, Transport Protocol Design Issues, Examples of Existing Transport Control Protocols, Performance of Transport Control Protocols						
Unit IV	**Localization and positioning**					**9 Hours**
Properties of localization and positioning procedures, Possible approaches, Mathematical basics for the lateration						

problem, Single-hop localization, Positioning in multihop environments, Topology control - Motivation and basic ideas, Controlling topology in flat networks, Hierarchical networks by dominating sets, Hierarchical networks by clustering, Combining hierarchical topologies and power control, Adaptive node activity		
Unit V	**Security in Wireless Systems and Wireless Application Protocol**	**9 Hours**
Security and Privacy Needs of a Wireless System, Required Features for a Secured Wireless Communications System, Methods of Providing Privacy and Security in Wireless Systems, Wireless Security and Standards, IEEE 802.11 Security, Security in North American Cellular/PCS Systems, Security in GSM, GPRS, and UMTS, Data Security, Air Interface Support for Authentication Methods, WAP Programming Model, WAP Architecture, WAP Advantages and Disadvantages, Applications of WAP, imode versus WAP		
	Total:	**45 Hours**
Further Reading:		
	1. Network Management and Operating Management for Wireless Sensor Networks	
	2. Performance and Traffic Management	
	3. Node and Network Architecture	
	4. Time synchronization, Naming and addressing	
Course Outcomes:		
	After completion of the course, Student will be able to	
	1. Analyse the challenges and constraints of wireless sensor network and its subsystems	
	2. Examine the Multiple Access Techniques, Spread Spectrum and Multiplexing	
	3. Analyse the protocols used at the Routing and Transport Control	
	4. compare and analyse the types of Localization, positioning and topology techniques	
	5. Identify the application areas and practical implementation issues.	
References:		
1. Jochen Schiller, "Mobile Communications", Second Edition, Pearson Education 2012.		
2. Vijay Garg, "Wireless Communications and networking", First Edition, Elsevier 2007.		
3. Kazem Sohraby, "Wireless Sensor Networks Technology, Protocols and Applications", Wiley Interscience 2007.		
4. Holger Karl, "Protocols and architectures for Wireless Sensor Networks", John Wiley & Sons 2005.		

17EC651		**VLSI DESIGN LABORATORY**	**L**	**T**	**P**	**C**
			0	**0**	**2**	**1**
Course Objectives:						
	1. To gain expertise in design, development and simulation of digital circuits with Verilog HDL.					
	2. To apply concepts and methods of digital system design techniques through hands-on experiments.					
	3. To develop skills, techniques and learn state-of-the-art engineering tools (such as HDL, Xilinx tools)					
List of Experiments:						
I. Design and simulation of Combinational Logic Circuit using Verilog HDL						
1. Adder – Carry Select & Carry Save, Multiplexer and Demultiplexer, Encoder and Decoder						
2. Multiplier						
II. Design and simulation of Sequential Logic Circuit using Verilog HDL						
3. Flip-flops, Counters, Shift Registers						
4. Frequency Dividers						
III. CMOS Circuit design using SPICE (DC and Transient Analysis)						
5. CMOS Inverter						

6. CMOS NAND and NOR Gates		
7. CMOS Latch		
IV. FPGA Implementation		
8. 4 bit Adder		
9. 4x4 Multiplier		
10. ALU Design		
	Total:	**45 Hours**

Additional Experiments:	
1. Synchronous Sequential Logic circuits.	
2. Asynchronous Sequential Logic circuits.	

Course Outcomes:	
After completion of the course, Student will be able to	
1. Design and simulation of Combination Logic Circuit using Verilog HDL.	
2. Design and simulation of Sequential Logic Circuit using Verilog HDL.	
3. Design, Simulate and Extract the layouts of Analog IC Blocks using spice.	
4. Analyze transient characteristics.	
5. Import the logic modules into FPGA boards.	

1702EC652	**COMMUNICATION AND NETWORKS LAB**	**L**	**T**	**P**	**C**
		0	**0**	**4**	**2**
	(Common to B.E / B.Tech – CSE, IT & ECE)				

Course Objectives:	
1. To make students aware about various types of cables used in guided media like coaxial cable, optical fiber cable, twisted pair cables and its categories	
2. To understand the working difference between straight cable and cross over cable.	
3. To use the packet tracer to simulate various networks.	

List of Experiments:		
1. Study of Network Topologies		
2. Implementation And Study of Stop & Wait Protocol		
3. Implementation And Study of Go Back N Protocol		
4. Implementation And Study of Selective Repeat Protocol		
5. Configure a Network Using Distance Vector Routing Protocol		
6. Configure a Network Using Link State Vector Routing Protocol		
7. Implementation And Study of CSMA/CA Protocol		
8. Implementation of Data Encryption And Decryption		
9. Configure a Network Topology Using Packet Tracer Software		
10. To Create Scenario And Study The Performance of Network With CSMA/CD Protocols through Simulation		
	Total:	**45 Hours**

Additional Experiments:	
1. To Create Scenario And Study The Performance of Token Bus And Token Ring Protocols Through Simulation	
2. Study of Socket Processing	

Course Outcomes:	
After completion of the course, Student will be able to	

	1. To explain how communication works in computer networks and to understand the basic terminology of computer networks.
	2. To become familiar with the network simulator Packet Tracer.
	3. To be able to analyze different protocols used for packet communication like ALOHA Protocol.
	4. To understand the working of LAN Card, Hub, TELNET and to understand the working difference between straight cable and cross over cable.
	5. To explain the role of protocols in networking and to analyze the services and features of the various layers in the protocol stack.
References:	
1. Computer Networks: A Systems Approach, 4th Ed. (2007), by Larry Peterson and Bruce Davie. Covers background networking material with which students should have familiarity.	
2. Computer Networking: A Top-Down Approach Featuring the Internet, 5th Ed. (2010), by James F. Kurose and Keith W. Ross. Covers similar material to Peterson and Davie.	

		LIFE SKILLS: APTITUDE - II	**L**	**T**	**P**	**C**
			0	**0**	**2**	**1**
		B.E – ECE				
Course Objectives:						
	1. To brush up problem solving skill and to improve intellectual skill of the students					
	2. To be able to critically evaluate various real life situations by resorting to Analysis Of key issues and factors					
	3. To be able to demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions.					
	4. To enhance analytical ability of students					
	5. To augment logical and critical thinking of Student					
Unit I	**Partnership, Mixtures and Allegations, Problem on Ages, Simple Interest, Compound Interest**					**5 Hours**
Introduction Partnership - Relation between capitals, Period of investments and Shares- Problems on mixtures - Allegation rule - Problems on Allegation – Problems on ages - Definitions Simple Interest - Problems on interest and amount - Problems when rate of interest and time period are numerically equal - Definition and formula for amount in compound interest - Difference between simple interest and compound interest for 2 years on the same principle and time period.						
Unit II	**Blood relations, , Clocks, Calendars**					**5 Hours**
Defining the various relations among the members of a family - Solving Blood Relation puzzles - Solving the problems on Blood Relations using symbols and notations - Finding the angle when the time is given - Finding the time when the angle is known - Relation between Angle, Minutes and Hours - Exceptional cases in clocks - Definition of a Leap Year - Finding the number of Odd days - Framing the year code for centuries - Finding the day of any random calendar date .						
Unit III	**Time and Distance, Time and Work**					**5 Hours**
Relation between speed, distance and time - Converting kmph into m/s and vice versa - Problems on average speed - Problems on relative speed - Problems on trains - Problems on boats and streams - Problems on circular tracks - Problems on races - Problems on Unitary method - Relation between Men, Days, Hours and Work - Problems on Man-Day-Hours method - Problems on alternate days - Problems on Pipes and Cisterns.						
Unit IV	**Data Interpretation and Data Sufficiency**					**5 Hours**
Problems on tabular form - Problems on Line Graphs - Problems on Bar Graphs - Problems on Pie Charts - Different models in Data Sufficiency - Problems on data redundancy						
Unit V	**Analytical and Critical Reasoning**					**5 Hours**
Problems on Linear arrangement - Problems on Circular arrangement - Problems on Double line-up - Problems on Selections - Problems on Comparisons - Finding the Implications for compound statements - Finding the Negations for compound statements- Problems on assumption - Problems on conclusions - Problems on inferences - Problems						

on strengthening and weakening of arguments .			
		Total:	**30 Hours**
ASSESSMENT PATTERN :			
	1. Two tests will be conducted (25 * 2) - 50 marks		
	2. Five assignments will be conducted (5*10) - 50 Marks		
Course Outcomes:			
	After completion of the course, Student will be able to		
	1. Solve problems on Partnership, Mixture & Allegation and ages least time using shortcuts and apply real life situations		
	2. Workout family relationships concepts, ability to visualize clocks & calendar and understand the logic behind a Sequence.		
	3. Calculate concepts of speed, time and distance, understand timely completion using time and work.		
	4. Learners should be able to understand various charts and interpreted data least time.		
	5. Workout puzzles, ability to arrange things in an orderly fashion.		
References:			
1. Arun Sharma, 'How to Prepare for Quantitative Aptitude for the CAT', 7th edition, McGraw Hills publication, 2016.			
2. Arun Sharma, 'How to Prepare for Logical Reasoning for CAT', 4th edition, McGraw Hills publication, 2017.			
3. R S Agarwal, 'A modern approach to Logical reasoning', revised edition, S.Chand publication, 2017.			
4. R S Agarwal, 'Quantitative Aptitude for Competitive Examinations', revised edition, S.Chand publication, 2017.			
5. Rajesh Verma, "Fast Track Objective Arithmetic", 3rd edition, Arihant publication, 2018.			
6. B.S. Sijwalii and Indu Sijwali, "A New Approach to REASONING Verbal & Non-Verbal", 2nd edition, Arihnat publication, 2014.			

Professional Elective – III

1703EC601		**INFORMATION THEORY AND CODING**	**L**	**T**	**P**	**C**
			3	**0**	**0**	**3**
Course Objectives:						
	1. To know basics of Information Theory					
	2.To understand noiseless channel capacity					
	3. To have a complete understanding of network information					
	4. To know about source codes and its limit performance					
Unit I	**INFORMATION THEORY**					**9 Hours**
Introduction-Measure of information- Average information content of symbols in long independent sequences-Average information content of symbols in long dependent sequences -Entropy and information rate of mark-off source.						
Unit II	**CAPACITY OF NOISELESS CHANNEL**					**9 Hours**
Fundamental theorem for a noiseless channel, Data compression, Kraft inequality, Shannon- Fano codes , Huffman codes , Asymptotic equipartition , Rate distortion theory.						
Unit III	**CHANNEL CAPACITY**					**9 Hours**
Channel coding theorem-Differential entropy and mutual information for continuous ensembles-Channel						

capacity Theorem. Binary Cycle Codes-Algebraic structures of cyclic codes		
Unit IV	**NETWORK INFORMATION THEORY**	**9 Hours**
Gaussian multiple user channels , Multiple access channel , Encoding of correlated sources, Relay channel , Source coding and rate distortion with side information , General multi-terminal networks		
Unit V	**SOURCE CODING AND FUNDAMENTAL LIMITS ON PERFORMANCE**	**9 Hours**
Encoding of the source output-Shannon's encoding algorithm-Communication Channels-Discrete communication channels -Source coding theorem-Huffman coding-Discrete memory less Channels-Mutual information-Channel Capacity		
	Total:	**45 Hours**

Further Reading:	
	1. Mark-off statistical model for information source
	2. Broadcast channel
	3. Continuous channels

Course Outcomes:	
	After completion of the course, Student will be able to
	1. illustrate the concept of Information theory
	2. understand of noiseless channel performance
	3. know different channel capacity techniques
	4. recognize basics of Information theory
	5. realize source coding and its limit affect performance

References:

1. Simon Haykin, Communication Systems, John Wiley & Sons. Pvt. Ltd, 2009
2. Elements of Information theory – Thomas Cover, Joy Thomas : Wiley 1999
3 Information Theory and Reliable Communication, R. G. Gallager, Wiley, 1966
4. David J.C. MacKay "Information theory, inference & learning algorithms" –Cambridge University Pre*ss 2003.*
5. Taub & Schilling, Principles of Communication Systems, Tata McGraw-Hill, 2007
6. Das, Mullick & Chatterjee, Principles of Digital Communication ,Wiley Eastern Ltd,2002
7. Information Theory, Inference, and Learning Algorithms, D. J. C. MacKay, Cambridge Univ. Press, 2003

1703EC602		DIGITAL CONTROL ENGINEERING	L	T	P	C
			3	0	0	3

Course Objectives:	
	1. Knowledge about principles of basic controllers
	2. Educate the students about stability analysis of digital control systems
	3. Train the students to develop digital control algorithms

Unit I	**PRINCIPLES OF CONTROLLERS**	**9 Hours**
Review of frequency and time response analysis and specifications of control systems, need for controllers, continues time compensations, continues time PI, PD, PID controllers, digital PID controllers		
Unit II	**SIGNAL PROCESSING IN DIGITAL CONTROL**	**9 Hours**
Sampling, time and frequency domain description, aliasing, hold operation, mathematical model of sample and hold, zero and first order hold, factors limiting the choice of sampling rate, reconstruction		
Unit III	**MODELING AND ANALYSIS OF SAMPLED DATA CONTROL SYSTEM**	**9 Hours**
Difference equation description, Z-transform method of description, pulse transfer function, time and frequency		

response of discrete time control systems, stability of digital control systems, Jury's stability test, state variable concepts, first companion, second companion, Jordan canonical models, discrete state variable models, elementary principles		
Unit IV	**DESIGN OF DIGITAL CONTROL ALGORITHMS**	**9 Hours**
Review of principle of compensator design, Z-plane specifications, digital compensator design using frequency response plots, discrete integrator, discrete differentiator, development of digital PID controller, transfer function, design in the Z-plane		
Unit V	**PRACTICAL ASPECTS OF DIGITAL CONTROL ALGORITHMS**	**9 Hours**
Algorithm development of PID control algorithms, software implementation, implementation using microprocessors and microcontrollers, finite word length effects, choice of data acquisition systems, microcontroller based temperature control systems, microcontroller based motor speed control systems		
	Total:	**45 Hours**

Further Reading:	
	Digital Control Engineering in Power electronics
Course Outcomes:	
	After completion of the course, Student will be able to
	1. Understand the basics of different controllers used in digital control Engineering
	2. Analyze signals in both time domain and Z domain
	3. Understand the basic knowledge necessary for sampled data control system
	4. Understand the state variable technique
	5. Develop the algorithm for digital control systems
References:	
1. M.Gopal, "Digital Control and Static Variable Methods", Tata McGraw Hill, New Delhi, 1997.	
2. John J. D'Azzo, "ConstantiveHoupios, Linear Control System Analysis and Design", Mc Graw Hill, 1995	
3. Kenneth J. Ayala, "The 8051 Microcontroller- Architecture, Programming and applications", Penram International, 2nd Edition, 1996	

1703EC603		**NETWORK SECURITY**	**L**	**T**	**P**	**C**
			3	**0**	**0**	**3**
		(Common to B.E / B.Tech – CSE, IT& ECE)				

Course Objectives:	
	1. To gain knowledge on the various attacks in a network
	2. To acquire knowledge on various encryption standards.
	3. To build the ability to develop security standard based on the requirement

Unit I	**INTRODUCTION**	**8 Hours**
Security Threats, Security Attacks, Security Services, Mechanisms- Model for Network Security- Classical Encryption Techniques- Substitutions-Transpositions Techniques- Stream Cipher, Block Cipher-Block Cipher Modes-ECB-CBC-CFB-OFB.		
Unit II	**BLOCK CIPHERS AND THE DATA ENCRYPTION STANDARD**	**8 Hours**
Simple DES-Differential cryptanalysis- DES-Modes of operation-Triple DES-AES-RC4 –RSA.		
Unit III	**HASH ALGORITHM, KEY MANAGEMENT**	**9 Hours**
Hash Function-Message Digest algorithm (MD 5)- Secure Hash Algorithm- Diffie-Hellman Key Exchange- Key Management Techniques- Key Distribution- Key Agreement - Elliptic Curve Cryptography - Digital Signatures-Authentication Protocols		
Unit IV	**SECURITY PRACTICE & SYSTEM SECURITY**	**9 Hours**
Authentication applications – Kerberos – X.509 Authentication services - Internet Firewalls for Trusted System: Roles of Firewalls – Firewall related terminology- Types of Firewalls - Firewall designs - SET for E-Commerce Transactions. Intruder – Intrusion detection system – Virus and related threats – Countermeasures – Firewalls design principles – Trusted systems – Practical implementation of cryptography and security.		
Unit V	**E-MAIL, IP & WEB SECURITY**	**11 Hours**

