St. Martin's Engineering College

UGC Autonomous
NBA & NAAC A+ Accredited
Dhulapally, Secunderabad-500 100
www.smec.ac.in

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

I YEAR I SEMESTER

S. No.	Course Code	Course Title	Hours per Week			Credits	Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
1	MA101BS	Linear Algebra and Calculus	3	1	0	4	30	70	100
2	AP102BS	Applied Physics	3	1	0	4	30	70	100
3	CS105ES	Programming for Problem Solving	3	1	0	4	30	70	100
4	ME106ES	Engineering Graphics	1	0	4	3	30	70	100
5	AP103BS	Applied Physics Lab	0	0	3	1.5	30	70	100
6	CS107ES	Programming for Problem Solving Lab	0	0	3	1.5	30	70	100
		Total	10	3	10	**18**	**180**	**420**	**600**
Mandatory Course (Non-Credit)									
7	*ES104BS	Environmental Science	0	0	2	-	100	-	100
8	*TS109	Technical Seminar	0	0	2	-	100	-	100
		Induction Programme	-	-	-	-	-	-	-

I YEAR II SEMESTER

S. No.	Course Code	Course Title	Hours per Week			Credits	Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
1	MA201BS	Advanced Calculus	3	1	0	4	30	70	100
2	CH202BS	Engineering Chemistry	3	1	0	4	30	70	100
3	EE206ES	Basic Electrical Engineering	3	0	0	3	30	70	100
4	ME207ES	Engineering Workshop	1	0	3	2.5	30	70	100
5	EN203HS	Professional English	2	0	0	2	30	70	100
6	CH204BS	Engineering Chemistry Lab	0	0	3	1.5	30	70	100
7	EN205HS	English Language and Communication SkillsLab	0	0	2	1	30	70	100
8	EE208ES	Basic Electrical Engineering Lab	0	0	2	1	30	70	100
		Total	**12**	**2**	**10**	**19**	**240**	**560**	**800**
Mandatory Course (Non-Credit)									
9	*MP209	Micro Project-I	0	0	2	-	100	-	100

***MC – Satisfied/Unsatisfied**

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

II YEAR I SEMESTER

S. No.	Course Code	Course Title	Hours per Week			Credits	Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
1	EC301PC	Electronic Devices and Circuits	3	1	0	4	30	70	100
2	EC302PC	Network Analysis and Transmission Lines	3	0	0	3	30	70	100
3	EC303PC	Digital System Design	3	1	0	4	30	70	100
4	EC304PC	Signals and Systems	3	1	0	4	30	70	100
5	EC305ES	Probability Theory and Stochastic Processes	3	0	0	3	30	70	100
6	EC306PC	Electronic Devices and Circuits Lab	0	0	2	1	30	70	100
7	EC307PC	Digital System Design Lab	0	0	2	1	30	70	100
8	EC308ES	Basic Simulation Lab	0	0	2	1	30	70	100
		Total	**15**	3	**6**	21	**240**	**560**	**800**
Mandatory Course (Non-Credit)									
9	*CI309MC	Constitution of India	3	0	0	-	100	-	100

II YEAR II SEMESTER

S. No.	Course Code	Course Title	Hours per Week			Credits	Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
1	MA401BS	Transformations, Complex Variables and Numerical Techniques	3	1	0	4	30	70	100
2	EC402PC	Electromagnetic Fields and Waves	3	0	0	3	30	70	100
3	EC403PC	Analog and Digital Communications	3	1	0	4	30	70	100
4	EC404PC	Linear IC Applications	3	0	0	3	30	70	100
5	EC405PC	Electronic Circuit Analysis	3	0	0	3	30	70	100
6	EC406PC	Analog and Digital Communications Lab	0	0	3	1.5	30	70	100
7	EC407PC	IC Applications Lab	0	0	3	1.5	30	70	100
8	EC408PC	Electronic Circuit Analysis Lab	0	0	2	1	30	70	100
		Total	**15**	2	8	21	**240**	**560**	**800**
Mandatory Course (Non-Credit)									
9	*GS409MC	Gender Sensitization Lab	0	0	2	-	100	-	100

***MC – Satisfied/Unsatisfied**

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

III YEAR I SEMESTER

S. No.	Course Code	Course Title	Hours per Week			Credits	Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
1	EC501PC	Microprocessors and Microcontrollers	3	1	0	4	30	70	100
2	EC502PC	Data Communications and Networks	3	1	0	4	30	70	100
3	EC503PC	Control Systems	3	1	0	4	30	70	100
4	BE504MS	Business Economics and Financial Analysis	3	0	0	3	30	70	100
5		**Professional Elective-I**	3	0	0	3	30	70	100
6	EC505PC	Microprocessors and Microcontrollers Lab	0	0	3	1.5	30	70	100
7	EC506PC	Data Communications and Networks Lab	0	0	3	1.5	30	70	100
8	EN506HS	Advanced Communication Skills Lab	0	0	2	1	30	70	100
		Total	**15**	**3**	**8**	22	**240**	**560**	**800**
Mandatory Course (Non-Credit)									
9	*IP510MC	Intellectual Property Rights	3	0	0	0	100	-	100

III YEAR II SEMESTER

S. No.	Course Code	Course Title	Hours per Week			Credits	Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
1	EC601PC	Antennas and Wave Propagation	3	1	0	4	30	70	100
2	EC602PC	Digital Signal Processing	3	1	0	4	30	70	100
3	EC603PC	VLSI Design	3	1	0	4	30	70	100
4		**Professional Elective II**	3	0	0	3	30	70	100
5		**Open Elective I**	3	0	0	3	30	70	100
6	EC604PC	Digital Signal Processing Lab	0	0	3	1.5	30	70	100
7	EC605PC	e – CAD Lab	0	0	3	1.5	30	70	100
8	EC606PC	Scripting Languages Lab	0	0	2	1	30	70	100
		Total	**15**	3	8	22	**240**	**560**	**800**
Mandatory Course (Non-Credit)									
9	*ES607MC	Environmental Science	3	0	0	0	100	-	100

***MC - Environmental Science – Should be Registered by Lateral Entry Students Only**

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

IV YEAR I SEMESTER

S. No.	Course Code	Course Title	Hours per Week			Credits	Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
1	EC701PC	Microwave and Optical Communication	3	0	0	3	30	70	100
2	SM702MS	Professional Practice, Law & Ethics	2	0	0	2	30	70	100
3		**Professional Elective III**	3	0	0	3	30	70	100
4		**Professional Elective IV**	3	0	0	3	30	70	100
5		**Open Elective II**	3	0	0	3	30	70	100
6	EC703PC	Microwave and Optical Communication Lab	0	0	2	1	30	70	100
7	EC704PC	Industry Oriented Mini Project	0	0	0	2	00	100	100
8	EC705PC	Project Stage-I	0	0	6	3	100	00	100
9	EC706PC	Seminar	0	0	2	1	100	00	100
		Total	**14**	**0**	**10**	**21**	**380**	**520**	**900**

IV YEAR II SEMESTER

S. No.	Course Code	Course Title	Hours per Week			Credits	Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
1		**Professional Elective V**	3	0	0	3	30	70	100
2		**Professional Elective VI**	3	0	0	3	30	70	100
3		**Open Elective III**	3	0	0	3	30	70	100
4	EC801PC	Project Stage-II	0	0	14	7	30	70	100
		Total	**9**	**0**	**14**	**16**	**120**	**280**	**400**

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

LINEAR ALGEBRA AND CALCULUS

I B. TECH- I SEMESTER (R 20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
MA101BS	B. Tech	3	1	0	4	30	70	100

COURSE OBJECTIVES

To learn

1. Types of matrices and their properties.
2. Concept of a rank of the matrix which is used to know the consistency of system of linear equations.
3. Concept of Eigen values and eigenvectors and to reduce the quadratic form to canonical form.
4. Determine the maxima and minima of functions of several variables by using partial differential coefficients.
5. Evaluation of improper integrals using Beta and Gamma functions.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Write the matrix representation of a set of linear equations and to analyze the solution of the system of equations.
2. Find the Eigen values and Eigen vectors , reduce the quadratic form to canonical form using orthogonal transformations.
3. Apply the Mean value theorems for the single variable functions.
4. Apply maxima and minima for functions of several variables and Lagrange's method of multipliers.
5. Evaluate the improper integrals using Beta and Gamma functions.