E-mail Security: Security Services for E-mail-attacks possible through E-mail - establishing keys privacy-authentication of the source-Message Integrity-Non-repudiation-Pretty Good Privacy-S/MIME. IPSecurity: Overview of IPSec - IP and IPv6-Authentication Header-Encapsulation Security Payload (ESP)-Internet Key Exchange (Phases of IKE, ISAKMP/IKE Encoding). Web Security: SSL/TLS Basic Protocol-computing the keys- client authentication-PKI as deployed by SSLAttacks fixed in v3- Exportability-Encoding-Secure Electronic Transaction (SET).	
Total:	**45 Hours**
Further Reading:	
1. Attacks- Primarily test- factoring, Discrete Logarithms	
2. Malicious software-viruses-Firewalls- Security Standards.	
Course Outcomes:	
After completion of the course, Student will be able to	
1. Identify vulnerability of computer networks to security threats.	
2. Acquire knowledge on existing security algorithms and cryptography standards.	
3. Understand various cryptography techniques and their implications on network security	
4. Analyze the type of security threat and the appropriate security standard to be adopted	
5. Formulate and implement new security standards	
References:	
1. William Stallings,"Cryptography and Network Security: Principles and Practice",Prentice Hall Professional Technical Reference, Fourth Edition. 2004	
2. Alfred J. Menezes, Paul C.VanOorSchot, Scott A.Van Stone, "Handbook Of Applied Cryptography", CRC Press, 1996.	
3. Atul Kahate "Cryptography and Network Security". Tata McGraw-Hill	
4. Bruce Schneier,"Applied Cryptography: Protocols, Algorithms, and Source Code in C",Second Edition, Wiley, John & Sons, Incorporated, October 1995.	
5. Richard E. Smith,"Internet Cryptography", Addison- Wesley, 1997	

1703EC604	**REAL TIME OPERATING SYSTEM**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
	(Common to B.E / B.Tech – CSE, IT & ECE)				
Course Objectives:	Gain knowledge in the following:				
	1. To importance of deadlines and concept of task scheduling.				
	2. Student will be able to understand and design real time operating systems which are backbone of embedded industry.				
Unit I	**INTRODUCTION TO REAL TIME SYSTEMS**				**8 Hours**
Issues in real time computing Structure of real time system Need for RTOS Task classes Performance measures for real time system: Properties, traditional performance measures, perform ability, cost functions and hard deadlines, and Estimating program run times. Introduction LINUX/ UNIX OS.					
Unit II	**FEATURES OF REAL TIME OPERATING SYSTEM**				**9 Hours**
Messages queues mailboxes pipes timer function events memory management Interrupt basic system design using an RT (OS design principles, interrupt routines, task structures and priority.) Current research in RTOS. Case Studies: Vx Works and Micro OS-II.					
Unit III	**EMBEDDED SYSTEMS, PROCESSOR**				**9 Hours**
Embedded into a system, Hardware units and devices in a system, software, Examples, SoC and VLSI technology, Complex System design and processors, System Design process,					
Unit IV	**UNIT-III: PROCESSES AND REAL-TIME OPERATING SYSTEMS**				**8 Hours**
Threads and Tasks: Tasks, Task States, Task and Data, Concept of Semaphores, Shared Data, Inter-process Communication, Signal Function, Semaphore Functions, Message Queue Functions, Mailbox Functions, Pipe Functions. Real-Time Operating Systems: OS Services, Process Management, Timer Functions, Event Functions, Memory Management, Device, File and I/O subsystems management, Interrupt routines.					
Unit V	**EMBEDDED SYSTEM DEVELOPMENT**				**11 Hours**

Embedded Software Development Process and Testing: Introduction to Embedded Software Development Process and Tools, Host and Target Machines, Linking and Locating Software, Getting Embedded Software into the Target System, Issues in Hardware-Software Design and Co-design, Testing on Host Machine, Simulators and Laboratory Tools.		
	Total:	**45 Hours**
Further Reading:		
	Basics of operating system; Basics of Embedded system	
Course Outcomes:		
After completion of the course, Student will be able to		
1. Understand the basics of RTOS and LINUX		
2. Handle the RTOS mail boxes, time functions		
3. Know the Embedded system design process.		
4. Operate the RTOS systems and functions.		
5. Understand the Embedded software testing and development.		
REFERENCE BOOKS:		
1. An Embedded Software Primer, David E. Simon Pearson Education Asia Publication ISBN-13		
2. Real Time Systems, C.M. Krishna and Kang G. Shin, TMH Publication ISBN 13:		
3. Embedded system: Architecture Programming and Design, Raj kamal, TMH Publication SBN 13		

17CS208		**SOFT COMPUTING**	**L**	**T**	**P**	**C**
			3	**0**	**0**	**3**
		(Common to B.E / B.Tech – ECE, CSE& IT)				
Course Objectives:						
	1. Learn the various soft computing frame works.					
	2. Be familiar with design of various neural networks.					
	3. Be exposed to fuzzy logic.					
	4. Learn genetic programming.					
Unit I	**INTRODUCTION**					**9 Hours**
Artificial neural network: Introduction, characteristics- learning methods – taxonomy – Evolution of neural networks-basic models - important technologies - applications. Fuzzy logic: Introduction - crisp sets- fuzzy sets - crisp relations and fuzzy relations: cartesian productof relation - classical relation, fuzzy relations, tolerance and equivalence relations, non-iterative fuzzy sets. Genetic algorithm- Introduction - biological background - traditional optimization and search techniques - Genetic basic concepts.						
Unit II	**NEURAL NETWORKS**					**9 Hours**
McCulloch-Pitts neuron - linear separability - hebb network - supervised learning network: perceptron networks - adaptive linear neuron, multiple adaptive linear neuron, BPN, RBF, TDNN- associative memory network: auto-associative memory network, hetero-associative memory network, BAM, hopfield networks, iterative autoassociative memory network & iterative associative memory network – unsupervised learning networks: Kohonenself organizing feature maps, LVQ – CP networks, ART network.						
Unit III	**FUZZY LOGIC**					**9 Hours**
Membership functions: features, fuzzification, methods of membership value assignments-Defuzzification: lambda cuts - methods - fuzzy arithmetic and fuzzy measures: fuzzy arithmetic -extension principle - fuzzy measures - measures of fuzziness -fuzzy integrals - fuzzy rule base and approximate reasoning : truth values and tables, fuzzy propositions, formation of rules-decomposition of rules, aggregation of fuzzy rules, fuzzy reasoning-fuzzy inference systems-overview of fuzzy expert system-fuzzy decision making.						
Unit IV	**GENETIC ALGORITHM**					**9 Hours**
Genetic algorithm and search space - general genetic algorithm – operators - Generational cycle - stopping condition – constraints - classification - genetic programming – multilevel optimization – real life problem- advances in GA						
Unit V	**HYBRID SOFT COMPUTING TECHNIQUES & APPLICATIONS**					**9 Hours**
Neuro-fuzzy hybrid systems - genetic neuro hybrid systems - genetic fuzzy hybrid and fuzzy genetic hybrid systems - simplified fuzzy ARTMAP - Applications: A fusion approach of multispectral images with SAR, optimization of traveling salesman problem using genetic algorithm approach, soft computing based hybrid fuzzy controllers						
				Total:		**45 Hours**
Further Reading:						

	1. Reinforcement learning
	2. Applications of neuro fuzzy system
Course Outcomes:	
	After completion of the course, Student will be able to
	1. Apply various soft computing frame works.
	2. Design of various neural networks.
	3. Use fuzzy logic.
	4. Apply genetic programming.
	5. Discuss hybrid soft computing
References:	
1. J.S.R.Jang, C.T. Sun and E.Mizutani, “Neuro-Fuzzy and Soft Computing”, PHI / Pearson Education 2004.	
2. S.N.Sivanandam and S.N.Deepa, "Principles of Soft Computing", Wiley India Pvt Ltd, 2011.	
3. S.Rajasekaran and G.A.VijayalakshmiPai, "Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis & Applications", Prentice-Hall of India Pvt. Ltd., 2006.	
4. David E. Goldberg, “Genetic Algorithm in Search Optimization and Machine Learning” Pearson Education India, 2013.	
5. George J. Klir, Ute St. Clair, Bo Yuan, “Fuzzy Set Theory: Foundations and Applications” Prentice Hall, 1997.	

PROFESSIONAL (OPEN) ELECTIVES – IV

17IT703		**CLOUD COMPUTING**	**L**	**T**	**P**	**C**
			3	**0**	**0**	**3**
		(Common to B.E / B.Tech – CSE, IT & ECE)				
Course Objectives:						
	1. To understand the differences between traditional deployment and cloud computing					
	2. To determine whether existing applications to the cloud makes technical and business sense					
	3. To learn how to build a transactional web application for the cloud or migrate one to it					
Unit I	**Cloud Architecture Basics**					**9 Hours**
The Cloud -Hype cycle-metaphorical interpretation-cloud architecture standards and interoperability- Cloud types; IaaS, PaaS, SaaS. Benefits and challenges of cloud computing, public, private clouds community cloud, role of virtualization in enabling the cloud.						
Unit II	**End to End Design**					**9 Hours**
Requirement analysis: strategic alignment and architecture development cycle-strategic impact-Risk impact-financial impact-Business criteria-technical criteria-cloud opportunities –evaluation criteria and weight-End to end design-content delivery networks-capacity planning-security architecture and design.						
Unit III	**Cloud Application Architectures**					**9 Hours**
Development environments for service development; Amazon, Azure, Google App-cloud platform in industry						
Unit IV	**How to Move Application into the Cloud**					**9 Hours**
Web Application Design- Machine Image Design-privacy design –Database management						
Unit V	**Specialized Cloud Architecture**					**9 Hours**
Workload distribution architecture-Dynamic scalability-Cloud bursting-hypervisor clustering-service quality metrics &SLA.						
		Total:				**45 Hours**
Further Reading:						
	1. Docker and Containers					
	2. Server less computing					
Course Outcomes:						
	After completion of the course, Student will be able to					
	1. Understand the differences between traditional and Cloud deployment					
	2. Understand technical and business viability of migrating existing applications to cloud					
	3. Deploy cloud applications on AWS and Azure					
	4. Design and build cloud based applications					

	5. Design scalable cloud environment for elastic demands
References:	
1. John Rhoton ,Cloud Computing Explained: Handbook for Enterprise Implementation 2013 edition, 2013, recursive press	
2. RajkumarBuyya, Christian Vecchiola, S.ThamaraiSelvi,Mastering Cloud Computing: Foundations and Applications Programming,MorganKaufmann,,Elsevier publication, 2013	
3. Thomas Erl, ZaighamMahmood, and Ricardo Puttini,Cloud Computing Concepts, Technology & Architecture, PRENTICE HALL,2013	
4. Reese, G (2009). Cloud Application Architectures: Building Applications and Infrastructure in the Cloud. Sebastopol, CA: O'Reilly Media, Inc. (2009).	

17CS033		**INTERNET OF THINGS**	**L**	**T**	**P**	**C**
			3	**0**	**0**	**3**
		(Common to B.E / B.Tech – CSE, IT & ECE)				
Course Objectives:						
	1. To understand the concepts of Internet of Things					
	2. To introduce network and communication protocols of IoT					
	3. To build IoT applications.					
Unit I	**Introduction to IoT**					**9 Hours**
Defining IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT, Communication models & APIs, Machine to Machine, Difference between IoT and M2M, Software defined Network(SDN)						
Unit II	**Network and Communication Aspects**					**9 Hours**
Wireless medium access issues, MAC protocol survey, Survey routing protocols, Sensor deployment & Node discovery, Data aggregation & dissemination						
Unit III	**Challenges of IoT**					**9 Hours**
Design challenges, Development challenges, Security challenges, Other challenges						
Unit IV	**Applications of IoT**					**9 Hours**
Home automation, Industry applications, Surveillance applications, Other IoT applications						
Unit V	**Developing IoTs**					**9 Hours**
Introduction to Python, Introduction to different IoT tools, Developing applications through IoT tools, Developing sensor based application through embedded system platform, Implementing IoT concepts with python						
		Total:				**45 Hours**
Further Reading:						
	1. Cloud Computing					
	2. Dockers and Containers					
Course Outcomes:						
	After completion of the course, Student will be able to					
	1. Understand the concepts of Internet of Things					
	2. Analyze basic protocols in wireless sensor network					
	3. Design IoT applications in different domain and be able to analyze their performance					
	4. Implement basic IoT applications on embedded platform					
	5. Develop the coding using Python programming.					
References:						
1. Vijay Madisetti, Arshdeep Bahga, “Internet of Things: A Hands-On Approach”						
2. Waltenegus Dargie,Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice"						

1703EC815		**BIG DATA ANALYTICS**	**L**	**T**	**P**	**C**
			3	**0**	**0**	**3**
		(Common to B.E / B.Tech – CSE& IT)				
Course Objectives:						
	1. Be exposed to big data					

	2. Learn the different ways of Data Analysis
	3. Learn the mining and clustering
	4. Be familiar with the data streams and visualization

Unit I	**INTRODUCTION TO BIG DATA**	**9 Hours**
Introduction to Big Data Platform – Challenges of conventional systems - Web data – Evolution of Analytic scalability, analytic processes and tools, Analysis vs reporting - Modern data analytic tools, Stastical concepts: Sampling distributions, resampling, statistical inference, prediction error.		
Unit II	**DATA ANALYSIS**	**9 Hours**
Regression modeling, Multivariate analysis, Bayesian modeling, inference and Bayesian networks, Support vector and kernel methods, Analysis of time series: linear systems analysis, nonlinear dynamics - Rule induction - Neural networks: learning and generalization, competitive learning, principal component analysis and neural networks; Fuzzy logic: extracting fuzzy models from data, fuzzy decision trees, Stochastic search methods.		
Unit III	**MINING DATA STREAMS**	**9 Hours**
Introduction to Streams Concepts – Stream data model and architecture - Stream Computing,Sampling data in a stream – Filtering streams – Counting distinct elements in a stream – Estimating moments – Counting oneness in a window – Decaying window – Realtime Analytics Platform(RTAP) applications - case studies - real time sentiment analysis, stock market predictions.		
Unit IV	**FREQUENT ITEMSETS AND CLUSTERING**	**9 Hours**
Mining Frequent itemsets - Market based model – Apriori Algorithm – Handling large data sets in Main memory – Limited Pass algorithm – Counting frequent itemsets in a stream – Clustering Techniques – Hierarchical – K- Means – Clustering high dimensional data – CLIQUE and PROCLUS – Frequent pattern based clustering methods – Clustering in non-euclidean space – Clustering for streams and Parallelism.		
Unit V	**FRAMEWORKS AND VISUALIZATION**	**9 Hours**
MapReduce – Hadoop, Hive, MapR – Sharding – NoSQL Databases - S3 - Hadoop Distributed file systems – Visualizations - Visual data analysis techniques, interaction techniques; Systems and applications		
	Total:	**45 Hours**

Further Reading:	
	1. Analyzing big data with twitter
	2. Big data for Ecommerce and Big data for blogs
Course Outcomes:	
	After completion of the course, Student will be able to
	1. Apply the statistical analysis methods.
	2. Compare and contrast various soft computing frameworks
	3. Design distributed file systems
	4. Apply Stream data model.
	5. Use Visualization techniques

References:

1. Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer, 2007.
2. Anand Rajaraman and Jeffrey David Ullman, Mining of Massive Datasets, Cambridge University Press, 2012.
3. Bill Franks, Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced analystics, John Wiley & sons, 2012.
4. Glenn J. Myatt, Making Sense of Data, John Wiley & Sons, 2007 Pete Warden, Big Data Glossary, O'Reilly, 2011.

1702CS601		**INTRODUCTION TO WEB TECHNOLOGY**	**L**	**T**	**P**	**C**
			3	**0**	**0**	**3**

Course Objectives:	
	1. To impart the new concepts in Web Technologies
	2. To develop understanding about the different technologies used in the World Wide Web including XML, Perl, Rails and PHP

Unit I	**INTRODUCTION**	**9 Hours**

XHTML Evolution of HTML and XHTML- Standard XHTML Document Structure- Basic Text Markup- Images-Hypertext Links-Lists- Tables- Forms- Frames. Cascading Style Sheets Introduction to CSS – Levels of Style Sheets- Style Specification Formats- Selector Forms- Property Value Forms – Font Properties- List Properties – Color- Alignment of Text – Background Images- Span and Div Tags.		
Unit II	**XML**	**9Hours**
Introduction to SGML – features of XML - XML as a subset of SGML – XML Vs HTML – Views of an XML document - Syntax of XML- XML Document Structure – Namespaces- XML Schemas- simple XML documents – Different forms of markup that can occur in XML documents - Document Type declarations – Creating XML DTDs – Displaying XML Data in HTML browser – Converting XML to HTML with XSL minimalist XSL style sheets – XML applications		
Unit III	**PERL**	**9 Hours**
Origin and Use of Perl- Scalars and their Operations – Assignment Statements and Simple Input and Output – Control Statements- Fundamentals of Arrays – Hashes References- Functions- Pattern Matching – File Input and Output – Simple programs in Perl -Using Perl for CGI Programming.		
Unit IV	**PHP & MySQL**	**9 Hours**
Origin and Use of PHP- Overview of PHP- General Syntactic Characteristics Operations and Expressions- Control Statements- Arrays- Functions-Pattern Matching- Form Handling- Files-Cookies-Session Tracking - Database Connectivity, Simple programs in PHP and MySQL.		
Unit V	**RAILS & AJAX**	**9 Hours**
RAILS - Overview of Rails- Document Requests- Processing Forms- Rails Application with Databases – Layouts AJAX - Ajax Overview of Ajax – Basics of Ajax – Rails with Ajax.		
	Total:	**45 Hours**
Further Reading:		
	Data analytics & Sever less Computing	
Course Outcomes:		
	After completion of the course, Students will be able to	
	1. Develop web pages using basic HTML	
	2. Apply XML techniques in web design	
	3. Implement CGI using Perl	
	4. Implement PHP & MySQL database connectivity for real world applications	
	5. Use AJAX with Rails.	
References:		
1. Deitel&Deitel, Nieto, Lin, Sadhu, XML How to Program, Pearson Education ,New Delhi, 2011		
2. Kogent Learning Solutions Inc, Web Technologies Black Book, Dreamtech Press, New Delhi, 2009		
3. Chris Bates, Web Programming Building Internet Applications 3rd ed., Wiley India Edition, New Delhi, 2009		
4. Phil Ballard, Michael Moncur, Sams Teach Yourself Ajax, JavaScript and PHP, Pearson Education ,New Delhi, 2009.		
5. Achyut S Godbole , Atul Kahate, Web Technologies TCP/IP Architecture and Java Programming, 2nd ed., Tata McGraw Hill Education Private Limited, New Delhi, 2010		
6. Pankaj Sharma, Introduction to Web Technology, Katson Books, New Delhi, 2008		
7. Bankim Patel, Lal Bihari Barik, Introduction to Web Technology & Internet, Acme Learning Private Limited, New Delhi, 2009		

		GRID COMPUTING	**L**	**T**	**P**	**C**
			3	**0**	**0**	**3**
		(B.E / B.Tech – ECE)				
Course Objectives:						
	1. To introduce the underlying concepts and architecture of Grid Computing					
	2. To understand the grid security and management					
	3. To introduce various grid middlewares					
Unit I	**Concepts And Architecture**					**9 Hours**
Introduction-Parallel and Distributed Computing-Cluster Computing-Grid Computing- Anatomy and						

Physiology of Grid-Review of Web Services-OGSA-WSRF		
Unit II	**Grid Monitoring**	**9 Hours**
Grid Monitoring Architecture (GMA) - An Overview of Grid Monitoring Systems- GridICE – JAMM -MDS-Network Weather Service-R-GMA-Other Monitoring Systems- Ganglia and GridMon		
Unit III	**Grid Security And Resource Management**	**9 Hours**
Grid Security-A Brief Security Primer-PKI-X509 Certificates-Grid Security-Grid Scheduling and Resource Management-Scheduling Paradigms- Working principles of Scheduling -A Review of Condor, SGE, PBS and LSF-Grid Scheduling with QoS		
Unit IV	**Data Management And Grid Portals**	**9 Hours**
Data Management-Categories and Origins of Structured Data-Data Management Challenges-Architectural Approaches-Collective Data Management Services-Federation Services-Grid Portals-First-Generation Grid Portals-Second-Generation Grid Portals.		
Unit V	**Grid Middleware**	**9 Hours**
List of globally available Middlewares - Case Studies-Recent version of Globus Toolkit and gLite - Architecture, Components and Features.		
	Total:	**45 Hours**

Course Outcomes:	
	After completion of the course, Student will be able to
	1. Understand the concepts of Grid Architecture
	2. Understand the resource and data management of grid
	3. Analyze the security requirements of grid
	4. Utilize the data management and grid portals
	5. Use the grid middlewares like globus toolkit

References:

1.Maozhen Li, Mark Baker, The Grid Core Technologies, John Wiley & Sons ,2005.

2.Ian Foster & Carl Kesselman, The Grid 2 – Blueprint for a New Computing Infrastructure , Morgan Kaufman – 2004.

3.Joshy Joseph & Craig Fellenstein, “Grid Computing”, Pearson Education 2004.

4.Fran Berman, Geoffrey Fox, Anthony J.G. Hey, “Grid Computing: Making the Global Infrastructure a reality”, John Wiley and sons, 2000.

E.G.S. PILLAY ENGINEERINGCOLLEGE

(Autonomous)

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NAGAPATTINAM–611002

B.E.Electronics and Communication Engineering

Full Time Curriculum and Syllabus

Final Year– Seventh Semester

Course Code	CourseName	L	T	P	C	Maximum Marks		
						CA	ES	Total
Theory Course								
1702EC701	Microwave Engineering	2	0	0	2	40	60	100
1702EC702	Optical Communication	3	0	0	3	40	60	100
1702EC703	Wireless Communication	3	0	0	3	40	60	100
1702EC704	Image Processing	3	0	0	3	40	60	100
	Professional (Open)Elective – V	3	0	0	3	40	60	100
	Professional Elective – VI	3	0	0	3	40	60	100
LaboratoryCourse								
1702EC751	Microwave and Optical Communication Laboratory	0	0	2	1	50	50	100
1702EC752	Mini Project	0	0	0	1	100	-	100
1704EC753	In-plant Training/ Internship Presentation	0	0	0	1	100	-	100
1704GE751	Life Skills: Competitive Exams Preparation	2	0	0	2	100	-	100
	Total	**20**	**0**	**6**	**24**	**640**	**460**	**1100**
Professional Elective - V								
1703MG701	Principles of Management	3	0	0	3	40	60	100
1703MG702	Disaster Management	3	0	0	3	40	60	100
1703MG703	Total Quality Management	3	0	0	3	40	60	100

1703MG704	Industrial Economics	3	0	0	3	40	60	100
1703MG705	Foundation Skills in Integrated Product Development	3	0	0	3	40	60	100
Professional Elective – VI								
1703EC021	Advanced Digital Signal Processing	3	0	0	3	40	60	100
1703EC022	Embedded System	3	0	0	3	40	60	100
1703EC023	Pattern Recognition and Machine Learning	3	0	0	3	40	60	100
1703EC024	Speech Processing	3	0	0	3	40	60	100
1703EC025	VLSI Signal Processing	3	0	0	3	40	60	100
1703EC026	RF System Design	3	0	0	3	40	60	100

L–Lecture|T–Tutorial|P–Practical|C–Credit|CA –ContinuousAssessment| ES–EndSemester

1702EC701		MICROWAVE ENGINEERING	L	T	P	C
			3	0	0	3

Course Objectives:

1.To gain knowledge about RF Electronics.
2. To study about the various microwave component, signal generators and amplifiers.
3. To gain knowledge about integrated circuits and microwave meaurements.

Unit I	**INTRODUCTION TO RF ELECTRONICS**	**9 Hours**

The Electromagnetic Spectrum, units and Physical Constants, Microwave bands, RF behavior of Passive components: Tuned resonant circuits, Vectors, Inductors and Capacitors. Voltage and Current in capacitor circuits, Tuned RF/IF Transformers.

Unit II	**MICROWAVE COMPONENTS**	**9 Hours**

Introduction to Microwaves and their applications, Coaxial Line Components, Wave-guide Components, Directional Couplers, Hybrid Tee Junction, Magic Tee, Attenuators, Ferrite Devices, Isolators, Circulators, Cavity Resonators, Re-entrant Cavities, Wave-meters, Microwave Filters, Detectors, Mixers.

Unit III	**MICROWAVE SIGNAL GENERATORS AND AMPLIFIERS**	**9 Hours**

Vacuum Tube Triodes, Resonant Cavity Devices, Reflex Klystron, Two –Cavity Klystron, Multi – Cavity Klystron, Slow – Wave Devices, TWT, Crossed Field Devices, Magnetrons, Semiconductor Devices, Microwave BJTs, FETs, Tunnel Diodes, Gunn Diode, IMPATT, TRAPATT Diodes.

Unit IV	**MICROWAVE INTEGRATED CIRCUITS**	**9 Hours**

Materials, Substrate, Conductor, Dielectric and Resistive Materials, MMIC Growth, Fabrication Techniques, MOSFET Fabrication, NMOS Growth and CMOS Development, Thin Film Formation.

Unit V	**MICROWAVE MEASUREMENTS**	**9 Hours**

VSWR, Frequency, Guide Wavelength, Coupling and Directivity measurements

	Total:	**45 Hours**

Further Reading:

1.Recent trend in Microwave application.

Course Outcomes:

After completion of the course, Student will be able to
1.Explain about RF Electronics.
2. Identify the component for microwave application.
3.Discuss signal generator and amplifiers.
4. Illustrate the concept of microwave integrated circuits.
5. Explain about microwave measurements.

References:

1. Reinhold Ludwing, Pavel Bretchko, “RF Circuit design: Theory and applications”, Pearson Education Asia Publication, New Delhi 2001.
2.Foundations For Microwave Engineering, R. R. Collin, McGraw Hill
3.Microwave Communications – Components and Circuits, E. Hund, McGrawHill.
4.Microwave Devices and Circuits, S. Y. Liao, PHI.
5.Microwave Engineering, R. Chatarjee, East – West Press Pvt. Ltd.

1702EC702	OPTICAL COMMUNICATION	L	T	P	C
		3	0	0	3

Course Objectives:

1. To learn the basic elements of optical fiber transmission link, fiber modes configurations and structures
2. To understand the different kind of losses, signal distortion in optical wave guides and other signal degradation factors. Design optimization of SM fibers, RI profile and cut-off wave length.
3. To learn about various Optical Sources and Detectors.
4. To Explore the trends of optical fiber measurement systems.
5. To Enrich the idea of optical fiber networks algorithm such as SONET/SDH and optical CDMA

Unit I	INTRODUCTION TO OPTICAL FIBERS	9 Hours

Evolution of fiber optic system- Element of an Optical Fiber Transmission link Ray theory transmission- Total internal reflection-Acceptance angle –Numerical aperture – Skew rays – Electromagnetic mode theory of optical propagation –EM waves – modes in Planar guide – phase and group velocity – cylindrical fibers –SM fibers- Graded Index fiber structure.

Unit II	SIGNAL DEGRADATION OPTICAL FIBERS	9 Hours

Attenuation - Absorption losses, Scattering losses, Bending Losses, Core and Cladding losses, Signal Distortion in Optical Wave guides-Information Capacity determination -Group Delay-Material Dispersion, Wave guide Dispersion, Signal distortion in SM fibers-Polarization Mode dispersion, Intermodal dispersion- Pulse Broadening in GI fibers-Mode Coupling -Optical fiber connectors**,** Fiber alignment and Joint Losses – Fiber Splices – Fiber connectors – Expanded Beam Connectors – Fiber Couplers

Unit III	SOURCES AND DETECTORS	9 Hours

Optical sources: Light Emitting Diodes - LED structures - surface and edge emitters, mono and hetero structures - internal - quantum efficiency, lasers Diodes-Modes and Threshold condition -Rate equations -External Quantum efficiency -Resonant frequencies- injection laser diode structures.

Optical Detectors: PIN Photo detectors, Avalanche photo diodes, construction, characteristics and properties, Comparison of performance, Photo detector noise –Noise sources, Signal to Noise ratio , Detector response time.

Unit IV	FIBER OPTIC RECEIVER AND MEASUREMENTS	9 Hours

Fundamental receiver operation, Pre amplifiers, Error sources – Receiver Configuration– Probability of Error – Quantum limit. Fiber Attenuation measurements- Dispersion measurements – Fiber Refractive index profile measurements – Fiber cut- off Wave length Measurements – Fiber Numerical Aperture Measurements – Fiber diameter measurements.

Unit V	OPTICAL NETWORKS AND SYSTEM TRANSMISSION	9 Hours

Basic Networks – SONET / SDH – Broadcast – and –select WDM Networks –Wavelength Routed Networks – Non linear effects on Network performance –-Link Power budget -Rise time budget- Noise Effects on System Performance-Operational Principles of WDM Performance of WDM + EDFA system – Solitons – Optical CDMA – Ultra High Capacity Networks**.**

Total: 45 Hours

Further Reading:

1. Design Optimization of SM fibers-RI profile and cut-off wavelength.
2. Fiber amplifiers- Power Launching and coupling, Lencing schemes

Course Outcomes:

After completion of the course, Student will be able to

1. Discuss the various optical fiber modes, configurations.
2. Demonstrate various signal degradation factors associated with optical fiber.
3. Classify various optical sources and optical detectors and their use in the optical communication system.
4. Explain Various Fiber Optic measurements.
5. Calculate the digital transmission and its associated parameters on system performance.

References:

1. Gerd Keiser, "Optical Fiber Communication" Mc Graw -Hill International, 4th Edition., 2010.
2. John M. Senior , “Optical Fiber Communication”, Second Edition, Pearson Education, 2007.
3. Ramaswami, Sivarajan and Sasaki “Optical Networks”, Morgan Kaufmann, 2009
4. J.Senior, "Optical Communication, Principles and Practice", Prentice Hall of India, 3rd Edition, 2008.
5. J.Gower, "Optical Communication System", Prentice Hall of India, 2001.

1702EC703		WIRELESS COMMUNICATIONS	L	T	P	C
			3	0	0	3
		(Common to B.E / B.Tech – ECE, IT)				

Course Objectives:	
	1. To become skilled at fundamentals of mobile and wireless communication technologies and its applications.
	2. To create the student to work on the transceivers for wireless channels.

Unit I	**Introduction**	**4 Hours**
Introduction to wireless Communication systems – Evolution of Mobile communication system – 2G, 3G, 4G, UMTS, LTE, WLL, WLAN, WPAN, Bluetooth, Ultra Wide Band		
Unit II	**Mobile Radio Propagation**	**10 Hours**
Large scale path loss –Path loss models: Free Space and TwoRay models -Link Budget design –Small scale fading-Parameters of mobile multipath channels –Time dispersion parameters-Coherence bandwidth –Doppler spread & Coherence time, Fading due to Multipath time delayspread–flat fading frequency selective fading –Fading due to Doppler spread –fast fading –slow fading.		
Unit III	**Cellular Communication**	**10 Hours**
Introduction, Frequency reuse, Cell Assignment techniques, Hand off Strategies, Interference and System Capacity, Trunking and Grade of Service, Improving Coverage and capacity in cellular systems.Multiple Access techniques: FDMA, TDMA, CDMA, SDMA		
Unit IV	**Modulation Schemes and Spread Spectrum**	**12 Hours**
Modulation techniques: M-QAM, M-PSK, GMSK, Spread Spectrum Systems: PN sequence-m-sequence -Direct Sequence Spread Spectrum-Frequency Hopping Spread Spectrum, Synchronization techniques for Spread Spectrum signals, Diversity and Combining Techniques: Time Diversity, Frequency diversity, Space Diversity		
Unit V	**Multiple Antenna Techniques**	**9 Hours**
MIMO systems – spatial multiplexing -System model – Pre-coding -Beam forming –Space Time Coding, Alamouti scheme -Channel state information-capacity in fading and non-fading channels- combining techniques-Selection combining, Equal gain combining, Maximum ratio Combining, RAKE receiver. Introduction to OFDM		
		Total: 45

Further Reading:	
	WANET, IoT, Zigbee Technology, WiMax, WLAN

Course Outcomes:	
	After completion of the course, Student will be able to
	1. Characterize interference between mobile and base stations.
	2. Apply the knowledge in understanding the allocation of the limited wireless spectrum by government regulatory agencies.
	3. Predict the received signal through the multipath channel.
	4. Analyze and Evaluate receiver and transmitter diversity techniques.
	5. Analyze the multiple antenna techniques

References:

1. Rappaport. T.S., **"Wireless Communications: Principles and Practices",** Second Edition,PHI, 2014
2. Andrea Goldsmith, **"Wireless Communication"**, Cambridge University Press, 2005
3. Andreas.F.Molisch, **"Wireless Communications"**, John Wiley, 2010
4. John G. Proakis, **"Digital Communication"**McGraw Hill, 4th Edition, 2008
5. Gordon L.Stuber, **"Principles of Mobile Communication"**, 3rd Edition, Springer International Ltd.,2011
6. William C Lee, **"Wireless and Cellular Communications"** 3rd Edition McGraw Hill, 2006

1702EC704		IMAGE PROCESSING	L	T	P	C
			3	0	0	3
		(Common to ECE/CSE/IT)				

Course Objectives:

1. To make the students to understand the digital image fundamentals.
2. To study the digital image using different transforms.
3. To acquire the basic knowledge in filters, image enhancement, image restoration and compression techniques.

Unit I	DIGITAL IMAGE FUNDAMENTALS	9 Hours

Elements of digital image processing systems, Elements of visual perception, Image sampling andquantization, Basic Relationships between pixels. Image Transforms:Discrete Fourier transform, Cosine,Hadamard, Haar, Walsh and Slant transform..

Unit II	IMAGE ANALYSIS	9 Hours

Histogram processing, Equalization and specification techniques,Basics of spatial filtering, Smoothing spatial filters, Sharpening spatial filters, Image smoothing and sharpening using frequency domain filters.

Unit III	IMAGE SEGMENTATION	9 Hours

Point, line and edge detection-Detection of isolated points, Line detection, Edge models, Basic edgedetection, Edge linking and boundary detection. Thresholding-basic global thresholding, Otsu's method,Multiple, Variable and multivariable thresholding. Region-based segmentation-Region growing, Regionsplitting and merging.

Unit IV	IMAGE RESTORATION AND RECOGNITION	9 Hours

Image degradation/ restoration model, Noise models, Restoration-Spatial Filtering, Constrained Leastsquare filtering, Inverse filtering, Wiener Filtering, Object recognition-Patterns and patternclasses,Matching-Minimum Distance classifiers, Neural networks-Background, Training by Back Propagation.

Unit V	IMAGE COMPRESSION	9 Hours

Fundamentals, Basic compression methods-Huffman coding, Golomb coding, Arithmetic coding, LZW coding, Run – length coding, Lossless and Lossy predictive coding, Block transform coding, Waveletcoding.

	Total:	45 Hours

Further Reading:

KL transform and their properties, Homomorphic filtering, Morphological image processing – Erosion and Dilation, Opening and closing, Segmentation using morphological watersheds, Applications of neural networks in image processing, Digital image watermarking.