UNIT-I	MATRICES	Classes: 12

Matrices: Types of Matrices, Symmetric, Hermitian, Skew-symmetric, Skew-Hermitian, orthogonal matrices, Unitary Matrices, rank of a matrix by Echelon form and Normal form, Inverse of Non-singular Matrices by Gauss-Jordan method, System of linear equations, solving system of Homogeneous and Non- Homogeneous equations. Gauss elimination method, Gauss Seidel Iteration Method.

UNIT-II	EIGEN VALUES AND EIGEN VECTORS	Classes:12

Linear Transformation and Orthogonal Transformation, Eigen values and Eigenvectors and their properties, Diagonalization of a matrix, Cayley-Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton Theorem, Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadratic form to canonical forms by Orthogonal Transformation.

UNIT-III	MEAN VALUE THEOREMS	Classes:12

Rolle's theorem, Lagrange's Mean value theorem with their Geometrical Interpretation and applications, Cauchy's Mean value Theorem. Taylor's Series. Applications: Finding areas, volumes of revolutions of curves (Only in Cartesian coordinates)

UNIT-IV	FUNCTIONS OF SEVERAL VARIABLES	Classes: 12

Definitions of Limit and continuity. Partial Differentiation; Euler's Theorem; Total derivative, Jacobian; Functional dependence & independence, Maxima and minima of functions of two variables and three variables using method of Lagrange multipliers. Application: Errors and approximations.

UNIT-V	FIRST ORDER PARTIAL DIFFERENTIAL EQUATIONS AND SPECIAL FUNCTIONS.	Classes: 12

First Order linear and nonlinear Partial Differential Equations, Method of separation of variables.

Beta and Gamma functions, properties, relation between Beta and Gamma functions, evaluation of integrals using Beta and Gamma functions.

TEXT BOOKS

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 43rd Edition.
2. Erwin kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2017.
3. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11thReprint, 2010.

REFERENCE BOOKS

1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint,2010.
2. B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9thEdition, Pearson, Reprint,2002.

WEB REFERENCES

1. https://www.efunda.com/math/gamma/index.cfm
2. https://ocw.mit.edu/resources/#Mathematics
3. https://www.sosmath.com/
4. https://www.mathworld.wolfram.com/

E -TEXT BOOKS

1. https://www.e-booksdirectory.com/listing.php?Programme=4
2. https://www.e-booksdirectory.com/details.php?ebook=10830

MOOCS COURSE

1. https://swayam.gov.in/
2. https://swayam.gov.in/NPTEL

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

APPLIED PHYSICS

I B. TECH- I SEMESTER (R 20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AP102BS	B. Tech	3	1	0	4	30	70	100

COURSE OBJECTIVES

To learn

1. The fundamental postulates of quantum mechanics.
2. The concepts related to semiconductors.
3. The concepts related to PN Junction diode and its applications.
4. The basic concepts of laser and optical fiber and its applications.
5. he fundamentals of dielectrics and magnetic materials.

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to

1. Demonstrate the fundamental concepts on Quantum behavior of matter in its microstate.
2. Understand the knowledge of fundamentals of Semiconductor physics.
3. Design and explain the characteristics of Optoelectronic devices.
4. Analyze the properties of Laser and Optical Fibers and its application in engineering fields.
5. Design, characterize and prepare new materials for various engineering applications by using dielectric and magnetic materials.

UNIT-I	QUANTUM MECHANICS	Classes: 12

Introduction to quantum physics, Black body radiation, Planck's Law, Photoelectric effect, Compton effect, de-Broglie's hypothesis, Wave-particle duality, Davisson and Germer experiment, Heisenberg's Uncertainty principle, Born's interpretation of the wave function, Schrodinger's time independent wave equation, Particle in one dimensional box.

UNIT-II	SEMICONDUCTOR PHYSICS	Classes: 14

Intrinsic and Extrinsic semiconductors, Carrier Concentration in Intrinsic and Extrinsic semiconductors Dependence of Fermi level on Temperature, Carrier generation and recombination, Carrier transport: diffusion and drift, Hall effect, p-n junction diode, Zener diode and their V-I Characteristics.

UNIT-III	OPTOELECTRONICS	Classes: 10
Radiative and non-radiative recombination mechanisms in semiconductors and LED: Device structure, Materials, Characteristics and figures of merit, Semiconductor photo detectors: Solar cell, PIN and Avalanche and their structure, Materials, working principle and Characteristics.		
UNIT-IV	**LASERS AND FIBRE OPTICS**	**Classes: 12**
Lasers: Introduction to interaction of radiation with matter, Characteristics, Principle and working of Laser, Population inversion, Pumping, Types of Lasers: Ruby laser, He-Ne laser and Semiconductor laser, Applications of laser. Fibre Optics: Introduction, Total internal reflection, Acceptance angle, Acceptance cone and Numerical aperture, Step and Graded index fibres, Losses associated with optical fibres, Applications of optical fibres in Communication System and Sensors.		
UNIT-V	**Dielectric and Magnetic Properties of Materials**	**Classes: 12**
Introduction to Dielectrics, Polarization, Permittivity and Dielectric constant, Types of Polarization (Qualitative), Internal fields in a solid, Clausius-Mossotti equation, Ferroelectrics and Piezo electrics. Magnetization, permeability and susceptibility, Classification of magnetic materials, Ferromagnetism and Domain theory of ferromagnetism – Hysteresis curve based on domain theory, Applications of magnetic materials.		

TEXT BOOKS

1. Engineering Physics, B.K. Pandey, S. Chaturvedi – CengageLearning.
2. Halliday and Resnick,Physics-Wiley.
3. A textbook of Engineering Physics, Dr. M. N. Avadhanulu, Dr. P.G. Kshirsagar-S.Chand.
4. Introduction to Solid State Physics by Charles Kittel (Publishers: JohnWiley&Sons)

REFERENCE BOOKS

1. Richard Robinett ,QuantumMechanics.
2. J. Singh, Semiconductor Optoelectronics: Physics and Technology, Mc Graw-Hillinc.(1995).
3. Online Course: "Optoelectronics Materials and Devices" by Monica Katiyar andDeepak GuptaNPTEL.

WEB REFERENCES

1. Introductory QuantumMechanics:https://nptel.ac.in/courses/115104096/
2. Fundamental concepts of semiconductors:https://nptel.ac.in/courses/115102025/
3. SemiconductorOptoelectronics:https://nptel.ac.in/courses/115102103/
4. FibreOptics:https://nptel.ac.in/courses/115107095/

E -TEXT BOOKS

1. library genesis: https://libgen.is/

MOOCS COURSE

1. Swayam:https://swayam.gov.in/nd1_noc19_ph13/preview
2. Alison:https://alison.com/courses?&Programme=physics

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

PROGRAMMING FOR PROBLEM SOLVING

I B. TECH- I SEMESTER (R 20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CS105ES	B. Tech	3	1	0	4	30	70	100

COURSE OBJECTIVES

1. To learn the fundamentals of computers.
2. To understand the various steps in program development.
3. To learn the syntax and semantics of C programming language.
4. To learn the usage of structured programming approach in solving problems.