Course Outcomes:

After completion of the course, Student will be able to

1. Analyze the image using image transforms.
2. Develop a methodology for smoothening and sharpening of the image
3. Segment the image using edge detection, thresholding and region based approach.
4. Develop a method to restore the image and object recognition
5. Compress the image using lossy and lossless compression techniques.

References:

1. C.Rafeal Gonzalez and E.Richard Woods, Digital Image Processing, Third Edition, Pearson Education 2008.
2. Anil K.Jain, Fundamentals of Digital Image Processing, PHI, 2010.
3. S Jayaraman, S Esakkirajan T Veerakumar, Digital Image Processing , Mc Graw- Hill, 2010
4. K.William Pratt, Digital Image Processing, John Wiley, 1997.
5. M.A.Sid Ahmed, Image Processing Theory, Algorithm and Architectures, McGraw - Hill, 1995.

1702EC751		Microwave and Optical Communication Lab	L	T	P	C
			0	0	4	2

Course Objectives:

	1. To have a detailed practical study on microwave equipmentsand microstrip components. 2. To study the optical devices and to use in appropriate application.
List of Experiments:	
MICROWAVE EXPERIMENTS:	
1. Reflex Klystron – Mode characteristics	
2. Gunn Diode – Characteristics	
3. VSWR, Frequency and Wave Length Measurement	
4. Directional Coupler – Directivity and Coupling Coefficient – S – parameter Measurement	
5. Circulator – S - parameter measurement	
6. Attenuation and Power measurement	
7. S - matrix Characterization of E-Plane T, H-Plane T and Magic T.	
8. Radiation Pattern of Antennas.	
9. Antenna Gain Measurement	
OPTICAL EXPERIMENTS:	
1. DC characteristics of LED and PIN Photo Diode.	
2. Mode Characteristics of Fibers.	
3. Measurement of Connector and Bending Losses.	
4. Fiber Optic Analog and Digital Link	
5. Numerical Aperture Determination for Fibers	
6. Attenuation Measurement in Fibers.	
Contend Beyond: • Study of Manchester coding.	
	Total: 45 Hours
Course Outcomes:	
	After completion of the course, Student will be able to 1. Able to study and analyze microwave equipments. 2. Able to study and analyze optical devices.

Professional Electives – V

1703MG001	**PRINCIPLES OF MANAGEMENT**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Course Objectives:

1. To enable the students to study the evolution of Management
2. To study the functions and principles of management
3. To learn the application of the principles in an organization

Unit I	**INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS**	**9 Hours**

Definition of Management – Science or Art – Manager Vs Entrepreneur - Types of managers - managerial roles and skills – Evolution of Management – Scientific, Human relations , System and contingency approaches – Types of Business organization - Sole proprietorship, partnership, Company-public and private sector enterprises -

Organization culture and Environment – Current trends and issues in Management.		
Unit II	**PLANNING**	**9 Hours**
Nature and purpose of planning – Planning Process – Types of planning – Objectives – Setting objectives – policies – Planning premises – Strategic Management – Planning Tools and Techniques – Decision making steps and process.		
Unit III	**ORGANISING**	**9 Hours**
Nature and purpose – Formal and informal organization – Organization chart – Organization structure – Types – Line and staff authority – Departmentalization – Delegation of authority – Centralization and Decentralization – Job Design - Human Resource Management – HR Planning, Recruitment, Selection, Training and Development, Performance Management , Career planning and Management.		
Unit IV	**DIRECTING**	**9 Hours**
Foundations of Individual and Group behaviour – Motivation – Motivation theories – Motivational techniques – Job satisfaction – Job enrichment – Leadership – Types and theories of leadership – Communication – Process of communication – Barrier in communication – Effective communication –Communication and IT.		
Unit V	**CONTROLLING**	**9 Hours**
System and process of controlling – Budgetary and non-budgetary control techniques – Use of computers and IT in Management control – Productivity problems and management – Control and performance – Direct and preventive control – Reporting.		
	Total:	**45 Hours**

Further Reading:	
	1. Decision roles of managers.
	2. Motivational thoughts.
Course Outcomes:	
	After completion of the course, Student will be able to
	1. Explain the elements of Management and Organization.
	2. Summarize the types, policies, tools and techniques in Planning in Management
	3. Relate the job design and human resource management in Organizing
	4. Illustrate the skills of leadership and communication
	5. Interpret the controlling techniques in Management

References:

1. Stephen A. Robbins & David A. Decenzo & Mary Coulter, "Fundamentals of Management" 7 th Edition, Pearson Education, 2011.
2. Stephen P. Robbins & Mary Coulter, "Management", 10th Edition,Prentice Hall (India) Pvt. Ltd., 2009.
3. Robert Kreitner & Mamata Mohapatra, " Management", Biztantra, 2008.
4. JAF Stoner, Freeman R.E and Daniel R Gilbert "Management", 6 th Edition,Pearson Education, 2004.
5. Tripathy PC & Reddy PN, "Principles of Management", Tata McGraw Hill, 1999
6. Harold Koontz & Heinz Weihrich "Essentials of management" Tata McGraw Hill,1998.

1703MG002		**DISASTER MANAGEMENT**	**L**	**T**	**P**	**C**
			3	**0**	**0**	**3**

Course Objectives:

1. To provide an exposure to disasters, their significance and types.
2. To understand the relationship between vulnerability, disasters, disaster prevention and risk reduction
3. To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR)

Unit I	**INTRODUCTION TO DISASTERS**	**9 Hours**

Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc – Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Dos and Don'ts during various types of Disasters.

Unit II	**APPROACHES TO DISASTER RISK REDUCTION (DRR)**	**9 Hours**

Disaster cycle – Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies

Unit III	**INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT**	**9 Hours**

Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India – Relevance of indigenous knowledge, appropriate technology and local resources.

Unit IV	**DISASTER RISK MANAGEMENT IN INDIA**	**9 Hours**

Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy) - Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

Unit V	**DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS**	**9 Hours**

Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

Total:	**45 Hours**

Further Reading:

1. Discussion about the Air Pollution and Nuclear pollution - case studies
2. DRR Master Planning for the Future

Course Outcomes:

After completion of the course, Student will be able to

1. Develop an understanding of the key concepts, definitions a key perspectives of all Hazards Emergency Management
2. Differentiate the types of disasters, causes and their impact on environment and society
3. Assess vulnerability and various methods of risk reduction measures as well as mitigation.
4. Draw the hazard and vulnerability profile of India, Scenarios in the Indian context,
5. Disaster damage assessment and management

References:

1. Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., 2012
2. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011
3. KapurAnu Vulnerable India: A Geographical Study of Disasters, IIAS and Sage Publishers, New Delhi, 2010
4. Dr.Mirnalinipandey- "Disaster Management", wiley India Pvt Ltd.
5. C. K. Rajan, NavalePandharinath"Earth and Atmospheric Disaster Management : Nature an Manmade" B S Publication
6. Shailesh Shukla, Shamna Hussain "Biodiversity, Environment and Disaster Management Unique Publications

1703MG005	TOTAL QUALITY MANAGEMENT	L	T	P	C
		3	0	0	3

Course Objectives:

1. To learn concepts, dimension quality and philosophies of TQM.
2. To study the TQM principles and its strategies.
3. To impart knowledge on TQM tools for continuous improvement.

Unit I **INTRODUCTION** **9 Hours**

Definition of Quality - Dimensions of Quality - Quality Planning - Quality costs - Analysis Techniques for Quality Costs - Basic concepts of Total Quality Management - Historical Review - Quality Statements - Strategic Planning, Deming Philosophy - Crosby philosophy - Continuous Process Improvement - JuranTrilogy, PDSA Cycle, 5S, Kaizen - Obstacles to TQM Implementation

Unit II **TQM PRINCIPLES** **9 Hours**

Principles of TQM, Leadership - Concepts - Role of Senior Management - Quality Council, Customer satisfaction - Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement - Motivation, Empowerment, Teams, Recognition and Reward, Performance Appraisal, Benefits - Supplier Partnership - Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures - Basic Concepts, Strategy, Performance Measure

Unit III **STATISTICAL PROCESS CONTROL (SPC)** **9 Hours**

The seven tools of quality - Statistical Fundamentals - Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Control Charts for variables X bar and R chart and attributes P, NP, C, and u charts, Industrial Examples, Process capability, Concept of six sigma - New seven Management tools

Unit IV **TQM TOOLS** **9 Hours**

Benchmarking - Reasons to Benchmark - Benchmarking Process, Quality Function Deployment(QFD)- House of Quality, QFD Process, and Benefits - Taguchi Quality Loss Function - Total Productive Maintenance (TPM) - Concept, Improvement Needs, and FMEA - Stages of FMEA- Casestudies

Unit V **QUALITY SYSTEMS** **9 Hours**

Concept, Requirements of ISO 9000 and Other Quality Systems - ISO 9000:2000 Quality System - Elements, Implementation of Quality System, Documentation, Quality Auditing, ISO 9000:2005 and 9001:2015, ISO 14000.

Total: 45 Hours

Further Reading:

1. Case Study: TQM Quality and Environmental Concepts in real World Applications
2. Environment Management system

Course Outcomes:

After completion of the course, Student will be able to

1. Understand the concepts, dimension quality and philosophies of TQM.
2. Understand the principles of TQM and its strategies.
3. Apply seven statistical quality and management tools
4. Understand TQM tools for continuous improvement.
5. Understand the QMS and EMS

References:

1. Rathakrishnan, Gas Dynamics, 5th edition, PHI Learing Private Limited,2013.
2. N. Gupta and B. Valarmathi, Total Quality Management, Tata McGraw-Hill Publishing Company Pvt. Ltd., New Delhi,2009.
3. S. Kumar, Total Quality Management, Laxmi Publications Ltd. New Delhi,2006

4. P.N. Muherjee, Total Quality Management, Prentice Hall of India, New Delhi,2006.
5. DaleH.Besterfiled, Total Quality Management, Pearson Education Inc., New Delhi,2003.
6. James R. Evans and William M. Lidsay, The Management and Control of Quality, South- Western2002.

1703MG006		INDUSTRIAL ECONOMICS	L	T	P	C
			3	0	0	3

Course Objectives:

1. To introduce the concepts of micro, macroeconomic systems and business decisions in industry.
2. To acquire knowledge on laws of demand & supply and methods of forecasting thedemand
3. To emphasis the systematic evaluation of the costs, breakeven point for return on economics and diseconomies

Unit I	**INTRODUCTION**	**9 Hours**

Introduction to Industrial economics- Micro and Macro economics - Kinds of Economic Systems - Production Possibility Frontier - Opportunity Cost - Objective of Organizations - Kinds of Organization.

Unit II	**DEMAND AND SUPPLY**	**9 Hours**

Functions of Demand and Supply - Law of diminishing Marginal Utility - Law of Demand and Supply Elasticity of Demand - Demand Forecasting Methods - Indifference curve.

Unit III	**PRODUCTION AND COST**	**9 Hours**

Production Function - Returns to Scale - Law of Variable Proportion - Cost and Revenue concepts and Cost Curves - Revenue curves - Economies and Dis-Economies of scale - Break Even point.

Unit IV	**MARKET STRUCTURE**	**9 Hours**

Market Structure - Perfect Competition - Monopoly - Monopolistic - Oligopoly - Components of Pricing - Methods f Pricing - Capital Budgeting IRR - ARR - NPV - Return on Investment - Payback Period.

Unit V	**INTRODUCTION TO MACRO ECONOMICS AND FINANCIAL ACCOUNTING**	**9 Hours**

National Income - Calculation Methods - Problems - Inflation - Deflation - Business Cycle - Taxes - Direct and Indirect Taxes - Fiscal and monetary policies.

Total:	**45 Hours**

Further Reading:

1. Nature and characteristics of Indian Economy
2. Role and functions of Central bank - LPG - GATT - WTO.

Course Outcomes:

After completion of the course, Student will be able to

1. Understand the micro and macroeconomic environment for a favorable business environment
2. Apply laws of demand and supply in engineering economy and forecast the demand
3. Evaluate the various costs and breakeven point for organizational profitability
4. Analyze the pricing, payback on investments and e-commerce completions.
5. Asses the influence of macro level economics, taxation in businesses and financial accounting process

References:

1. A Ramachandra Aryasri and V V Ramana Murthy, Engineering Economics and Financial Accounting, Tata McGraw Hill Publishing Company Limited, New

Delhi,2006.
2. R Kesavan, C Elanchezhian and T Sunder Selwyn, Engineering Economics and Financial Accounting, Laxmi Publication Ltd, New Delhi,2005.
3. V L Samuel Paul and G S Gupta,Managerial Economics Concepts and Cases, Tata McGraw Hill Publishing Company Limited, New Delhi,1981.
4. S N Maheswari, Financial and Management Accounting, SultanChand
5. V L Samuel Paul and G S Gupta, Managerial Economics-Concepts andCases.
6. Barthwal R.R., Industrial Economics - An Introductory Text Book, New Age.

1703MG007		FOUNDATION SKILLS IN INTEGRATED PRODUCT DEVELOPMENT	L	T	P	C
			3	0	0	3

Course Objectives:

1. To understand the recent subsequent development of global trends and development methodologies of various types of products and services
2. To conceptualize, prototype and develop product management plan for a new product based on the type of the new product and development methodology integrating the hardware, software, controls, electronics and mechanical systems
3. To understand requirement engineering and know how to collect, analyze and arrive at requirements for new product development and convert them in to design specification

Unit I	**FUNDAMENTALS OF PRODUCT DEVELOPMENT**	**9 Hours**

Introduction to Product Development Methodologies and Management - Overview of Products and Services - Types of Product Development - Overview of Product Development methodologies - Product Life Cycle – Product Development Planning and Management.

Unit II	**REQUIREMENTS AND SYSTEMDESIGN**	**9 Hours**

Requirement Engineering - Types of Requirements - Quality Function Deployment & Phases - Modeling - Requirement Management - Introduction to System Modeling – System Optimization-System Specification.

Unit III	**DESIGN AND TESTING**	**9 Hours**

Introduction to Concept generation Techniques - Concept Screening & Evaluation - Detailed Design - Component Design and Verification - High Level /Low Level product Design - S/W Testing- Hardware Schematic, Component design, Layout and Hardware Testing.

Unit IV	**SUSTENANCE ENGINEERING AND END-OF-LIFE (EOL) SUPPORT**	**9 Hours**

Sustenance -Maintenance and Repair – Enhancements - Product EOL - Obsolescence Management – Configuration Management - EOL Disposal

Unit V	**BUSINESS DYNAMICS – ENGINEERING SERVICES INDUSTRY**	**9 Hours**

The Industry - Engineering Services Industry - Product Development in Industry versus Academia –The IPD Essentials - Introduction to Vertical Specific Product Development Processes - Product Development Trade-offs - Intellectual Property Rights – Security and Configuration Management.

Total:	**45 Hours**

Further Reading:

1. Rapid Prototyping and Rapid Manufacturing
2. PESTLE Analysis

Course Outcomes:

After completion of the course, Student will be able to

1. Define, formulate and analyze a problem
2. Solve specific problems independently or as part of a team
3. Gain knowledge of the Innovation & Product Development process in the Business Context

	4. Work independently and also in teams
	5. Manage a project from beginning to end
References:	
1. Mark S Sanders and Ernest J McCormick, "Human Factors in Engineering and Design", McGraw Hill Education, Seventh Edition, 2013	
2. Hiriyappa B, ―Corporate Strategy – Managing the Business‖, Author House, 2013.	
3. Karl T Ulrich and Stephen D Eppinger, "Product Design and Development", Tata McGraw Hill, Fifth Edition, 2011.	
4. John W Newstorm and Keith Davis, "Organizational Behavior", Tata McGraw Hill, Eleventh Edition, 2005.	
5. 4. Peter F Drucker, ―People and Performance‖, Butterworth – Heinemann [Elsevier], Oxford, 2004.	
6. Vinod Kumar Garg and Venkita Krishnan N K	

Professional Electives – VI

1703EC021		**ADVANCED DIGITAL SIGNAL PROCESSING**	**L**	**T**	**P**	**C**
			3	**0**	**0**	**3**
Course Objectives:		To provide in-depth treatment on methods and techniques in				
	1. Discrete-time signal transforms, digital filter design, optimal filtering					
	2. Power spectrum estimation, multi-rate digital signal processing					
	3. DSP architectures which are of importance in the areas of signal processing, control and communications.					
Unit I	**Parametric Methods for Power Spectrum Estimation**					**9 Hours**
Relationship Between Auto Correlation and Model Parameters: The Yule Walker method for the AR model parameters - the Burg method for the AR model parameters – unconstrained least square method for the AR model parameters - sequential estimation methods for the AR model parameters.						
Unit II	**Non-Parametric Methods for Power Spectrum Estimation**					**9 Hours**
Estimation of spectra from finite duration observation of signals; Non-Parametric Methods: Bartlett - Welch and Blackman - Tukey method.						
Unit III	**Adaptive Signal Processing**					**9 Hours**
FIR Adaptive Filters: Steepest descent adaptive filter - LMS algorithm - convergence of LMSalgorithms; Applications: Noise cancellation - channel equalization; Adaptive recursivefilters - recursive least squares.						
Unit IV	**Multirate Signal Processing**					**9 Hours**
Decimation by a factor D – Interpolation by a factor I – Filter design and implementation forsampling rate conversion; Direct form FIR filter structures – Polyphase filter structure.						
Unit V	**Discrete Transforms**					**9 Hours**
Discrete Transforms: Discrete Fourier transform - discrete cosine transform; WaveletTransform: Introduction - Haar scaling functions and function spaces- nested spaces –Haarwavelet function - orthogonality of $\varphi(t)$ and $\psi(t)$ - normalization of Haar bases at differentscales - Daubechies wavelets -support of wavelet system.						
				Total:		**45 Hours**
Further Reading:	http://www.ti.com/processors/dsp/overview.html					
Course Outcomes:						
	After completion of the course, Student will be able to					
	1. To design adaptive filters for a given application					
	2.To design multirate DSP systems.					
References:						
1. J.G. Proakis and D.G. Manolakis, 'Digital Signal Processing Principles, Algorithms and Applications', Pearson Education, New Delhi, PHI. 2003.						
2. Monson H. Hayes, "Statistical Digital Signal Processing and Modeling", Wiley, 2002.						
3. Roberto Crist, "Modern Digital Signal Processing", Thomson Brooks/ Cole, 2004.						

4. Raghuveer. M. Rao and AjitS.Bopardikar, "Wavelet Transforms: Introduction to Theoryand Applications", Pearson Education, Asia, 2000.
5. K. P Soman, K. I Ramachanadran and N.G Reshmi, "Insights into Wavelets: From
6. Theory to Practice", 3rd Edition, Prentice Hall of India, 2010.

1703EC022		EMBEDDED SYSTEMS	L	T	P	C
			3	0	0	3

Course Objectives:

1. In this course it is aimed to Understand the fundamentals of embedded systems differences of microprocessor and controller.
2. Understand the microcontroller architecture and pin diagrams.
3. Understand and able to write the assemble language program.
4. Understand and able to write the I/O and timers/counter programming
5. To use the embedded controllers In real time applications

Unit I	**Embedded system introduction**	**9 Hours**

Introduction to embedded system, embedded system architecture, classifications of embedded systems, challenges and design issues in embedded systems, fundamentals of embedded processor and microcontrollers, CISC vs. RISC, fundamentals of Vonneuman/Harvard architectures, types of microcontrollers, selection of microcontrollers.

Unit II	**Microcontroller (89C51 & 89S51 & 89S52)**	**9 Hours**

Microcontroller-Pin diagram of each series -Complete Pin description-Difference between 8031, 8051, 8052-Addressing modes -Instruction sets used in ATMEL-Types of instructions -Timers/Counters with I/O ports -Applications using timers/counters-Simple programs.

Unit III	**AVR Architecture**	**9 Hours**

Brief History of AVR Microcontrollers, Architecture of AVR Atmega32x Microcontroller, Pin diagram, AVR Family Overview, Atmega32 Family Members, AVR Assembly Language Programming.

Unit IV	**I/O Device Interfacing**	**9 Hours**

Assembly Language and Embedded C Programming- Interfacing Simple I/O Devices Like LED, Seven Segment, LCD, Switches -89c51 and AVR controller

Unit V	**Embedded controllers Application**	**9 Hours**

Sensor Interfacing and Signal Conditioning, Relay Interfacing, Opto isolator and Stepper Motor Interfacing, PWM Programming and DC Motor Control and various control applications.

Total: 45Hours

Further Reading: Serial communications, i2c communications

Course Outcomes:

After completion of the course, Student will be able to

1. Explain 8051,52 and AVR Microcontroller Architecture.
2. Develop an Assembly Language Program..
3. Build an interface for I/O Devices using Embedded C and ALP
4. Make use of internal and external peripherals.
5. Develop an interface for Sensors and Actuators.

References:

1. Programming PIC microcontrollers with PIC basic by chuck helebuyck
2. PIC microcontrollers-programming in basic by Milan verle.
3. Mohammad Ali Mazidi, Sarmad Naimi, SepehrNaimi; The AVR Microcontroller and Embedded Systems using Assembly and C; 1stEdition,Pearson Education India.
4. Dhananjay Gadre; Programming and Customizing the AVR Microcontroller; 1 st Edition, McGraw Hill.
5. The 8051 Microcontroller and Embedded Systems Using Assembly and C Second Edition Muhammad Ali Mazidi Janice GillispieMazidiRolin D. McKinlay

EMBEDDED SYSTEMS LABORATORY		
List of Experiments:		
1. StudyofARMevaluationsystem		
2. InterfacingADC andDAC		
3. InterfacingLEDand PWM		
4. Interfacing realtimeclock and serial port		
5. InterfacingkeyboardandLCD		
6. InterfacingEPROMand interrupt		
7. Mailbox		
8. InterruptperformancecharacteristicsofARMandFPGA		
9. FlashingofLED's		
10. Interfacingstepper motor andtemperaturesensor		
11. Implementingzigbeeprotocol with ARM		
	Total:	**45 Hours**
Additional Experiments:		
1. LCD display using Arduino processor		
2. Interfacing of keyboard and serial port using Arduino processor		
Course Outcomes:		
After completion of the course, Student will be able to		
1. Writeprograms in ARMforaspecificApplication		
2. InterfaceA/Dand D/Aconvertorswith ARMsystem		
3. Writeprogrammesforinterfacingkeyboard,display,motorandsensor		
4. Formulateamini project inembeddedsystem		
References:		
1. Sedra and Smith, "Micro Electronic Circuits"; Sixth Edition, Oxford University Press, 2011		
2. Robert L. Boylestad and Louis Nasheresky, "Electronic Devices and Circuit Theory", 10th Edition, Pearson Education / PHI, 2008		
3. David A. Bell, "Electronic Devices and Circuits", Fifth Edition, Oxford University Press, 2008		
4. Millman J. and Taub H., "Pulse Digital and Switching Waveforms", TMH, 2000		
5. Millman and Halkias. C., Integrated Electronics, TMH, 2007		

1703EC023	**PATTERN RECOGNITION AND MACHINE LEARNING**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
	(Common to B.E / B.Tech – CSE, IT & ECE)				
Course Objectives:					
	1. Provide knowledge of models, methods and tools used to solve regression, classification, feature selection and density estimation problems				
	2. Provide knowledge of learning and adaptation in supervised modes of learning				
	3. Provide knowledge of recognition, decision making and statistical learning problems.				
	4. Provide knowledge of current research topics and issues in Pattern Recognition and Machine Learning				
	5. Provide knowledge about linear functions				
Unit I	**SPEECH FUNDAMENTALS**				**9 Hours**
Articulatory Phonetics – Production and Classification of Speech Sounds; Acoustic Phonetics – acoustics of speech production; Review of Digital Signal Processing concepts; Short-Time Fourier Transform, Filter-Bank and LPC Methods					
Unit II	**VLSI SIGNAL PROCESSING**				**9 Hours**
An overview of DSP concepts- Representations of DSP algorithms.- Loop bound and iteration bound-Transformation Techniques: Retiming, Folding and Unfolding					
Unit III	**RF SYSTEM DESIGN**				**9 Hours**

Characteristics- amplifier power relations- stability considerations- constant gain circles- constant VSWR circles- low noise circles broadband- high power and multistage amplifiers.		
Unit IV	**MULTIMEDIA COMMUNICATION**	**9 Hours**
Introduction - Multimedia skills - Multimedia components and their characteristics - Text, sound, images, graphics, animation, video, hardware.		
Unit V	**CLOUD COMPUTING**	**12 Hours**
Technologies for Network-Based System – System Models for Distributed and Cloud Computing – NIST Cloud Computing Reference Architecture. Cloud Models:- Characteristics – Cloud Services – Cloud models (IaaS, PaaS, SaaS) – Public vs Private Cloud –Cloud Solutions - Cloud ecosystem – Service management – Computing on demand.		
	Total:	**45 + 15 Hours**

Further Reading:	
	Dimensional Reduction and Model Selection, On Feature Selection in Gaussian Mixture Clustering
Course Outcomes:	
	After completion of the course, Student will be able to
	1:Identify areas where Pattern Recognition and Machine Learning can offer a solution
	2: Describe the strength and limitations of some techniques used in computational Machine Learning for classification, regression and density estimation problems
	3: Describe genetic algorithms, validation methods and sampling techniques
	4 :l Describe some discriminative, generative and kernel based techniques
	5 :Describe and model sequential data
References:	
1.Lawrence Rabinerand Biing-Hwang Juang, “Fundamentals of Speech Recognition”, Pearson Education, 2003	
2. Keshab k. Parhi,” VLSI Digital Signal Processing Systems: Design and Implementation”, Wiley, inter science	
3.Reinhold Ludwig and Powel Bretchko, RF Circuit Design – Theory and Applications, Pearson Education Asia, First Edition, 2001.	

1703EC024		**SPEECH PROCESSING**	**L**	**T**	**P**	**C**
			3	**0**	**0**	**3**

Course Objectives:	
	1. To make the students to understand the digital Speech fundamentals.
	2. To study the digital models and processing of speech signal
	3. To acquire the basic knowledge in filters, voice enhancement, voice restoration and compression techniques.

Unit I	**SPEECH PRODUCTION MODEL**	**9 Hours**
1D sound waves-functional block of the Vocal tract model –Linear predictive co- efficients (LPC) -Auto-correlation method-Levinson-durbin algorithm-Auto-co- variance method-Lattice structure-Computation of Lattice co-efficient from LPC-Phonetic Representation of speech-Perception of Loudness - Critical bands – Pitch perception – Auditory masking.		
Unit II	**FEATURE EXTRACTION OF THE SPEECH SIGNAL**	**9 Hours**
Endpoint detection-Dynamic time warping- Pitch frequency estimation: Autocorrelation approach- Homomorphic approach-Formant frequency estimation using vocal tract model and Homomorphic approach-Linear predictive co-efficient -Poles of the vocal tract-Reflection co-efficient-Log Arearatio		
Unit III	**FREQUENCY DOMAIN METHODS FOR SPEECH PROCESSING**	**9 Hours**
Cepstrum- Line spectral frequencies- Functional blocks of the ear- Mel frequency cepstral co-efficients- Spectrogram-Time resolution versus frequency resolution-Discrete wavelettransformation.		
Unit IV	**PATTERN RECOGNITION FOR SPEECH DETECTION**	**9 Hours**
Back-propagation Neural Network-Support Vector Machine- Hidden Markov Model (HMM)-Gaussian Mixture Model(GMM) -Unsupervised Learning system: K-Means and Fuzzy K-means clustering - Kohonen self-		

organizing map- Dimensionality reduction techniques: Principle component analysis (PCA), Linear discriminant analysis (LDA), Kernel-LDA (KLDA), Independent component analysis(ICA).		
Unit V	**SPEECH ANALYSIS AND SYNTHESIS**	**9 Hours**
Non-uniform quantization for Gaussian distributed data- Adaptive quantization-Differential pulse code modulation-Code Exited Linear prediction (CELP)-Quality assessment of the compressed speech signal Text to Speech (TTS) analysis –Evolution of speech synthesis systems-Unit selection methods - TTS Applications		
	Total:	**45 Hours**

Further Reading:

Phonetic Mechanisms in Speech Perception
Disorders of Peripheral and Central Auditory Processing
Neurobiology of Statistical Information Processing in the Auditory Domain

Course Outcomes:

After completion of the course, Student will be able to

1. Illustrate how the speech production is modeled
2. Summarize the various techniques involved in collecting the features from the speech signal in both time and frequency domain
3. summarize the functional blocks of the ear.
4. compare the various pattern recognition techniques involved in speech and speaker detection
5. summarize the various speech compression techniques

References:

1. *L.R.Rabiner and R.W.Schafer," Introduction to Digital speech processing",now publishers USA,2007*
2. *E.S.Gopi,"Digital speech processing using matlab",Springer,2014*
3. *L.R.Rabiner and R.W.Schafer,"Digital processing of speech signals", PrenticeHall,1978*
4. *T.F.Quatieri,"Discrete-time Speech Signal Processing", Prentice-Hall, PTR,2001*
5. *L.Hanzaetal, "Voice Compression and Communications", Wiley/ IEEE ,2001.*

1703EC025		**VLSI Signal Processing**	**L**	**T**	**P**	**C**
			3	**0**	**0**	**3**

Course Objectives:

1. To enable students to design VLSI systems with high speed and low power.
2. To encourage students to develop a working knowledge of the central ideas of implementation of DSP algorithm with optimized hardware.

Unit I	**INTRODUCTION TO DSP SYSTEMS**	**9 Hours**
An overview of DSP concepts, Representations of DSP algorithms. Systolic Architecture Design: FIR Systolic Array, Matrix-Matrix Multiplication, 2D Systolic Array Design. Digital Lattice Filter Structures: Schur Algorithm, Derivation of One-Multiplier Lattice Filter, Normalised Lattice Filter, Pipelining of Lattice Filter.		
Unit II	**PIPELINING AND RETIMING**	**9 Hours**
Scaling and Round off Noise - State variable description of digital filters, Scaling and Round off Noise computation, Round off Noise in Pipelined IIR Filters, Round off Noise Computation using state variable description, Slow-down, Retiming and Pipelining.		
Unit III	**BIT-LEVEL ARITHMETIC ARCHITECTURES**	**9 Hours**
Bit level arithmetic Architectures- parallel multipliers, interleaved floor-plan and bit-plane- based digital filters, Bit serial multipliers, Bit serial filter design and implementation, Canonic signed digit arithmetic, Distributed arithmetic.		
Unit IV	**REDUNANT ARTITHMETIC**	**9 Hours**
Redundant arithmetic -Redundant number representations carry free radix-2 addition and subtraction, Hybrid radix-4 addition, Radix-2 hybrid redundant multiplication architectures, data format conversion, Redundant to Non redundant converter.		

Unit V	**NUMERICAL STRENGTH REDUCTION**	**9 Hours**
Numerical Strength Reduction - Subexpression Elimination, Multiple Constant Multiplication, Subexpression Sharing in Digital Filters, Additive and Multiplicative Number Splitting.		
	Total:	**45 Hours**

Further Reading:	
	1. Special decoders
	2. Sparse array processing
Course Outcomes:	
	After completion of the course, Student will be able to
	1. Understand basics of DSP systems
	2. Know about algorithmic strength reduction
	3. Convolute IIR filters
	4. Identify bit level arithmetic algorithms
	5. Compare protocols

References:

1. Keshab K. Parhi, " VLSI Digital Signal Processing Systems, Design and implementation ", Wiley, Interscience, 2007
2. U. Meyer – Baese, " Digital Signal Processing with Field Programmable Gate Arrays", Springer, Second Edition, 2004

1703EC026		**RF SYSTEM DESIGN**	**L**	**T**	**P**	**C**
			3	**0**	**0**	**3**

Course Objectives:	
	1. To understand the basics of system design
	2. To understand the concepts of radio architectures
	3. To introduce to the students the transmitter and receiver system design techniques and analysis
	4. To learn the applications of RF systems in wireless communication.

Unit I	**TRANSCEIVER ARCHITECTURES**	**9 Hours**
Heterodyne and Homodyne architectures, Discrete and CMOS realization passive components for RF, Impedance Matching, Distortion, IIP3 and Blocking Effects, Noise Figure, Noise matching conditions. Friis Formula for cascaded blocks.		
Unit II	**CMOS LNAS AND MIXERS**	**9 Hours**
Noise Figure of and impedance matching issues CS, CG and differential LNAs, Passive mixers and conversion loss, Active mixers, Gilbert cells, linearity and Noise Figure of mixers		
Unit III	**OSCILLATORS**	**9 Hours**
Negative transconductance, nonlinearity and Differential LC tuned oscillators, Ring oscillators and Colpitts oscillator, Quadrature oscillators–Phase noise		
Unit IV	**PLLS AND SYNTHESIZERS**	**9 Hours**
Phase Detectors, charge pumps and their transfer functions, Synthesizers based on first, second and third order PLLs and stability issues, Introduction to integer and fractional N synthesizers		
Unit V	**POWER AMPLIFIERS**	**9 Hours**
Class A, B, C, D, E, F and AB power amplifiers, Linearization and impedance matching issues of power amplifiers.		
	Total:	**45 Hours**

Further Reading:	
	Measurement of noise, jitter, SFDR, intermodulation products for RF system
Course Outcomes:	
	After completion of the course, Student will be able to
	1. Understand radio transceiver architectures
	2. Design and Analyze CMOS LNAs , Mixers
	3. Design and Analyze Oscillators, PLLs,
	4. Design and Analyze Synthesizers and Power Amplifiers.

References:

1. B. Razavi, ―RF Microelectronics‖, Pearson Education, 2nd edition, 2012.
2. Thomas Lee, ―The Design of CMOS Radio Frequency Integrated Circuits, Cambridge University Press, Second Edition, 2004
3. Zhipei Chi, *High Performance, High Speed VLSI Architectures for Wireless Communication Applications* University of Minnesota, 2000.