COURSE OUTCOMES

Upon successful completion of the course, the student is able

1. To write algorithms and to draw flowcharts for solving problems.
2. To convert the algorithms/flowcharts to C Programs.
3. To code and test, a given logic in C programming language.
4. To decompose a problem into functions and to develop modular reusable code.
5. To use arrays, pointers, strings and structures to write C programs
6. Searching and sorting problems

UNIT-I	INTRODUCTION TO C PROGRAMMING LANGUAGE	Classes: 16

Introduction to components of a computer system: disks, primary and secondary memory, processor, operating system, compilers, creating, compiling and executing a program etc., Number systems Introduction to Algorithms: steps to solve logical and numerical problems. Representation of Algorithm, Flowchart/Pseudo code with examples, Program design and structured programming.

Introduction to C Programming Language: I/O: Simple input and output with scanf and printf, variables (with data types and space requirements), Syntax and Logical Errors in compilation, object and executable code, Operators, expressions and precedence, Expression evaluation, type conversion

UNIT-II	CONDITIONAL BRANCHING, LOOPS, ARRAY AND STRINGS	Classes: 14

Conditional Branching and Loops: Writing and evaluation of conditionals and consequent branching with if, if-else, switch-case, ternary operator, goto, Iteration with for, while, do- while loops.

Arrays: one- and two-dimensional arrays, creating, accessing and manipulating elements of arrays.

Strings: Introduction to strings, handling strings as array of characters, basic string functions available in C (strlen, strcat, strcpy, strstr etc.), arrays of strings.

UNIT-III	STRUCTURE AND POINTER	Classes:10

Structures: Defining structures, initializing structures, unions, Array of structures.

Pointers: Idea of pointers, defining pointers, Pointers to Arrays and Structures, Use of Pointers in self- referential structures, usage of self-referential structures in linked list (no implementation), Enumeration data type.

Dynamic memory allocation: Allocating and freeing memory, Allocating memory for arrays of different datatypes

UNIT-IV	FUNCTION AND STORAGE CLASSES	Classes: 12

Functions: Designing structured programs, declaring a function, Signature of a function, Parameters and return type of a function, passing parameters to functions, call by value Passing arrays to functions, passing pointers to functions, idea of call by reference, Some C standard functions and libraries

Recursion: Simple programs, such as Finding Factorial, Fibonacci series etc., Limitations of Recursive functions

Storage classes (auto, extern, static and register)

UNIT-V	FILES AND PRE-PROCESSOR	Classes: 12

Preprocessor: Commonly used Preprocessor commands like include, define, undef, if, ifdef, ifndef.

Files: Text and Binary files, Creating and Reading and writing text and binary files, Appending data to existing files, Writing and reading structures using binary files, Random access using fseek, ftell and rewind functions

TEXT BOOKS

1. The C Programming Language by Dennis M Ritchie, Brian W. Kernigham, 1988,PHI
2. Computer System & Programming in C by S Kumar & S Jain, Nano Edge Public publications,Meerut.
3. Fundamentals of Computing and C Programming, R. B. Patel, Khanna Publications, 2010, NewDelhi.

REFERENCE BOOKS

1. Computer Fundamentals and Programming in C, ReemaTheraja,Oxford
2. Information technology, Dennis P. Curtin, Kim Foley, Kunal Sen, Cathleen Morin, 1998,TMH
3. Theory and problem of programming with C, Byron CGottfried,TMH

WEB REFERENCES
1. https://www.tutorialspoint.com/cprogramming/ 2. https://www.tutorialspoint.com/cplusplus/ 3. https://www.cprogramming.com/tutorial/c-tutorial.html
E -TEXT BOOKS
1. https://fresh2refresh.com/c-programming/ 2. https://beginnersbook.com/2014/01/c-tutorial-for-beginners-with-examples/ 3. https://www.sanfoundry.com/simple-c-programs/
MOOCS COURSE
1. nptel.ac.in/courses/106105085/4 2. https://www.quora.com/Are-IIT-NPTEL-videos-good-to-learn-basic-C-programming

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

ENGINEERING GRAPHICS

I B. TECH- I SEMESTER (R 20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
ME106ES	B.Tech	1	0	4	3	30	70	100

COURSE OBJECTIVES

To learn

1. The course aims at empowering the students with drafting skills and enhancing their visualization capacity in order to draw different views of the given object.
2. To develop in students, graphic skills for communication of concepts, ideas and design of engineering products.
3. To expose them to existing national standards related to technical drawings.
4. To impart knowledge about standard principles of orthographic projection of objects.
5. It will help students to use the techniques, skills, and modern engineering tools and communicate effectively.

COURSE OUTCOMES

1. Upon successful completion of the course, the student is able to familiarize with the fundamentals and standards of Engineering graphics Project orthographic projections of lines and plane surfaces.
2. Convert orthographic views to isometric views and vice-versa and know the basics of AutoCAD.
3. Preparing working drawings to communicate the ideas and information.
4. Know and use common drafting tools with the knowledge of drafting standards.

UNIT-I	INTRODUCTION TO ENGINEERING DRAWING	Classes: 15

Introduction to Engineering Graphics: Principles of Engineering Graphics and their significance, Usage of Drawing instruments, lettering, Conic sections including Rectangular Hyperbola (General method only); Cycloid, Epicycloids and Involutes.

Scales: Plain & Diagonal Scales.

UNIT-II	ORTHOGRAPHIC PROJECTIONS	Classes:15

Projections of points: Principles of orthographic projections – conventions – first and third angle projections. Projection of points in all quadrants.

Projection Of Lines – lines inclined to single plane, lines inclined to both the planes.

Projection of Planes: Projection of regular planes – planes inclined to one plane, planes inclined to both planes.

UNIT-III	PROJECTION OF SOLIDS & SECTION OF SOLIDS	Classes:12

Projection of Solids: Projections of regular solids like cube, prism, pyramid, cylinder and cone. Axis inclined to both the reference planes.

Section of Solids: Sectioning of above solids in simple vertical position with the cutting planeisinclinedtotheoneplaneandperpendiculartotheother–trueshapeofsection.

UNIT-IV	DEVELOPMENT OF SURFACES & ISOMETRIC PROJECTIONS	Classes: 15

Development of Surfaces: Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones.

Isometric Projections: Principles of Isometric Projection – Isometric Scale – Isometric Views– Conventions –Plane Figures, Simple and Compound Solids.

UNIT-V	TRANSFORMATION OF PROJECTIONS & INTRODUCTION AUTO CAD	Classes: 15

Transformation of Projections: Conversion of Isometric Views to Orthographic Views. Conversion of orthographic views to isometric views – simple objects.

Introduction to Auto CAD: Introduction, Salient features of AutoCAD software, Basic Commands, construction, editing and dimensioning, two dimensional drawings.

TEXT BOOKS

1 Engineering Drawing - N.D. Bhatt & V.M. Panchal, 50th edition, 2013-Charotar Publishing House, Gujarat.
2 Basant Agarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill PublishingCompany Limited, New Delhi, 2008.
3 K.L.Narayana, P. Kannaiah, “Engineering Drawing”, SciTech Publishers. 2nd Edition, 2013
4 Shah M.B., and Rana B.C., “Engineering Drawing”, Pearson, 2nd Edition, 2009.

REFERENCE BOOKS

1 Venugopal K. and Prabhu Raja V., “Engineering Graphics”, New Age International (P) Limited,2011.
2 K. V. Natarajan, “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai,2015.
3 Gopalakrishna K.R., “Engineering Drawing” (Vol. I&II combined), Subhas Stores, Bangalore,2007.
4 Trymbaka Murthy, “Computer Aided Engineering Drawing", I.K. international Publishing
House, 3rd Edition, 2011.