E.G.S.PILLAYENGINEERINGCOLLEGE

(Autonomous)

Approved byAICTE,New Delhi|Affiliated to AnnaUniversity, Chennai Accredited byNAAC with „A"Grade|Accredited byNBA (CSE, EEE, MECH)

NAGAPATTINAM–611002

B.E. Electronics and Communication Engineering

Full Time Curriculum and Syllabus

Fourth Year– Eighth Semester

Course Code	Course Name	L	T	P	C	Maximum Marks		
						CA	ES	Total
Theory Course								
	Professional Elective -VII	3	-	-	3	40	60	100
	Professional Elective -VIII	3	-	-	3	40	60	100
	Professional Elective - IX	3	-	-	3	40	60	100
Laboratory Course								
1704EC851	Project Work	-	-	18	9	50	50	100
	Total	**9**	**-**	**18**	**18**	**170**	**230**	**400**
Professional Elective - VII								
1703EC027	Multimedia Communication	3	0	0	3	40	60	100
1703EC028	Wireless Sensor Networks	3	0	0	3	40	60	100
1703EC029	Radar and Navigation Aids	3	0	0	3	40	60	100
1703EC030	Microwave Integrated Circuits	3	0	0	3	40	60	100
1703EC031	Satellite Communication	3	0	0	3	40	60	100
Professional Elective – VIII								
1703EC032	System-on Chip Design	3	0	0	3	40	60	100
1703EC033	Network on Chip Design	3	0	0	3	40	60	100
1703EC034	Low Power VLSI Design	3	0	0	3	40	60	100
1703EC035	Analog IC Design	3	0	0	3	40	60	100
1703EC036	Mixed Signal CMOS Design	3	0	0	3	40	60	100

Professional Elective - IX								
1703EC037	Electromagnetic Interference and Compatibility	3	0	0	3	40	60	100
1703EC038	Digital System Design and Testing	3	0	0	3	40	60	100
1703EC039	Optical Networks	3	0	0	3	40	60	100
1703EC040	RF MEMS	3	0	0	3	40	60	100
1703EC041	Digital Switching and Transmission	3	0	0	3	40	60	100
1703EC042	ARM Processors	3	0	0	3	40	60	100
1703EC043	Mobile Computing	3	0	0	3	40	60	100

Professional Elective – VII

1703EC027		**MULTIMEDIA COMMUNICATIONS**	**L**	**T**	**P**	**C**
			3	**0**	**0**	**3**
		(Common to B.E / B.Tech –ECE, CSE, IT)				
Course Objectives:						
	1.To have a detailed knowledge of compression and decompression techniques					
	2.To introduce the concepts of multimedia communication					
	3. To introduce standards of MPEG					
Unit I	**Introduction to Multimedia Communications**					**5 Hours**
Components of multimedia system, Desirable features, Applications of multimedia systems, Introduction to different types, Multimedia storage device.						
Unit II	**Digital audio representation**					**9 Hours**
Digital audio representation and processing-time domain and transform domain representations. Coding standards, transmission and processing of digital audio. Musical instrument synthesizers.						
Unit III	**Image coding algorithms**					**12 Hours**
Still image coding-JPEG. Discrete cosine Transform. Sequential and Progressive DCT based encoding algorithms, lossless coding, hierarchical coding. Basic concepts of discrete wavelet transform coding and embedded image coding algorithms. Introduction to JPEG2000.						
Unit IV	**MPEG**					**9 Hours**
Feature of MPEG 1, structure of encoding and decoding process, MPEG 2 enhancements, and different blocks of MPEG video encoder.						
Unit V	**Video coding**					**10 Hours**
Content based video coding-overview of MPEG 4 video, motion estimation and compensation. Different coding techniques and verification models. Block diagram of MPEG 4 video encoder and decoder. An overview of H261 and H263 video coding techniques						
		Total:				**45**
Further Reading:						
	1. Advanced compression techniques					
	2. Coding Techniques					
Course Outcomes:						
	After completion of the course, Student will be able to					
	1. Describe various multimedia components					
	2. Describe compression and decompression techniques					
	3. Apply the compression concepts in multimedia communication					
	4. Describe the video encoding					
	5. To know the digital audio representation					
References:						
1. Fred Halsall, "**Multimedia Communications**", Pearson education, 2001						

2. J.S. Chitode, **"Information coding techniques"**, Technical publications, 1st edition 2007.
3. Raif steinmetz, Klara Nahrstedt, "**Multimedia: Computing, Communications and Applications**", Pearson education, 2002
4. John Billamil, Louis Molina, "**Multimedia : An Introduction**", PHI, 2002

1703EC028		WIRELESS SENSOR NETWORKS	L	T	P	C
			3	0	0	3
		(Common to B.E / B.Tech – CSE, IT & ECE)				

Course Objectives:

1. To study about Wireless networks, protocol stack and standards.
2. To study about fundamentals of 3G Services, its protocols and applications.
3. To study about evolution of 4G Networks, its architecture and applications.

Unit I	WIRELESS NETWORK ARCHITECTURE	9 Hours

Introduction-Wireless network logical architecture – Network physical architecture- Wireless LAN standards: System architecture, protocol architecture, physical layer, MAC layer, 802.11 Enhancements – Hiper LAN: WATM, BRAN, HiperLAN2 – Bluetooth- VoWLAN and VoIP security – WPA- IEEE802.16-WIMAX: Physical layer, MAC, Spectrum allocation for WIMAX

Unit II	ADHOC AND SENSOR NETWORKS	9 Hours

Introduction - Mobile IP: IP packet delivery, Agent discovery, tunneling and encapsulation, IPV6- Mobile ad-hoc network: Routing, Destination Sequence distance vector, Dynamic source routing- Characteristics of MANETs, Table-driven and Source-Initiated On Demand routing protocols, Hybrid protocols, Wireless Sensor networks-Classification, MAC and Routing protocols.

Unit III	PROTOCOLS AND TCP/IP SUITE	9 Hours

The Need for a Protocol Architecture - The TCP/IP Protocol Architecture - The OSI Model - Internetworking TCP enhancements for wireless protocols - Traditional TCP: Windows based Congestion control, fast retransmit/fast recovery, Influences of mobility on TCP mechanism - Classical TCP improvements: Indirect TCP, Snooping TCP, Mobile TCP, Time out freezing, Selective retransmission, Transaction oriented TCP - TCP over 3G wireless networks

Unit IV	DESIGN OF WIRELESS WIDE AREA NETWORK	9 Hours

Basics of indoor RF planning- Three phases of wireless network design- Overview of UTMS Terrestrial Radio access network-UMTS Core network Architecture: link budgets for GSM, CDMA, 3G-MSC, 3G- SGSN, 3G-GGSN, SMS-GMSC/SMS-IWMSC, Firewall, DNS/DHCP-High speed Downlink packet access (HSDPA)systems - LTE network architecture and protocol.

Unit V	CURRENT AND FUTURE OF WIRELESS NETWORKING TECHNOLOGY	9 Hours

Introduction – 4G vision – 4G features and challenges - Applications of 4G – Leading edge WNT: Wireless mesh network routing- Network independent roaming- Gigabit wireless LANs- OFDM-MIMO systems, Adaptive Modulation and coding with time slot scheduler, Cognitive Radio.

Total:	45 Hours

Further Reading:

Signal Encoding Techniques, Cordless Systems and Wireless Local Loop

Equalization, Coding, and Diversity, Heterogeneous Wireless Networks

Course Outcomes:

After completion of the course, Student will be able to

1. Conversant with the latest 3G/4G and WiMAX networks and its architecture.
2. Design and implement Routing Techniques
3. Analyze wireless network environment for any application using latest wireless protocols and standards.
4. Compare and Analyze the Different types Networks
5. Implement different type of applications for smart phones and mobile devices with latest network strategies.

References:

1. Erik Dahlman, Stefan Parkvall, Johan Skold and Per Beming, "3G Evolution HSPA and LTE for Mobile Broadband", Second Edition, Academic Press, 2008.
2. Anurag Kumar, D.Manjunath, Joy kuri, "Wireless Networking", First Edition, Elsevier 2011.
3. Simon Haykin , Michael Moher, David Koilpillai, "Modern Wireless Communications", First Edition, Pearson Education 2013

1703EC029		RADAR AND NAVIGATION AIDS	L	T	P	C
			3	0	0	3

Course Objectives:

1. Able to understand radar equations and types of radar
2. Able to understand aids and navigation systems
3. Obtain the knowledge of Doppler effects and equations nd detect the moving objects

Unit I	RADAR EQUATIONS	9 Hours

RADAR Block Diagram & operation- RADAR Frequencies- RADAR Equation- Detection of signals in Noise- RADAR cross section of targets- RADAR cross section fluctuations- transmitter power- pulse repetition frequency- system losses and propagation effects

Unit II	MTI AND PULSE DOPPLER RADAR	9 Hours

Introduction to Doppler & MTI RADAR- Delay Line canceller- Moving Target Detector- Pulse Doppler RADAR- Non-Coherent MTE- CW RADAR- FMCW RADAR- Tracking RADAR- Monopulse Tracking – Conical Scan and Sequential Lobing.

Unit III	RADAR SIGNAL DETECTION AND PROPAGATION ON WAVES	9 Hours

Detection criteria- automatic detection- constant false alarm rate receiver- information available from a RADAR- ambiguity diagram- pulse compression- introduction to clutter- surface clutter RADAR equation- anomalous propagation and diffraction.

Unit IV	TRACKING ,IMAGING AND SCANNING RADAR	9 Hours

Tracking with radar ,monopulse tracking ,conical scan and sequential lobing, low angle tracking ,air surveillance radar, Introduction to synthetic aperture radar ,tracking in range and Doppler ,acquisition Principle of phased array for electronic scanning ,and its operation .Radio ranges: LF/MF four course radio ranges ,VHF omni directional range ,vor receiving equipment, Hyperbolic system of navigation :LORAN,DECCA

Unit V	SATELLITE NAVIGATIONAL SYSTEM	9 Hours

Instrument landing system, Ground controlled approach system, Microwave landing system, Distance measuring equipment ,TACAN Doppler navigation _Doppler effect, Track stabilization .SATELLITE navigation :GPS principle of operation ,position location determination, principle of GPS receiver and applications

	Total:	45 Hours

Further Reading:

GPS principle of operation, Position location determination, principle of GPS receiver and applications

Course Outcomes:

After completion of the course, Student will be able to

1. Students equipped to find the range and tracking moving object
2. Learn the equations of radar and Doppler effect
3. Study the satellite navigation system
4. Learn the range equation
5. Understand Principles of navigation and landing aids

References:

1. "Introduction to radar system", Merrill I.skolnik ,3rd edition Tata McGraw hill 2003 .
2. "Elements electronic navigation system",N.S.Nagaraja ,2nd edition Tata McGraw Hill 2000.
3. " Principle of Radar",J C Toomay ,PHI 2nd edition 2004.
4. " Radar Principles ',Peyton Z Peebles ,John Wiley ,2004.

1703EC030		MICROWAVE INTEGRATED CIRCUITS	L	T	P	C
			3	0	0	3

Course Objectives:

1. To enhance the students knowledge in the area of planar microwave engineering and to make them understand the intricacies in the design of microwave circuits.
2. To impart knowledge about the state of art in MIC technology.

Unit I	**INTRODUCTION TO MICROWAVE CIRCUITS**	**9 Hours**
Definitions – Frequency Bands – Lumped versus Distributed Circuits - Behavior of finite length transmission lines – General Characteristics of PC Boards – Transmission Lines on PC Boards – Passives made from Transmission Lines – Resonators - Combiners, Splitters and Couplers		
Unit II	**MATCHING NETWORKS AND FILTER DESIGN**	**9 Hours**
Circuit Representation of two port RF/Microwave Networks: Low Frequency Parameters, High Frequency Parameters, Transmission Matrix, ZY Smith Chart, Design of Matching Circuits using Lumped Elements, Matching Network Design using Distributed Elements, Filter design.		
Unit III	**AMPLIFIERS AND OSCILLATORS**	**9 Hours**
Amplifiers: Stability considerations in active networks – Gain Consideration in Amplifiers – Noise Consideration in active networks – Broadband Amplifier design – Low Noise Amplifier Design, Oscillators: Oscillator versus Amplifier Design – Oscillation conditions – Design and stability considerations of Microwave Transistor Oscillators		
Unit IV	**MIXERS AND CONTROL CIRCUITS**	**9 Hours**
Mixer Types – Conversion Loss – SSB and DSB Mixers – Design of Mixers: Single Ended Mixers – Single Balanced Mixers - Sub Harmonic Diode Mixers , Microwave Diodes , Phase Shifters – PIN Diode Attenuators		
Unit V	**MICROWAVE IC DESIGN AND MEASUREMENT TECHNIQUES**	**12 Hours**
Microwave Integrated Circuits – MIC Materials- Hybrid versus Monolithic MICs – Multichip Module Technology - Fabrication Techniques, Miniaturization techniques, Introduction to SOC, SOP, Test fixture measurements, probe station measurements, thermal and cryogenic measurements, experimental field probing techniques.		
	Total:	**45 + 15 Hours**
Further Reading:		
	1. Monolithic Microwave Integrated circuit (mmic) technology for space communication applications	
	2. Integrated Microwave packaging Antenna design	
Course Outcomes:		
	After completion of the course, Student will be able to	
	1. Equipped from fundamentals to recent techniques in MIC technology.	
	2. Independently design and assess the performance of various planar configurations.	
	3.Know measurement technique	
	4. Able to design microwave amplifiers and oscillators	
	5. Able to design lumped and distributed elements.	
References:		
1. Thomas H.Lee, “Planar Microwave Engineering”, Cambridge University Press, 2004,		
2. Matthew M. Radmanesh, “Radio Frequency and Microwave Electronics”, Pearson Education, II Edition 2002		
3. “Microwave Transistor Amplifiers – Analysis and Design”, II Edition, Prentice Hall, New Jersy		
4. Ravender Goyal, “Monolithic MIC; Technology & Design”, Artech House, 1989.		
5. Gupta K.C. and Amarjit Singh, “ Microwave Integrated Circuits”, John Wiley, New York, 1975.		
6. Hoffman R.K. “Handbook of Microwave Integrated Circuits”, Artech House, Boston, 198		
7. Ulrich L. Rohde and David P.N., “ RF / Microwave Circuit Design for Wireless Applications”, John Wiley, 2000.		

1703EC031		**SATELLITE COMMUNICATION**	**L**	**T**	**P**	**C**
			3	**0**	**0**	**3**
Course Objectives:						
	1. To impart knowledge about the Satellite communication.					
	2. To enhance the students’ knowledge in astronomy and space					
Unit I	**SATELLITE ORBITS**					**9 Hours**

Introduction - Spectrum allocations for satellite systems -Kepler's Laws - orbital parameters - orbital perturbations - station keeping – Type of orbits - Geo stationary orbits – look angle determination- limits of visibility – eclipse -sub satellite point – sun transit outage - launching procedures - launch vehicles and propulsion.		
Unit II	**SPACE AND EARTH SEGMENT**	**9 Hours**
Spacecraft technology- structure- power supply- attitude and orbit control - thermal control and propulsion - communication subsystems - telemetry, tracking and command - TranspondersAntenna subsystem, Equipment reliability. Earth station technology -Receive only home TV systems - MATV – CATV – Transmit Receive Earth Stations.		
Unit III	**SATELLITE ACCESS**	**9 Hours**
Modulation and Multiplexing-Voice, Data, Video, Analog – digital transmission system-Digital video broadcast - multiple access: FDMA, TDMA, CDMA- assignment methods -spread spectrum communication -compression – encryption. Mobile satellite Service: GSM, GPS, communication between satellites		
Unit IV	**SATELLITE LINK DESIGN**	**9 Hours**
Introduction- Equivalent isotropic radiated power -Transmission Losses – Link power budget equation - System Noise, Carrier to Noise ratio – uplink – downlink – effects of rain – combined uplink and downlink C/N ratio –inter modulation noise - Interference between satellite circuits.		
Unit V	**SATELLITE APPLICATIONS**	**12 Hours**
Satellite mobile services – VSAT- Radarsat- GPS- Orbcomm-iridium- Direct Broadcast satellites (DBS) - Direct to home Broadcast (DTH) -Digital audio broadcast (DAB) – World space services, Business TV (BTV) – GRAMSAT - Specialized services: E mail, Video conferencing, Internet- INTELSAT Series- INSAT – INMARSAT. Remote sensing		
	Total:	**45 Hours**
Further Reading:		
	Latesttrend in satellite communication, Recent launching satellites and its application, Communication between satellites, Comparison of satellite	
Course Outcomes:		
	After completion of the course, Student will be able to	
	1. Discuss orbital mechanics and launch methodologies.	
	2. Describe various space subsystems.	
	3. Explain different subsystems of earth segment	
	4. Design and analyze link power budget for satellites	
	5. Describe in various Satellite Applications	
References:		
1. Wilbur L.Pritchard, Hendri G. Suyderhoud, Robert A. Nelson, "Satellite Communication Systems Engineering", Prentice Hall/Pearson, 2007.		
2. N.Agarwal, "Design of Geosynchronous Space Craft", Prentice Hall, 1986.		
3. Bruce R. Elbert, "The Satellite Communication Applications", Hand Book, Artech House Bostan London, 1997.		
4. Tri T. Ha, "Digital Satellite Communication", II nd edition, 1990.		
5. Emanuel Fthenakis, "Manual of Satellite Communications", Mc Graw Hill Book Co., 1984.		
6. Robert G. Winch, "Telecommunication Trans Mission Systems", Mc Graw-Hill Book Co., 1983		
7. Brian Ackroyd, "World Satellite Communication and earth station Design", BSP professional Books, 1990.		
8. G.B.Bleazard, "Introducing Satellite communications", NCC Publication, 1985.		
9. M.Richharia, "Satellite Communication Systems-Design Principles", Macmillan 2003.		