WEB REFERENCES	
1	http://freevideolectures.com/Course/3420/Engineering-Drawing
2	https://www.slideshare.net/search/slideshow?searchfrom=header&q=engineering+drawing
3	https://www.wiziq.com/tutorials/engineering-drawing
4	http://road.issn.org/issn/2344-4681-journal-of-industrial-design-and-engineering-graphics
E -TEXT BOOKS	
1	http://rgpv-ed.blogspot.com/2009/09/development-of-surfaces.html
2	http://www.techdrawingtools.com/12/l1201.htm
MOOCS COURSE	
1	https://nptel.ac.in/course.php
2	https://swayam.gov.in/explorer

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

APPLIED PHYSICS LAB

I B. TECH- I SEMESTER (R 20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AP103BS	B. Tech	0	0	3	1.5	30	70	100

COURSE OBJECTIVES

1. To study semiconductor devices.
2. To verify the Biot –Savart law.
3. To experience resonance phenomena.
4. To compare the experimental results with the class room learning.
5. The basic experimental skills which are very essential for an engineering student.

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

1. Learn the working principles of PN Junction diode.
2. Examine the electrical and magnetic properties of materials.
3. Determine the characteristics of Opto-Electronic devices.
4. Understand the basic principles of Optical Fibers.
5. Analyze the basic electronic circuits.

LIST OF EXPERIMENTS

1. **Energy gap of P-N junction diode**: To determine the energy gap of a semiconductor diode.
2. **Solar Cell**: To study the V-I Characteristics of solar cell.
3. **Light emitting diode**: Plot V-I and P-I characteristics of light emitting diode.
4. **Stewart – Gee's experiment**: Determination of magnetic field along axis of the current carrying coil.
5. **Hall Effect**: To determine Hall co-efficient of given semiconductor.
6. **Photoelectric effect**: To determine work function of a given material.
7. **LASER**: To study the characteristics of LASER sources.
8. **Optical Fibre**: To determine the Numerical aperture and bending losses of optical fibres.
9. **LCR Circuit**: To determine the Quality factor of LCR circuit.
10. **RC Circuit**: To determine the Time constant of RC circuit.

NOTE: Any 8 experiments are to be performed

TEXT BOOKS
1. Engineering Physics, B.K. Pandey, S. Chaturvedi –CengageLearning. 2. Halliday and Resnick,Physics-Wiley. 3. A textbook of Engineering Physics, Dr. M. N. Avadhanulu, Dr. P.G. Kshirsagar- S.Chand.
REFERENCE BOOKS
1. Main, I. G., Vibrations and Waves in Physics. 2nd. edition. CambridgeUniversity Press,1984. 2. Eugene Hecht, "Optics" , 5thEdition,AdelphiUnioversity,2016
WEB REFERENCES
1. Fundamental concepts of semi conductors:https://nptel.ac.in/courses/115102025/ 2. Semi conductor Optoelectronics:https://nptel.ac.in/courses/115102103/
E -TEXT BOOKS
1. http://www.lehman.edu/faculty/kabat/F2019-166168.pdf 2. https://www.scribd.com/doc/143091652/ENGINEERING-PHYSICS-LAB-MANUAL
MOOCS COURSE
1. Swayam:https://swayam.gov.in/nd1_noc19_ph13/preview 2. Alison:https://alison.com/courses?&Programme=physics

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

PROGRAMMING FOR PROBLEM SOLVING LAB

I B. TECH- I SEMESTER (R 20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CS107ES	B. Tech	0	0	3	1.5	30	70	100

COURSE OBJECTIVES

1. To learn the fundamentals of computers.
2. To understand the various steps in program development.
3. To learn the syntax and semantics of C programming language.
4. To learn the usage of structured programming approach in solving problems

COURSE OUTCOMES

Upon successful completion of the course, the student is able

1. To write algorithms and to draw flowcharts for solving problems.
2. To convert the algorithms/flowcharts to C programs.
3. To code and test a given logic in C programming language.
4. To decompose a problem into functions and to develop modular reusable code.
5. To use arrays, pointers, strings and structures to write C programs.
6. Searching and sorting problems

LIST OF EXPERIMENTS

1. Write a simple program that prints the results of all the operators available in C
2. Write a simple program to convert the temperature from Fahrenheit to Celsius
3. Write a program for find the max and min from the three numbers using if else statement
4. Write a C program to find the roots of a Quadratic equation.
5. Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators+,-,*, /, % and use Switch Statement)
6. Write a program that finds if a given number is a prime number
7. Write a C program to find the sum of individual digits of a positive integer and test given number is palindrome.
8. Write a C program to generate the Fibonacci sequence of numbers.
9. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
10. Write a C program to find the minimum, maximum and average in an array of integers
11. Write a C program that uses functions to perform the following:1) Addition of Two Matrices 2) Multiplication of Two Matrices

Write a C program to determine if the given string is a palindrome or not (Spelled same in both directions with or without a meaning like madam, civic, noon, abcba, etc.)

13. Toinsertasub- string into a given main string from a given position. e.ii. Todeleten Characters from a given position in a given string
14. WriteaCprogramthatdisplaysthepositionofacharacterchinthestringSor – 1ifSdoesn‘tcontainch
15. Write a C program to count the lines, words and characters in a given text.
16. Define a structure student to store the details like Roll Number, Name, and Marks in three subjects of a student and display the same.
17. Write a C program to perform specified operation on complex numbers.
18. Write a C program to store the information about three students.
19. Write a C Program to illustrate the use of nested structures.
20. Write a C Program to perform arithmetic operations using pointers.
21. Write a C Program to display the array elements in reverse order using pointer.
22. Write a C Program to find factorial of a number using functions.
23. Write a C Program to find factorial of a number using recursive functions.
24. Write a C Program to implement call by value and call by reference.
25. Write a C Program to copy the data from one file to another
26. Write a C Program to append data to the file
27. Write a C Program to merge the two files
28. Write a C Program to display the file content on reverse order.
29. Write a C Program to count number of vowels, consonants, digits, words in a given file

TEXT BOOKS

1. TheCProgrammingLanguagebyDennisMRitchie,BrianW.Kernigham,1988,PH I Publications, 2010,NewDelhi.
2. Computer System & Programming in C by SKumar &SJain, NanoEdge Public publicationns, Meerut.
3. 3 Fundamentals of Computing and C Programming, R. B. Patel,Khanna

REFERENCE BOOKS

1. Computer Fundamentals and Programming in C, ReemaTheraja,Oxford
2. Informationtechnology,DennisP.Curtin,KimFoley,Kun al Sen,Cathleen Morin,1998,TMH
3. Theory and problem of programming with C, Byron CGottfried,TMH.

WEB REFERENCES

1. https://www.tutorialspoint.com/cprogramming/
2. https://www.w3schools.in/c-tutorial/
3. https://www.cprogramming.com/tutorial/c-tutorial.html
4. www.studytonight.com/c/

E -TEXT BOOKS

1. http:///programming-with-c
2. https://developerinsider.co/best-c-programming-book-for-beginners/

MOOCS COURSE

1. https://nptel.ac.in/courses/106105085/4
2. https://www.coursera.org/courses?query=c%20programming

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

ENVIRONMENTAL SCIENCE

I B. TECH- I SEMESTER (R 20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
*ES104BS	B. Tech	0	0	2	-	100	-	100

COURSE OBJECTIVES

To learn

1. Analyze the inter relationship between living organism and environment
2. Describe various types of natural resources available on the earth surface
3. Identify the values, threats of biodiversity, endangered and endemic species of India along with the conservation of biodiversity
4. Explain the causes, effects and control measures of various types of environmental pollutions
5. Understand the importance of environment by assessing its impact on the human world

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Differentiate between various biotic and abiotic components of ecosystem
2. Describe the various types of natural resources
3. Examine the values, threats of biodiversity, the methods of conservation, endangered and endemic species of India
4. Illustrate causes, effects, and control measures of various types of environmental pollutions
5. Understand technologies on the basis of ecological principles environmental regulations which in turn helps in sustainable development

UNIT-I	ECOSYSTEMS	Classes: 8

Definition, Scope, and Importance of ecosystem. Classification, structure and function of an ecosystem, food chains, food webs and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Bio magnification.

UNIT-II	NATURAL RESOURCES	Classes: 8

Classification of Resources: Living and Non-Living resources.
Water resources: use and overutilization of surface and ground water, floods and droughts, Dams: benefits and problems.
Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources
Land resources: Forest resources.Energy resources: growing energy needs, renewable and non-renewable energy sources, use of alternate energy source, case studies.

UNIT-III	BIODIVERSITY AND BIOTIC RESOURCES	Classes: 7
Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic, optional values and hotspots of biodiversity. Endangered and endemic species of India, Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation.		
UNIT-IV	**ENVIRONMENTAL POLLUTION**	**Classes: 9**
Types of pollution, Causes, effects and prevention and control measures of air, water, soil, noise and thermal pollution. Solid waste and e-waste management.		
UNIT-V	**ENVIRONMENTAL POLICY AND SUSTAINABLE DEVELOPEMENT**	**Classes: 10**
Concept of sustainable development: Sustainable development goals. Threats to sustainability: Population explosion- crazy consumerism. Green building concept. Water conservation, Rainwater harvesting, watershed management. Environmental Policies and Legislations: Environment Protection Act, Air (Prevention and Control of Pollution) Act, Forest (conservation) Act, 1980. Wildlife Protection Act.		

TEXT BOOKS

1. Textbook of Environmental Studies for Undergraduate Courses by Each Bharuch for University Grants Commission
2. Environmental Studies by R. Rajagopalan, Oxford University Press.
3. Textbook of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications
4. Dr. P. D Sharma, "Ecology and Environment", Rastogi Publications, New Delhi,12 Edition, 2015

REFERENCE BOOKS

1. Environmental Studies by Anubha Kaushik, 4 Edition, New age international publishers
2. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Pvt. Ltd, NewDelhi
3. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHL Learning Pvt. Ltd, NewDelhi
4. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIAedition

WEB REFERENCES

1. https://www.britannica.com/science/ecosystem
2. https://ocw.mit.edu/resources/#EnvironmentandSustainability

E -TEXT BOOKS

1. P N Palanisamy Environmental Science ISBN:9788131773253, eISBN:97899332509771 Edition: Secondedition
2. Environmental Studies. Author, Dr. J. P. Sharma. Publisher, Laxmi Publications, 2009 ISBN, 8131806413,9788131806418.

MOOCS COURSE

1. https://nptel.ac.in/courses/122103039/38
2. https://nptel.ac.in/courses/106105151/12

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

ADVANCED CALCULUS

I B. TECH- II SEMESTER (R 20)								
Course Code	**Programme**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
MA201BS	**B. Tech**	**3**	**1**	**0**	**4**	**30**	**70**	**100**

COURSE OBJECTIVES

To learn

1. Methods of solving the differential equations of first and highe rorder
2. Evaluation of multiple integrals and their applications
3. The physical quantities involved in engineering field related to vector valued functions
4. The basic properties of vector valued functions and their applications
5. Vector point functions and scalar point functions

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Identify whether the given differential equation of first order is exact or not.
2. Solve higher order differential equation and apply the concept of differential equation to real problems.
3. Evaluate the multiple integrals and apply the concept to find areas and volumes.
4. Is able to find gradient, directional derivative, divergence and curl.
5. Evaluate the line, surface and volume integrals and converting them from one to another.

UNIT-I	**FIRST ORDER ORDINARY DIFFERENTIAL EQUATIONS**	**Classes: 10**

Exact, linear and Bernoulli's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type, Applications: Newton's law of cooling, Law of natural growth and decay, Simple Harmonic Motion

UNIT-II	**ORDINARY DIFFERENTIAL EQUATIONS OF HIGHER ORDER**	**Classes: 12**

Second order linear differential equations with constant coefficients: Non-Homogeneous terms of the type e^{ax}, sinax, cosax, polynomial in x^m, $e^{ax}V(x)$ and xV(x),method of variation of parameters, Applications: LCR Circuit.

UNIT-III	MULTIPLE INTEGRATION	Classes:12
Evaluation of Double Integrals (Cartesian and polar coordinates), change of order of integration (only Cartesian form); Evaluation of Triple Integrals: Change of variables (Cartesian to polar) for double and (Cartesian to Spherical and Cylindrical polar coordinates) for triple integrals. Applications: Areas (by double integrals) and volumes (by double integrals and triple integrals)		
UNIT-IV	**VECTOR DIFFERENTIATION**	**Classes: 12**
Vector point functions and scalar point functions. Gradient, Divergence and Curl. Directional derivatives, Tangent plane and normal line. Vector Identities. Scalar potential functions. Solenoidal and Irrotational vectors		
UNIT-V	**VECTOR INTEGRATION**	**Classes: 12**
Line, Surface and Volume Integrals. Theorems of Green, Gauss and Stokes (without proofs) and their applications		

TEXT BOOKS

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 43rd Edition.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,2006
3. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9thEdition, Pearson, Reprint, 2002.

REFERENCE BOOKS

1. Paras Ram, Engineering Mathematics, 2nd Edition, CBS Publishes
2. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.

WEB REFERENCES

1. https://www.efunda.com/math/gamma/index.cfm
2. https://ocw.mit.edu/resources/#Mathematics
3. https://www.sosmath.com/
4. https://www.mathworld.wolfram.com/

E -TEXT BOOKS

1. https://www.e-booksdirectory.com/listing.php?Programme=4
2. https://www.e-booksdirectory.com/details.php?ebook=10830

MOOCS COURSE

1. https://swayam.gov.in/
2. https://swayam.gov.in/NPTEL

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

ENGINEERING CHEMISTRY

I B. TECH- II SEMESTER (R 20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CH202BS	B. Tech	3	1	0	4	30	70	100

COURSE OBJECTIVES

To learn

1. To provide basic knowledge on atomic, molecular orbitals and the bonding interaction between atoms
2. To analyze the impact of water hardness and its various methods for removal of hardness of water, numerical problems to calculate the hardness of water in a given sample
3. To discover the importance of electrical energy which originates from chemical reactions essential for industrial needs
4. Tounderstandthebasicconceptsofspectroscopyanddrugmoleculestoextrapolatetheir chemical knowledge in day to day life
5. To enable the students to understand the use of engineering materials such as polymers, lubricants and study the industrial applications in the field of engineering and technology

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Achieve the basic concepts of atomic, molecular and electronic changes related to molecular bonding and magnetism
2. Familiarize with fundamentals of treatment technologies and considerations for its design and implementation in water treatment plants
3. To extrapolate the knowledge of cell, electrode, electrolysis, electromotive force. To analyze and develop a technical solution to corrosion problems related to engineering materials
4. Acquire the significant knowledge about basic concepts of spectroscopy and synthesis of drug molecules would be known to the students
5. Comprehended and explore engineering applications of polymers and lubricants

UNIT-I	MOLECULAR STRUCTURE AND THEORIES OF BONDING	Classes: 10

Introduction to VBT, Postulates and draw backs of VBT- Atomic and Molecular orbitals, Linear Combination of Atomic Orbitals (LCAO), Introduction to Crystal Field Theory (CFT): Salient featuresofCFT-CrystalFieldSplittingoftransitionmetaliond-orbitals in tetrahedral, octahedral and square planar geometries. Applications of CFT- color and magnetic properties.