Professional Electives – VIII

1703EC032		**SYSTEM ON CHIP DESIGN**	**L**	**T**	**P**	**C**
			3	**0**	**0**	**3**
Course Objectives:						

	1. To introduce architecture and design concepts underlying system on chips
	2. To gain knowledge of designing SoCs
	3. To impart knowledge about the hardware-software design of a modest complexity chip the way from specifications, modeling, synthesis and physical design

Unit I	**: SYSTEM ARCHITECTURE: OVERVIEW**	**9 Hours**
Components of the system –Processor architectures –Memory and addressing –system level interconnection –SoC design requirements and specifications –design integration –design complexity – cycle time, die area and cost, ideal and practical scaling, area-time-power tradeoff in processor design, Configurability.		
Unit II	**PROCESSOR SELECTION FOR SOC**	**9 Hours**
Overview –soft processors, processor core selection. Basic concepts–instruction set, branches, interrupts and exceptions. Basic elements in instruction handling –Minimizing pipeline delays –reducing the cost of branches –Robust processors –Vector processors, VLIW processors, Superscalar processors.		
Unit III	**MEMORY DESIGN**	**9 Hours**
SoC external memory, SoC internal memory, Scratch pads and cache memory –cache organization and write policies –strategies for line replacement at miss time –split I-and D-caches –multilevel caches –SoC memory systems –board based memory systems –simple processor/memory interaction		
Unit IV	**INTERCONNECT ARCHITECTURES AND SOC CUSTOMIZATION**	**9 Hours**
Bus architectures –SoC standard buses –AMBA, CoreConnect –Processor customization approaches Reconfigurable technologies –mapping designs onto reconfigurable devices -FPGA based design – Architecture of FPGA, FPGA interconnect technology, FPGA memory, Floor plan and routing.		
Unit V	**FPGA BASED EMBEDDED PROCESSOR**	**9 Hours**
Hardware software task partitioning – FPGA fabric Immersed Processors –Soft Processors and Hard Processors –Tool flow for Hardware/Software Co-design–Interfacing Processor with memory and peripherals –Types of On-chip interfaces –Wishbone interface, Avalon Switch Matrix, OPB Bus Interface, Creating a Customized Microcontroller -FPGA-based Signal Interfacing and Conditioning		
	Total:	**45 Hours**

Further Readings	
	1.Modern system design trends
	2.MPSoCs design
Course Outcomes:	
	After completion of the course, Student will be able to
	1.Explain all important components of a System-on-Chip and an embedded system, i.e. digital hardware and embedded software
	2.Outline the major design flows for digital hardware and embedded software
	3.Discuss the major architectures and trade-offs concerning performance, cost and power consumption of single chip and embedded systems
	4.gain the knowledge of designing SoCs.
	5.Understand designing complexity in specification ,Modelling, synthesis and physical design.

References:

1. Michael J. Flynn and Wayne Luk, Computer System Design: System-on-Chip", John Wiley and sons, 2011
2. Rahul Dubey, "Introduction to Embedded System Design Using Field Programmable Gate Arrays", Springer Verlag London Ltd., 2009.
3. Sudeep Pasricha and Nikil Dutt,On-Chip Communication Architectures-System on Chip Interconnect, Elsevier, 2008
4. Wayne Wolf, "Modern VLSI Design – System – on – Chip Design", Prentice Hall, 3rd Edition, 2008.
5. Wayne Wolf Modern VLSI Design – IP based Design", Prentice Hall, 4th Edition, 2008.

1703EC033		NETWORK ON CHIP	L	T	P	C
			3	0	0	3

Course Objectives:	
	1.understand the various classes of Interconnection networks
	2.learn about different routing techniques for on-chip network
	3.know the importance of flow control in on-chip network

Unit I	ICN ARCHITECHTURE	9 Hours
Introduction - Classification of ICNs - Topologies - Direct networks - Indirect networks-Performance analysis		
Unit II	**SWITCHING TECHNLOGIES**	**9 Hours**
Basic switching techniques - Virtual channels - Hybrid switching techniques Optimizing switching techniques - Comparison of switching techniques - Deadlock, livelock and Starvation		
Unit III	**ROUTING TECHNOLOGIES**	**9 Hours**
Taxonomy of routing algorithms - Deterministic routing algorithms - Partially adaptive algorithms - Fully adaptive algorithms - Routing in MINs - Routing in switch-based networks with irregular topologies - Resource allocation policies- Flow control.		
Unit IV	**NETWORK ON CHIP**	**9 Hours**
NoC Architectures - Router architecture - Area, energy and reliability constraints - NoC design lternatives - uality-of Service (QoS) issues in NoC architectures		
Unit V	**EMERGING TRENDS**	**9 Hours**
. Fault-tolerance issues - Emerging on-chip interconnection technologies- 3D NoC- Simulation		
	Total:	**45 Hours**

Further Readings	
	1.Multi.processor System on chip (MpSOC)
	2.NoC in Real time systems (RTS)

Course Outcomes:	
	After completion of the course, Student will be able to
	1. Identify the major components required to design an on-chip network
	2.Compare different switching techniques
	3.Evaluate the performance of given on chip process
	4.Demonstrate the dead lock free and live lock free routing protocols
	5.Simulate and asses the performance of given on chip network

References:

1. Jose Duato, Sudhakar Yalamanchili, Lionel Ni, "Interconnection Networks: An Engineering Approach", Morgan Kaufmann, 2002
2. William James Dally, Brian Towles, "Principles and Practices of Interconnection Networks", Morgan Kaufmann, 2004
3. Giovanni De Micheli, Luca Benini, "Networks on Chips: Technology and Tools", Morgan Kaufmann, 2006
4. Natalie D. Enright Jerger, Li-ShiuanPeh, “On-Chip Networks (Synthesis Lectures on Computer Architecture)”, Morgan and Claypool, 2004
5. Fayez Gebali, Haytham Elmiligi, Mohamed Wathed El-Kharashi, “Networks-on-Chips: Theory and Practice”, CRC Press, 2009

1703EC034		LOW POWER VLSI DESIGN	L	T	P	C
			3	0	0	3

Course Objectives:	
	Identify sources of power in an IC.
	Identify the power reduction techniques based on technology independent and technology dependent

	Power dissipation mechanism in various MOS logic style.
	Identify suitable techniques to reduce the power dissipation.
	Design memory circuits with low power dissipation.

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

Further Reading:	
	Dual VDD architecture, High VDD for critical paths and low VDD for non-critical paths.

Course Outcomes:	
	After completion of the course, Student will be able to
	1. know the basics and advanced techniques in low power design
	2. know the reduction in power dissipation.
	3. Explain the low power CMOS circuits
	4. Analyze Power Estimation in low power
	5. Synthesis the Low Power Circuits.

References:

1. Gary Yeap, “Practical low power digital VLSI design”, Kluwer, 1998.
2. Kaushik Roy and S.C.Prasad, “Low power CMOS VLSI circuit design”, Wiley, 2000.
3. DimitriosSoudris, ChirstianPignet, Costas Goutis, “Designing CMOS Circuits for Low Power”, Kluwer, 2002.
4. J.B.Kulo and J.H Lou, “Low voltage CMOS VLSI Circuits”, Wiley 1999.
5. A.P.Chandrasekaran and R.W.Broadersen, “Low power digital CMOS design”, Kluwer,1995.
6. AbdelatifBelaouar, Mohamed.I.Elmasry, “Low power digital VLSI design”, Kluwer, 1995.
7. James B.Kulo, Shih-Chia Lin, “Low voltage SOI CMOS VLSI devices and Circuits”, John Wiley and sons, inc. 2001.

1703EC035		ANALOG IC DESIGN	L	T	P	C
			3	0	0	3

Course Objectives:	
	To impart knowledge about the Analog VLSI Design.
	To enhance the students’ knowledge in classical VLSI Design

Unit I	**MOS DEVICES AND CIRCUITS**	**9 Hours**
Evolution of ICs - VLSI design flow - Device modeling -Moore_s law- MOS transistors- depletion and enhancement mode operations - NMOS and CMOS inverter circuits - Stick diagram and Layout diagram- Two input NAND and NOR circuits using CMOS		
Unit II	**FABRICATION OF ICS**	**9 Hours**

NMOS and CMOS fabrication - N-well, P-well and twin tub processes		
Unit III	**IMPLEMENTATION STRATEGIES**	**9 Hours**
PLDs – PAL, PLA, CPLD, Full custom and Semi custom ASIC design- Standard cell design, FPGA building block architectures, FPGA interconnect - Routing – FPGA, Xilinx 4000 series - Altera Cyclone III		
Unit IV	**CURRENT TRENDS**	**9 Hours**
BiCMOS and GaAs devices- Introduction to Low power VLSI circuit techniques - Introduction to analog and mixed signal design.		
Unit V	**VERILOG HARDWARE DESCRIPTION LANGUAGE**	**9 Hours**
Introduction to Verilog HDL –Behavior modeling -Tasks and functions -Verilog structure, syntax and semantics, Gate level modeling - Dataflow modeling Design examples - Adders, Multiplexers, Flip Flops, Registers , counters		
	Total:	**45 Hours**

Further Readings	
	Analog Design Essentials
	Stability and Frequency Compensation
Course Outcomes:	
	After completion of the course, Student will be able to
	1. Explain the operation and characteristics of MOS transistor
	2. Discuss the steps involved in fabrication of IC
	3. Outline the role of stick diagram and Layout diagram
	4. Discuss the basic concepts of FPGA and ASIC
	5. Use the Verilog HDL for digital design

References:

1. Pucknell D.A and EshraghianK ,"Basic VLSI Design‖, PHI publication, Second Edition, 2011.
2. Charles H. Roth , ―Digital Systems Design Using VHDL‖, CL Engineering/Cengage Learning India, 2012.
3. Samir Palnitkar, ―Verilog HDL Guide to Digital design and synthesis‖, Second Edition Pearson Education, 2009.
4. M.J. Smith, ‖Application specific integrated circuits‖, Addison Wesley, 2008.
5. West N and EshraghianK,―Principles of CMOS VLSI Design‖, Addison Wesley Publication, Second Edition, 1993.

1703EC036		**MIXED SIGNAL CMOS DESIGN**	**L**	**T**	**P**	**C**
			3	**0**	**0**	**3**

Course Objectives:	1. To know mixed signal circuits like DAC, ADC, PLL etc.
	2. To gain knowledge on filter design in mixed signal mode.
	3. To acquire knowledge on design different architectures in mixed signal mode.

Unit I	**CMOS AMPLIFIERS BASICS**	**9 Hours**
Introduction to MOS Capacitances- passive components and their parasitic- small and large signal odelling and analysis- Different Single stage and Differential Amplifiers- Current Mirrors.		
Unit II	**MULTI-STAGE AMPLIFIERS**	**9 Hours**
Telescopic and Folded cascode amplifiers- Slew-rate, Pole splitting-Two-stage amplifiers – analysis-Frequency response- Stability compensation- Common mode feedback analysis-feedback amplifier topologies.		
Unit III	**CIRCUIT DESIGN**	**9 Hours**
Custom Circuit design-Cell based and Array based design implementations- Static and Dynamic Characteristics of CMOs inverter-Power dissipation-Logical effort- Module 2 Designing combinational and sequential circuits.		

Unit IV	**LOGIC CIRCUITS**	**9 Hours**
Static CMOS design- Different styles of logic circuits-Logical effort of complex gates-Static and dynamic properties of complex gates- Dynamic CMOS Logic- Timing metrics of sequential circuits- Dynamic latches and Registers-Pipelining.		
Unit V	**CIRCUIT CHARACTERIZATION**	**9 Hours**
Circuit characterization and performance estimation – Resistance-Capacitance estimation - Switching characteristics - Delay models –Timing issues in Digital circuits-Power dissipation-Impact of Clock Skew and Jitter.		
	Total:	**45 Hours**
Further Readings:		
	Anatomy of mixed-signal interfaces: Driver applications, design approaches & circuit requirements	
	Benchmarking the CMOS fabric: Transconductance, noise, distortion, mismatch	
Course Outcomes:		
	After completion of the course, Student will be able to	
	1. Students will demonstrate the use of analog circuit analysis techniques to analyze the operation and behavior of various analog integrated circuits.	
	2. Students will demonstrate their knowledge by designing the stages of analog circuits	
	3. Design, layout, and testing of Analog circuits.	
	4. Implement the logic circuits using MOS and CMOS technology	
	5. Analyze the merits of circuits according to the technology and applications change.	
References:		
1. R.Jacob Baker, "CMOS Mixed-Signal Circuit Design", John Wiley & Sons, 2008.		
2. Vineetha P.Gejji Analog and Mixed Mode Design - Prentice Hall, 1st Edition , 2011		
3. "Analog Integrated Circuit Design" by Tony Chan Carusone, David A. Johns, Kenneth W. Martin Reference books:2011,.		
4. "Analog Design Essentials" by Willy M. C. Sansen,2010		
5. "Design of Analog CMOS Integrated Circuits" by Behzad Razavi,2002.		

1703EC037	**ELECTROMAGNETIC INTERFERENCE AND COMPATIBILITY**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
Course Objectives:					
	1. To analyze EMI Sources, EMI problems.				
	2. To analyze methods in PCB level / Subsystem and system level design.				
	3. To measure the emission. immunity level from different systems.				
	4. To analyze various testing equipment and compare prescribed EMC standards.				
UNIT I	**PRINCIPLES OF EMI AND EMC**				**9 Hours**
Definition of EMI and EMC with examples – Classification of EMI/EMC – CE, RE, CS, RS – Units of Parameters –Sources of EMI – EMI coupling modes – CM and DM – ESD Phenomena and effects – Transient phenomena andsuppression					
UNIT II	**EMI MEASUREMENTS**				**9 Hours**
Basic principles of RE, CE, RS and CS measurements – EMI measuring instruments – Antennas – LISN – Feed through capacitor – Current probe – EMC analyzer and detection technique open area site – Shielded anechoicchamber – TEM cell.					
UNIT III	**EMC STANDARD AND REGULATIONS**				**9 Hours**
National and International standardizing organizations – FCC, CISPR, ANSI, DOD, IEC, CENEEC, FCC CE and REstandards – CISPR, CE and RE Standards, IEC/EN, CS standards – Frequency assignment – spectrumconversation.					
UNIT IV	**EMI CONTROL METHODS AND FIXES**				**9 Hours**

Shielding – Theory and materials, Grounding, Bonding – General procedure and guidelines, Filtering – characteristics of filters – Power line filter – Filter evaluation and filter installation, EMI gasket, Isolation transformer,opto isolator.		
UNIT V	**EMC DESIGN AND INTERCONNECTION TECHNIQUES**	**9 Hours**
Cable routing and connection – Component selection and mounting – PCB design – Trace routing – Impedance control – Decoupling – Zoning and grounding.		
	Total:	**45 Hours**
Further Reading:	Capacitive coupling - Inductive coupling- Common Impedance Ground Coupling- Ground Loop coupling-Transients in power supply lines- Radiation coupling- Conduction coupling	
Course Outcomes:		
	After completion of the course, Student will be able to	
	1. Design TV and other household articles radiation hazard free and compliant to EMI / EMC standards.	
	2. Perform EMI measurements.	
	3. Apply the concepts of EMI Coupling in cables and other equipment.	
	4. Apply techniques for reducing the cross talk.	
	5. Design a EMC interconnecting models.	
References:		
1. Keiser, "Principles of Electromagnetic Compatibility" , 3rd Edition , Artech House, 1994.		
2. C.R.Paul, "Introduction to Electromagnetic Compatibility", John Wiley and Sons, 2006.		
3. Prasad Kodali, V., "Engineering Electromagnetic Compatibility", S. Chand and Co, 2000.		
4. Donwhite Consultant Incorporate – Handbook of EMI / EMC – Vol I – 1985.		
5. Henry W. Ott, "Noise Reduction Techniques in Electronic Systems", John Wiley & Sons, 2 Edition, 1988.		

1703EC038		**DIGITAL SYSTEM DESIGN AND TESTING**	**L**	**T**	**P**	**C**
			3	**0**	**0**	**3**
Course Objectives:						
	1. To make the student learn, ASIC and FPGA fundamentals, design and implementation of circuits.					
	2. To give basic knowledge of Programmable devices and EDA tools					
	3. To study the fundamental concepts about system generator and Testing of VLSI circuits.					
Unit I	**VERILOG HDL AND TEST BENCHES**					**9 Hours**
Importance of HDL, Design Methodologies, Basic Concepts - Lexical Conventions - Data Types - Verilog Operators - Modules and Ports - Gate Level, Dataflow, Behavioural - Verilog Test Benches						
Unit II	**ADVANCED VERILOG HDL AND SYSTEM DESIGN**					**9 Hours**
Switch Level Modeling - User Defined Primitives (UDP) - Timing and Delays - ALU - Barrel Shifter - Random Number Generator - Traffic Light Controller - Vending Machine Controller – Single Port RAM Design- FIFO -PCI Arbiter Design						
Unit III	**ASIC DESIGN**					**9 Hours**
ASIC Design Flow - Types of ASICs - ASIC Design EDA tools – Analysis - DC, Transient, AC and Parametric Sweep Analysis - Design Synthesis - Floor Plan, Constructive & Iterative Partition and Placement Algorithm - Lee Maze Routing Algorithm - Physical Verification						
Unit IV	**PROGRAMMABLE ASIC**					**9 Hours**
PROM, PLA, PAL ,CPLD Programmable IC Technologies - Introduction to FPGA – FPGA Implementation Process – FPGA EDA Tools - FPGA Internal Architectures - Actel ACT1 -Shannon's expansion theorem - Function generators - Xilinx XC3000 - Programmable Interconnections						
Unit V	**TESTING OF VLSI CIRCUITS**					**9 Hours**

General Concepts - Faults in Digital Circuits - Fault Detection using Path Sensitization and Boolean Difference - Fault Simulation -Design For Testability (DFT) - Adhoc Design - Boundary Scan Test – Built InSelf Test (BIST) - BILBO – LOCST- STUMPS - Signature Analyzer		
	Total:	**45 Hours**
Further Reading:		
	Bidirectional Shift Register - Comparisons between PLDs CPLD and FPGAs –Interfacing Matlab Simulink with Xilinx ISE - DSP Application using Xilinx System Generator	
Course Outcomes:		
	After completion of the course, Student will be able to	
	1. Program and simulate any digital function in verilog HDL and build test benches.	
	2. Apply verilog coding styles for state machines and work with timing issues in high speed digital systems	
	3. Perform high level synthesis, floor plan and design algorithms for placement and partitioning 4. process.	
	5. Understand the concept of SPLD,CPLD and FPGA	
	6. Implement digital design in an FPGA's and testing for different faulty environments	
References:		
1. Ming-Bo Lin, Digital System Designs and Practices using Verilog HDL and FPGAs, Wiley,2012.		
2. Samir Palnitkar, Verilog HDL, Pearson Education, 2nd Edition, 2004		
3. M.J.S .Smith, Application Specific Integrated Circuits, Pearson Education Inc., 2006.		
4. Bob Zeidman, Designing with FPGAs and CPLDs, Elsevier, CMP Books, 2002.		
5. P.K.Lala, Digital Circuit Testing and Testability, Academic Press, 1997		
6. M.Abramovici, M.A.Breuer and A.D.Friedman, Digital Systems and Testable Design, Jaico Publishing House, 2004.		

1703EC039		**OPTICAL NETWORKS**	**L**	**T**	**P**	**C**
			3	**0**	**0**	**3**
Course Objectives:						
	1. To get a basic understanding of optical networks components					
	2. To get a profound understanding of optical switching methods and networking techniques, circuit, packet, hybrid, burst and flow.					
	3. To get a basic understanding of optical network design.					
Unit I	**OPTICAL SYSTEM COMPONENTS**					**9 Hours**
Light propagation in optical fibers – Loss & bandwidth, System limitations, Non-Linear effects; Solitons; Optical Network Components – Couplers, Isolators & Circulators, Multiplexers & Filters, Optical Amplifiers, Switches, Wavelength Converters.						
Unit II	**OPTICAL NETWORK ARCHITECTURES**					**9 Hours**
Introduction to Optical Networks; SONET / SDH, Metropoliton-Area Networks, Layered Architecture ; Broadcast and Select Networks – Topologies for Broadcast Networks, Media-Access Control Protocols, Testbeds for Broadcast & Select WDM; Wavelength Routing Architecture.						
Unit III	**WAVELENGTH ROUTING NETWORKS**					**9 Hours**
The optical layer, Node Designs, Optical layer cost tradeoff, Routing and wavelength assignment,Virtual topology design, Wavelength Routing Testbeds, Architectural variations.						
Unit IV	**PACKET SWITCHING AND ACCESS NETWORKS**					**9 Hours**
Photonic Packet Switching – OTDM, Multiplexing and Demultiplexing, Synchronisation, Broadcast OTDM networks, Switch-based networks; Access Networks – Network Architecture overview, Future Access Networks, Optical Access Network Architectures; and OTDM networks.						
Unit V	**NETWORK DESIGN AND MANAGEMENT**					**9. Hours**
Transmission System Engineering – System model, Power penalty - transmitter, receiver, Optical amplifiers, crosstalk, dispersion; Wavelength stabilization ; Overall design considerations; Control and Management – Network management functions, Configuration management, Performance management, Fault management, Optical safety, Service interface.						
		Total:				**45 Hours**

Further Reading:	
	1. Survivability Techniques for Multicast Connections
	2. Introduction to Software Defined Networking, Reconfigurable Optical Add/Drop Multiplexer (ROADM).
Course Outcomes:	
	After completion of the course, Student will be able to
	1. Discuss various optical system components.
	2. Demonstrate various optical network architectures.
	3. Explain wavelength routing networks.
	4. Illustrate Packet switching and access networks.
	5. Summarize Network design and Management.
References:	
1. Rajiv Ramaswami and Kumar N. Sivarajan, "Optical Networks : A Practical Perspective", Harcourt Asia Pte Ltd., Second Edition 2004.	
2. Siva Ram Moorthy and Mohan Gurusamy, "WDM Optical Networks :Concept,Design and Algorithms", Prentice Hall of India, Ist Edition, 2002.	
3. P.E. Green, Jr., "Fiber Optic Networks", Prentice Hall, NJ, 1993.	

1703EC040		**RF MEMS**	**L**	**T**	**P**	**C**
		(Title can be Continued)	**3**	**0**	**0**	**3**
		(Common to B.E / B.Tech – CSE, IT & ECE)				
Course Objectives:						
	1. To understand the basic concepts of RF MEMS					
	2. To acquire the basic knowledge of Micro machined Components I &II					
	3. To understand the key concepts of beam structures and micro strip antennas and analysis					
Unit I	**INTRODUCTION**					**9 Hours**
Overview of RF MEMS, Road map, fabrication process design and testing, Applications, RF MEMS relays and switches: Switch parameters, Actuation mechanisms, Bistable relays and micro actuators, Dynamics of switching operation.						
Unit II	**MICRO MACHINED INDUCTORS AND CAPACITORS**					**9 Hours**
MEMS inductors and capacitors: Micro machined inductor, Effect of inductor layout, Modeling and design issues of planar inductor, Gap tuning and area tuning capacitors, Dielectric tunable capacitors.						
Unit III	**RF MEMS PHASE SHIFTERS**					**9 Hours**
MEMS phase shifters: Types. Limitations - Switched delay lines, Micro machined transmission lines, coplanar lines, Micro machined directional coupler and mixer.						
Unit IV	**MICRO MACHINED FILTERS ANTENNAS**					**9 Hours**
Micro machined RF filters: Modeling of mechanical filters, Electrostatic comb drive, Micromechanical filters using comb drives, Electrostatic coupled beam structures. Micro machined antennas: Micro strip antennas – design parameters, Micromachining to improve performance, Reconfigurable antennas.						
Unit V	**RF MEMS DESIGN ANALYSIS**					**9 Hours**
MEMS Physical Modeling, Physical and practical aspects of RF circuit design: X –Band RF MEMS Phase shifter for radar system applications, FBAR filter for PCS applications, A Ka-Band millimeterwave tunable filter. Impedance mismatch effects in RF MEMS, RF/Microwave substrate properties, MEMS-Resonators.						
		Total:				**45 Hours**

Further Reading:	
	1. MEMS Airbag system
	2. MEMS in Automobiles
Course Outcomes:	
	After completion of the course, Student will be able to
	1. Explain the basics of RF MEMS and switching.
	2. Explain about tuning elements.
	3. Demonstrate critical thinking and problem solving capabilities.
	4. Identify the major RF filters and antennas.
	5. Design and analyze circuits using RF MEMS.
References:	
1. V.K.Varadan, KJ.Vinoy,K.N.Jose, "RFMEMS and their Applications", Wiley, 2003.	
2. H.J.Delos Santos, "RF MEMS circuit Design for Wireless Communications", Artech House, 2002.	

3. Gabriel.M.Rebeiz, "RF MEMS Theory, Design and Technology", John Wiley, 2003
4. Ulrich L, Rohde David P Razavi and NewKirk," RF / Microwave Circuit Design", John Wiley and Sons USA, 2000.
5. Rebeiz G.M," RF MEMS: THEORY, Design and Technology", John Wiley and Sons Inc., 2003
6. Matthew M Radmanesh, "Radio Frequency and Microelectronic Illustrated", Pearson Education Asia Publication, 2002.

1703EC041		DIGITAL SWITCHING AND TRANSMISSION	L	T	P	C
			3	0	0	3

Course Objectives:

1. To educate the students about evolution of switching systems
2. To teach the students about telecommunication traffic and digital switching systems
3. To impart the students on digital switching maintenance

Unit I	**EVOLUTION OF SWITCHING SYSTEMS**	**9 Hours**

Introduction, Message switching, Circuit switching, Functions of switching systems, Distribution systems, Electronic switching, Digital switching systems, Basics of crossbar systems

Unit II	**TELECOMMUNICATIONS TRAFFIC**	**9 Hours**

Introduction, Unit of traffic, Congestion, Traffic measurement, Mathematical model, lost call systems, Queuing systems, Problems

Unit III	**DIGITAL SWITCHING SYSTEMS**	**9 Hours**

Fundamentals : Purpose of analysis, Basic central office linkages, Outside plant versus inside plant, Switching system hierarchy, Evolution of digital switching systems, Stored program control switching systems, switching system fundamentals, Building blocks of a digital switching system, Basic call processing

Unit IV	**TIME DIVISION SWITCHING**	**9 Hours**

Introduction, space and time switching, Time switching networks, Synchronization

Unit V	**MAINTENANCE OF DIGITAL SWITCHING SYSTEM**	**9 Hours**

Software maintenance, Impact of software patches on digital switching system maintainability, Embedded patcher concept, Generic program upgrade, Effect of firmware deployment on digital switching system, Firmware-software coupling, Diagnostic resolution rate

Total:	**45 Hours**

Further Reading:

- High Speed Switching architecture and networks
- Telecommunication Switching systems

Course Outcomes:

After completion of the course, Student will be able to

1. Explain the working principle of switching systems involved in telecommunication switching
2. Assess the need for voice digitization and T Carrier systems
3. Compare and analyze Line coding techniques and examine its error performance
4. Design multi stage switching structures involving time and space switching stages
5. Analyze basic telecommunication traffic theory

References:

1. Telecommunication and Switching, Traffic and Networks - J E Flood: Pearson Education, 2002.
2. Digital Switching Systems, Syed R. Ali, TMH Ed 2002.
3. Digital Telephony - John C Bellamy: Wiley India 3rd Ed, 2000
4. Digital switching systems, V.S Bagad, Anjali Bagad, Technical publications, 2014.
5. Digital Switching Systems, Syed Riffact Ali, Tata McGraw-Hill Inc, New York, 2002.
6. Tomasi Wayne, Electronic Communications System: Fundamentals Through Advanced, 5th Edition, Pearson PrenticeHall,2005. (TK5101.T655E 2004)
7. M.T. Hills , Telecommunication Switching Principles, London : Allen and Unwin, 1979.

1703EC042		ARM PROCESSOR	L	T	P	C
			3	0	0	3

Course Objectives:

1. To provide in-depth knowledge about ARM Architecture and its instruction set.
2. To explain the system development using ARM target boards.
3. To explain the memory hierarchy, ARM CPU cores and its application.

Unit I	**Introduction to ARM Architecture and Assembly language Programming**	**9 Hours**

The Acorn RISC Machine-Architectural inheritance -The ARM programmer's model- ARM development tool-Data processing instructions- Data transfer instructions -Control flow instructions- Writing simple assembly language programs

Unit II	**ARM Organization and System Development**	**9 Hours**

3-stage pipeline ARM organization-5-stage pipeline ARM organization-ARM instruction execution-ARM implementation-The ARM floating-point architecture-The ARM memory interface-The Advanced Microcontroller Bus Architecture (AMBA)- The ARM reference peripheral specification-The ARMulator-The ARM debug architecture.

Unit III	**The ARM Instruction Set**	**9 Hours**

Introduction- Exceptions -Conditional execution -Branch and Branch with Link (B, BL)- Branch, Branch with Link and exchange (BX, BLX)- Software Interrupt (SWI)- Data processing instructions- Multiply instructions-Count leading zeros (CLZ - architecture v5T only)-Single word and unsigned byte data transfer instructions-Half-word and signed byte data transfer instructions-Multiple register transfer instructions-Swap memory and register instructions (SWP) -status register to general register transfer instructions-General register to status register transfer instructions -

Unit IV	**ARM Processor Cores and Memory Hierarchy**	**9 Hours**

ARM7TDMI-ARM8-ARM9TDMI-ARM10TDMI- Memory size and speed- On-chip memory -Caches -Cache design - an example -Memory management

Unit V	**Embedded ARM Applications and Operating Systems**	**9 Hours**

The VLSI Ruby II Advanced Communication Processor-The VLSI ISDN Subscriber Processor-The OneC™ VWS22100 GSM chip-The Ericsson-VLSI Bluetooth Baseband Controller-The ARM7500 and ARM7500FE - An introduction to operating systems-The ARM system control coprocessor- CP15 protection unit registers - ARM protection unit-CP15 MMU registers-ARM MMU architecture-Synchronization- Context switching

Total:	**45 Hours**

Further Reading:

1. Arduino microcontroller
2. Commercial application of ARM processor

Course Outcomes:

After completion of the course, Student will be able to

1. Explain the basics principles of ARM architecture
2. Summarize the ARM organization and Developments in embedded system.
3. Explain the different types of instruction used in ARM processor
4. Explain the ARM processor cores and Memory Hierarchy
5. Discuss the different applications by ARM processor

References:

1. "ARM System-on-Chip Architecture" by Steve Furber, Addison-Wesley Professional; 2 edition, August 14, 2000.
2. "Modeling and Simulation of ARM Processor Architecture: Using System C" by Mitesh Limachia and Nikhil Kothari LAP LAMBERT Academic Publishing , June 29, 2012.
3. "Mobile Unleashed: The Origin and Evolution of ARM Processors in Our Devices" by Don Dingee and Daniel Nenni, Create Space Independent Publishing Platform; 1 edition, December 8, 2015.
4. "ARM Assembly Language: Fundamentals and Techniques" by William Hohl and Christopher Hinds, CRC Press; 2 edition, 10 December 2014.
5. "Introduction to Microprocessor Based Systems Using the ARM Processor" by Kris Schindler, Pearson Learning Solutions; 2 edition , January 8, 2013.
6. "ARM System Developer's Guide" by Andrew Sloss, Morgan Kaufmann, 10 May 2004.
7. "ARM processor" by Santul Bisht, LAP Lambert Academic Publishing, 25 November 2012.

1703EC043		Mobile Computing	L	T	P	C
		Professional(Open)Electives - IV	3	0	0	3
		B.E – ECE				

Course Objectives:	The student should be made to:
	1. Understand the basic concepts of mobile computing
	2. Be familiar with the network protocol stack
	3.Learn the basics of mobile telecommunication system
	4.Be exposed to Ad-Hoc networks
	5. Gain knowledge about different mobile platforms and application development

Unit I	INTRODUCTION	9 Hours

Mobile Computing – Mobile Computing Vs wireless Networking – Mobile Computing Applications – Characteristics of Mobile computing – Structure of Mobile Computing Application. MAC Protocols –Wireless MAC Issues – Fixed Assignment Schemes – Random Assignment Schemes – Reservation Based Schemes.

Unit II	MOBILE INTERNET PROTOCOL AND TRANSPORT LAYER	9 Hours

Overview of Mobile IP – Features of Mobile IP – Key Mechanism in Mobile IP – route Optimization. Overview of TCP/IP – Architecture of TCP/IP- Adaptation of TCP Window – Improvement in TCP Performance.

Unit III	MOBILE TELECOMMUNICATION SYSTEM	9 Hours

Global System for Mobile Communication (GSM) – General Packet Radio Service (GPRS) –Universal Mobile Telecommunication System (UMTS).

Unit IV	MOBILE AD-HOC NETWORKS	9 Hours

Ad-Hoc Basic Concepts – Characteristics – Applications – Design Issues – Routing – Essential of Traditional Routing Protocols –Popular Routing Protocols – Vehicular Ad Hoc networks (VANET) –MANET Vs VANET – Security.

Unit V	MOBILE PLATFORMS AND APPLICATIONS	9 Hours

Mobile Device Operating Systems – Special Constrains & Requirements – Commercial Mobile Operating Systems – Software Development Kit: iOS, Android, BlackBerry, Windows Phone – M Commerce– Structure – Pros & Cons – Mobile Payment System – Security Issues.

Total:	45 Hours

Further Reading:	1. Mobile Generations VOLTE, 4G, 5G
	2.Android Developers : http://developer.android.com/index.html
	3.Apple Developer : https://developer.apple.com/

Course Outcomes:	
	At the end of the course, the student should be able to:
	1. Explain the basics of mobile telecommunication system
	2. Choose the required functionality at each layer for given application
	3.Identify solution for each functionality at each layer
	4.Use simulator tools and design Ad hoc networks
	5. Develop a mobile application.

References:

1. Jochen H. Schller, “Mobile Communications”, Second Edition, Pearson Education, New Delhi,2007.
2. Prasant Kumar Pattnaik, Rajib Mall, “Fundamentals of Mobile Computing”, PHI Learning Pvt.Ltd, New Delhi – 2012.
3. Dharma Prakash Agarval, Qing and An Zeng, "Introduction to Wireless and Mobile systems",Thomson Asia Pvt Ltd, 2005.
4. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, “Principles of Mobile Computing”, Springer, 2003.
5. William.C.Y.Lee,“Mobile Cellular Telecommunications-Analog and Digital Systems”, Second Edition,Tata Mc Graw Hill Edition ,2006.
6. C.K.Toh, “AdHoc Mobile Wireless Networks”, First Edition, Pearson Education, 2002.