Postulates of MOT, molecular orbitals of diatomic molecules-molecular orbital energy level diagrams of N_2, O_2 and CO molecules

UNIT-II	WATER AND ITS TREATMENT	Classes: 12

Introduction-hardness of water-causes of hardness. Types of harness: Temporary and Permanent. Expression and units of hardness. Estimation of hardness of water by complex metric method (EDTA method), Numerical problems. Boiler troubles- scales, sludges, carryover and caustic embrittlement. Internal treatment- Calgon conditioning, phosphate conditioning and colloidal conditioning. External treatment of water- Ion exchange process. Desalination of brackish water- Reverse osmosis. Potable water and its specifications. Steps involved in the treatment of water by chlorination andozonization.

UNIT-III	ELECTROCHEMISTRY AND CORROSION	Classes: 14

Electrochemical cells- electrode potential, standard electrode potential, Galvanic cell, Nernst equation- Applications. EMF of a cell. Types of electrodes-standard hydrogen electrode, calomel and glass electrode- construction and working. Numerical problems.

Batteries - Primary (Lithium cell) and secondary batteries (Lithium ion, Lead acid storage cell)- Applications.

Corrosion: Introduction, Causes and effects of corrosion- theories of chemical and electrochemical corrosion- mechanism of electrochemical corrosion. Corrosion control methods- Cathodic protection-sacrificial anode and impressed currentcathodic methods. Metallic coatings- Methods of preparation of surface- Hot dipping- Galvanization and tinning. Electro plating and electro less plating.

UNIT-IV	SPECTROSCOPY AND SYNTHESIS OF DRUG MOLECULES	Classes: 08

Spectroscopy- Introduction, electromagnetic spectrum, principles of UV-visible, IR spectroscopy- selection rules and applications. Basic concepts of Nuclear magnetic resonance spectroscopy, chemical shift, spin-spin splitting. Magnetic resonance imaging.

Structure, synthesis and pharmaceutical applications of Paracetamol and Aspirin.

UNIT-V	MATERIAL CHEMISTRY	Classes: 12

Polymers: Introduction, Classification of polymers with examples. Types of polymerization: Addition and Condensation polymerization with examples.
Plastics: Introduction, Characteristics. Thermoplastic and thermosetting plastics. Compounding and fabrication of plastics (compression and injection molding). Preparation, properties and engineering applications of PVC, Teflon and Bakelite.
Lubricants: Introduction, Characteristics, mechanism-thick film, thin film, extreme pressure lubrication, properties- flash point, fire point, cloud point, pour point, mechanical stability and their significance- applications of lubricants.

TEXT BOOKS

1. P. C. Jain and M. Jain, “Engineering Chemistry”, Dhanpat Rai Publishing Company Ltd., New Delhi,18th edition(2018)
2. Prasanta Rath, B. Rama Devi, Ch. Venkataramana Reddy, S. Chakrovarthy, “A Text book of Engineering Chemistry”, Cengage publications(2019)
3. Shashi Chawla, “Engineering Chemistry”, Dhanpat Rai & Co. Publishers., New Delhi,15thedition(2015)
4. C.N. Banwell, “Fundamentals of MolecularSpectroscopy”

REFERENCE BOOKS

1. B. H. Mahan, "University Chemistry", Narosa Publishing house, New Delhi, 3rd edition (2013)
2. B.R.Puri,L.R.SharmaandM.S.Pathania,"PrinciplesofPhysicalChemistry",S.Nagin Chand & Company Ltd., 46th edition(2013)
3. J.D. Lee, "Concise Inorganic Chemistry", Willey Publications, 5th edition(2008)
4. P.W. Atkins, J.D. Paula, "Physical Chemistry", Oxford, 8th edition(2006)
5. G. L. David Krupadanam, D. Vijaya Prasad, K. Varaprasad Rao, K.L.N. Reddy and C. Sudhakar, "Drugs", Universities Press (India) Limited, Hyderabad(2007)

WEB REFERENCES

1. Chemistry: foundations and applications. J. J. Lagowski, editor in chief. New York, Macmillan Reference USA, c2004. 4v
2. Polymer data handbook. Edited by James E. Mark. 2nd ed. Oxford, New York, Oxford University Press, 2009
3. https://www.wyzant.com/resources/lessons/science/chemistry
4. http://www.chem1.com/acad/webtext/virtualtextbook.html

E -TEXT BOOKS

1. Krishnamurthy, N., Vallinayagam, P., Madhavan, D., Engineering Chemistry, ISBN: 9789389347005, eBook ISBN: 9789389347012, Edition: FourthEdition
2. Vijayasarathy, P. R., Engineering Chemistry, Print Book ISBN : 9789387472778, eBook ISBN : 9789387472785, Edition : Third Edition

MOOCS COURSE

1. https://onlinecourses-archive.nptel.ac.in
2. https://www.mooc-list.com/tags/chemistry

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

BASIC ELECTRICALENGINEERING

I B. TECH- II SEMESTER (R 20)

Course Code	Programme	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EE206ES	B. Tech	3	0	0	3	30	70	100

COURSEOBJECTIVES

To learn

1. To introduce the concepts of electrical circuits and its components
2. To understand magnetic circuits, DC circuits and AC single phase & three phase circuits
3. To study and understand the different types of DC/AC machines and Transformers.
4. To import the knowledge of various electrical installations.
5. To introduce the concept of power, power factor and its improvement.

COURSEOUTCOMES

Upon successful completion of the course, the student is able to

1. To analyze and solve electrical circuits using network laws.
2. To analyze and solve electrical circuits using theorems.
3. To understand and analyze basic Electric and Magnetic circuits.
4. To study the working principles of Electrical Machines.
5. To introduce components of Low Voltage Electrical Installations.

UNIT-I	D.C.CIRCUITS	Classes:15

Electrical circuit elements (R, L and C), voltage and current sources, KVL&KCL, analysis of simple circuits with dc excitation. Superposition, The venin's and NortonsTheorems.

Time-domain analysis of first-order RL and RC circuits.

UNIT-II	A.C.CIRCUITS	Classes:10

Representationofsinusoidalwaveforms,peakandrmsvalues,phasorrepresentation,realpower, reactive power, apparent power, power factor, Analysis of single-phase ac circuits consisting of R, L,C,RL,RC,RLCcombinations(seriesandparallel),resonanceinseriesRL-Ccircuit.

UNIT-III	TRANSFORMERS	Classes:15

Ideal and practical transformer, EMF equation, operation on no load and on load, OC and SC tests, phasor diagrams equivalent circuit, losses in transformers, regulation, Efficiency and condition for maximum efficiency, Auto-transformer.

UNIT-IV	ELECTRICALMACHINES	Classes:15
Generation of rotating magnetic fields, Construction and working of a three-phase induction Motor, Significance of torque-slip characteristics. Loss components and efficiency. Construction, working, Torque-speed characteristics of separately excited, shunt, series, compound dc motors.		
UNIT-V	**ELECTRICALINSTALLATIONS**	**Classes:10**
Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, electrical Safety precautions in handling electrical appliances, electric shock, first aid for electric shock, safety rules.		

TEXTBOOKS

1. Basic Electrical Engineering - D.P. Kothari and I.J. Nagrath, 3rd edition 2010,Tata, McGraw Hill.
2. D.C. Kulshreshtha, "Basic Electrical Engineering", McGrawHill,2009.
3. L.S.Bobrow,FundamentalsofElectricalEngineering",OxfordUniversityPress,2011
4. Electrical and Electronics Technology, E. Hughes, 10th Edition,Pearson,2010

REFERENCEBOOKS

1. Electrical Engineering Fundamentals, Vincent Deltoro, Second Edition,PrenticeHallIndia, 1989.
2. P. V. Prasad, S. Sivanagaraju, R. Prasad, "Basic ElectricalandElectronics Engineering" Cengage Learning, 1stEdition,2013.
3. V. D. Toro, – Electrical Engineering Fundamentals Prentice HallIndia,1989.

WEBREFERENCES

1. https://www.electrical4u.com/
2. http://www.basicsofelectricalengineering.com/
3. https://www.khanacademy.org/science/physics/circuits-topic/circuits-
4. resistance/a/ee-voltage-and-current
5. https://circuitglobe.com/

E –TEXTBOOKS

1. https://easyengineering.net/basic-electrical-engineering-by-wadhwa/
2. https://easyengineering.net/objective-electrical-technology-by-mehta/

MOOCSCOURSE

1. https://nptel.ac.in/courses/108108076/1
2. https://nptel.ac.in/courses/108102146/
3. https://nptel.ac.in/courses/108108076/35

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

ENGINEERING WORKSHOP

I B. TECH- II SEMESTER (R 20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
ME207ES	B.Tech	1	0	3	2.5	30	70	100

COURSE OBJECTIVES

To learn

1. To Study of different hand operated power tools, uses and their demonstration.
2. To gain a good basic working knowledge required for the production of various engineering products.
3. To provide hands on experience about use of different engineering materials, tools, equipment's and processes those are common in the engineering field.
4. To develop a right attitude, team working, precision and safety at workplace.
5. It explains the construction, function, use and application of different working tools, equipment and machines.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Study and practice on machine tools and their operations
2. Practice on manufacturing of components using workshop trades including Fitting, Carpentry, Foundry, Tin-smithy, House Wiring and Welding.
3. Identify and apply suitable tools for different trades of Engineering processes including drilling, material removing, measuring, chiseling.
4. Apply basic electrical engineering knowledge for house wiring practice.

LIST OF EXPERIMENTS

TRADES FOR EXERCISES (Any two exercises from each trade)

1. Tin-Smithy – (Square Tin, Cone and Cylinder)
2. Carpentry – (T-Lap Joint, Planning Sawing & Dovetail Joint)
3. Welding Practice – (Arc Welding-Butt Joint, Lap Joint&T-Joint)
4. Black Smithy – (Round to Square, S-Hook&U-Clamp)
5. Foundry – (Mould using Single Piece and SplitPattern)
6. Fitting – (V-Fit, Square Filing & Semi-circular fit)
7. House-wiring – (Two-way Switch and one-way switch inseries)

TRADES FOR DEMONSTRATION

8. Plumbing, Machine Shop, Power tools in construction, Wood turning lathe and Casting Process.

Note: At least perform 10 Exercises out of 14 Exercises.

TEXT BOOKS

1. Work shop Manual - P.Kannaiah/ K.L.Narayana/ ScitechPublishers.
2. Workshop Manual / Venkat Reddy/ BS Publications/SixthEdition
3. Workshop Technology byChapman
4. A Textbook Of Workshop Technology : Manufacturing Processes/J. KGUPTA

REFERENCE BOOKS

1. Work shop Manual - P. Kannaiah/ K. L. Narayana/ SciTech
2. Workshop Manual / Venkat Reddy/BSP
3. Workshop Technology byHazra-Chowdhary
4. Production Engineering byR.K.Jain

WEB REFERENCES

1. https://nptel.ac.in/courses/112105126/
2. https://nptel.ac.in/downloads/112105127/
3. https://nptel.ac.in/courses/112107145/
4. https://nptel.ac.in/courses/122104015/

E -TEXT BOOKS

1. http://103.135.169.82:81/fdScript/RootOfEBooks/MED/Introduction Workshop%20Technology
2. https://www.quora.com/Download-free-mechanical-engineering-ebooks-sites

MOOCS COURSE

1. http://www.nits.ac.in/workshops/Workshop_on_MOOCS_26082017.pdf
2. https://www.nitttrc.ac.in/swayam/index.html

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

PROFESSIONAL ENGLISH

I B. TECH- II SEMESTER (R 20)

Course Code	Programme	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EN203HS	B. Tech	2	0	0	2	30	70	100

COURSE OBJECTIVES:

To enable students

1. To enhance their vocabulary and basic grammar rules for communicative competence.
2. To hone their comprehensive skills through various reading techniques.
3. To develop the professional writing with the practice of formal letters, e-mails, reports, resumes, etc.
4. To use various sentence structures effectively in formal and informal on texts.
5. To improve scientific and technical communication skills through technical vocabulary and appropriate prose texts.

COURSE OUTCOMES:

Upon successful completion of the course, the students are able to

1. Use vocabulary effectively and syntactically.
2. Translate the reading techniques and apply them in literary texts.
3. Demonstrate enhanced competence in standard Written English.
4. Develop the competence in writing professional documents.
5. Exhibit appropriate communicative approaches to suit various contexts.

UNIT-I	THE RAMAN EFFECT	Classes:7

Vocabulary: Word Formation, Use of affixes,
Grammar: Articles, Prepositions
Writing: Paragraph Writing, Organizing principles of Paragraphs in documents

UNIT-II	THE LOST CHILD	Classes:9

Vocabulary: Synonyms and Antonyms
Grammar: Noun – Pronoun Agreement and Concord
Reading: Significance & Techniques of reading; Skimming – Reading for the gist of a text; Scanning– Reading for specific information; Intensive; Extensive reading; SQ3R Technique; Reading Comprehension;
Reading Poetry -The Road Not Taken
Writing: Narrative Writing

UNIT-III	SATYA NADELLA'S EMAIL TO HIS EMPLOYEES	Classes:10

Vocabulary: Homonyms-Homophones-Homographs
Grammar: Tenses
Writing : Significance & Effectiveness of Writing; Writing Descriptions; Letter writing; E-mail writing

UNIT-IV	WHAT SHOULD YOU BE EATING?	Classes:10

Vocabulary: Technical vocabulary; Words from Foreign Languages; abbreviations and acronyms
Grammar: Misplaced Modifiers; Redundancies and Cliches
Writing: Information Transfer, Note Making, Writing an Abstract and Report Writing

UNIT-V	HOW A CHINESE BILLIONAIRE BUILT HER FORTUNE	Classes:9

Vocabulary: Words often Confused; Idioms and Phrasal verbs, One- word Substitutes;
Grammar: Conditional Sentences; Degrees of Comparison; Simple-Complex-Compound Sentences and Common errors
Writing: Essay writing

TEXTBOOKS

1. Sudarshana, N.P. and Savitha, C. (2018). English forEngineers. Cambridge UniversityPress.
2. Education for Life and Work – English Workbook prepared by English Faculty of St. Martin's EngineeringCollege.

REFERENCE BOOKS

1. Swan, M. (2016). Practical English Usage. Oxford UniversityPress.
2. Kumar, S and Lata, P. (2018). Communication Skills. Oxford UniversityPress.
3. Zinsser, William. (2001). On Writing Well. Harper ResourceBook.

WEB REFERENCES

1.www.edufind.com
2.www.myenglishpages.com
3.http://grammar.ccc.comment.edu
4. http://owl.english.prudue.edu

E –TEXTBOOKS

1.http://bookboon.com/en/communication-ebooks-zip
2.http://learningenglishvocabularygrammar.com/files/idiomsandphraseswithmeaningsandexamlespdf.pdf

MOOCS COURSE

1. https://mooec.com/courses/grammar-guru-1
2. https://mooec.com/courses/learning-styles

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

ENGINEERING CHEMISTRY LABORATORY

I B. TECH- II SEMESTER (R 20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CH204BS	B. Tech	0	0	3	1.5	30	70	100

COURSE OBJECTIVES

To learn

1. Estimation of hardness and chloride content in water to check its suitability for drinking purpose
2. To find the concentration of ions present in an unknown solution
3. To know the handling procedure of colorimetric and conductometric instruments
4. The fundamentals of drug synthesis
5. The measurement of physical properties like surface tension, viscosity and acid value

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Understand the total dissolved salts present in a sample of water
2. Determine the concentration of ions existing in a solution
3. Find the strength of an acid by conductometric methods
4. Acquire basic knowledge on the chemical reaction used to synthesize drug molecules like aspirin and Paracetamol
5. Select lubricants for various purposes such as to reduce the friction between two movable surfaces and to determine the surface tension of a given liquid

LIST OF EXPERIMENTS

Volumetric Analysis

1. Determination of total hardness of water by complex metric method using EDTA.
2. Determination of chloride content of water by Argentometry.
3. Determination of acid value of coconut oil.

Potentiometry

4. Determination of Fe^{2+} ions present in the given sample by Potentiometric titration.

Conductometry

5. Estimation of HCl by conductometric titration.
6. Estimation of acetic acid by conductometric titration.

Colorimetry

7. Estimation of Copper by colorimetric method.

Synthesis of Drugs

8. Synthesis of aspirin and Paracetamol.

Physicalconstants

9. Determination of viscosity of the given sample by using Ostwald's Viscometer.
10. Determination of surface tension of a given liquid using stalagmometer

TEXT BOOKS

1. Senior practical physical chemistry, B. D. Khosla, A. Gulati and V. Garg (R. Chand and Co.Delhi)
2. Prasanta Rath, B. Rama Devi, Ch. Venkataramana Reddy, S. Chakrovarthy, "A Text book of Engineering Chemistry", Cengage publications(2019)
3. An introduction to practical; chemistry, K.K. Sharma and D. S. Sharma (Vikas publishing, NewDelhi)
4. Vogel's text book of practical organic chemistry, 5thedition
5. S. S. Dhara, Text book on experiments and calculations in engineering chemistry, B.S Publications

REFERENCE BOOKS

1. G. H. Jeffery, J. Bassett, J. Mendham and R. C. Denney, "Vogel's Text Book of Quantitative ChemicalAnalysis"
2. O. P. Vermani & Narula, "Theory and Practice in Applied Chemistry", New Age InternationalPublishers
3. Gary D. Christian, "Analytical chemistry", 6th Edition, WileyIndia

WEB REFERENCES

1. Phillip E. Savage, Industrial & Engineering Chemistry: At the Forefront ofChemical Engineering Research since 1909, *Ind. Eng.Chem.Res.*20195811
2. Elias, AI. Sundar Manoharan S. and Raj, H. "Laboratory Experiments for General Chemistry", I.I.T. Kanpur,1997

E -TEXT BOOKS

1. Payal B Joshi, Experiments In Engineering Chemistry, Edition: First, ISBN:978-93-85909-13-9, Publisher: I.K. International Publishing House Pvt.Ltd
2. Mohapatra, Ranjan Kumar, Engineering Chemistry With Laboratory Experiments, ISBN: 978- 81-203-5158-5, PHI Learning PrivateLimited

MOOCS COURSE

1. https://sce.ethz.ch/en/programmes-and-courses/suche-angebote.html?polycourseId=1299
2. https://www.classcentral.com/course/open2study-chemistry-building-blocks-of-the-world-1297

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

ENGLISH LANGUAGE AND COMMUNICATION SKILLS LABORATORY

I B. TECH- II SEMESTER (R20)

Course Code	Programme	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EN205HS	B.Tech	0	0	2	1	30	70	100

COURSE OBJECTIVES:

To train students

1. To use accurate and appropriate pronunciation through the practice of phonetic sounds, symbols, word accent and intonation.
2. To improve their fluency in spoken English and neutralize their mothertongue influence through JAM Sessions, Role-play, etc.
3. To comprehend the speech of people of various regions through Listening practice exercises.
4. To enable students to transfer information verbally with the right usage of Body language through individual and group activities.
5. To understand nuances of English language by practicing various exercises at Multi-media lab.

COURSE OUTCOMES:

Upon successful completion of the course, student will be able to

1. Differentiate the speech sounds in English and demonstrate accurate pronunciation.
2. Communicate with others in clear and confident manner.
3. Improve their effective and empathetic listening ability.
4. Show the zeal to participate in Public Speaking Sessions.
5. Neutralize the Mother tongue influence in day to communication.

LIST OF EXPERIMENTS

EXERCISE: III

CALL LAB:
Introduction to Phonetics – Speech sounds - vowels and consonants

ICS LAB:
Ice-breaking Activity – Non-verbal Communication

EXERCISE: II

CALL LAB:
Minimal Pairs – Consonant Clusters – Past Tense Marker and Plural Marker Rules

ICS LAB:
Role Play – Expressions in various Situations – Making Requests and Seeking Permissions

EXERCISE: III

CALL LAB:

Structure of Syllables – Word Accent –Stress shift–Intonation

ICS LAB:

Telephone Communication –Etiquette

EXERCISE: IV

CALL LAB:

Listening Comprehension Tests

ICS LAB:

Presentations Skills & JAM Session

EXERCISE: V

CALL LAB:

Mother Tongue Interference – Differences in British and American Pronunciation

Interview Skills – Mock Interviews

TEXTBOOKS

1. ELCS Lab Manual prepared by English faculty of St. Martin's EngineeringCollege.
2. Exercises in Spoken English. Parts I –III. CIEFL, Hyderabad. OxfordUniversity Press.

REFERENCE BOOKS

1. T Balasubramanian. A Textbook of English Phonetics for Indian Students,Macmillan,2008
2. J Sethi et al. A Practical Course in English Pronunciation, Prentice Hall India,2005.
3. Priyadarshi Patnaik. Group Discussions and Interviews, Cambridge University Press PvtLtd2011.
4. Arun Koneru, Professional Speaking Skills, Oxford UniversityPress,2016.

WEB REFERENCES

1. https://www.asha.org/PRPSpecificTopic.aspx?folderid=8589935321&section=References
2. Argyle,MichaelF.,Alkema,Florisse,&Gilmour,Robin."Thecommunicationof friendly and hostile attitudes: Verbal and nonverbal signals." European Journalof Social Psychology, 1, 385-402:1971
3. Blumer, Herbert. Symbolic interaction: Perspective and method. Engle wood Cliffs; NJ: PrenticeHall.1969

E –TEXTBOOKS

1. Mc corry Laurie Kelly Mc Corry Jeff Mason, Communication Skills forthe Healthcare Professional, 1st edition,ISBN:1582558140, ISBN-13:9781582558141
2. RobertEOwens,Jr,LanguageDevelopment, 9th edition, ISBN:0133810364,9780133810363

MOOCS COURSE

1. https://www.coursera.org/specializations/improve-english
2. https://www.edx.org/professional-certificate/upvalenciax-upper-intermediate-english

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

BASIC ELECTRICAL ENGINEERINGLABORATORY

I B. TECH- II SEMESTER (R20)

Course Code	Programme	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EE208ES	B.Tech	0	0	2	1	30	70	100

COURSEOBJECTIVES:

To learn

1. To analyze a given network by applying various electrical laws
2. To analyze a given network by applying various network theorems
3. To know the response of electrical circuits for different excitations
4. To calculate, measure and know the relation between basic electrical parameters.
5. To analyze the performance characteristics of DC and AC electrical machines

COURSEOUTCOMES:

Upon successful completion of the course, the student is able to

1. Get an exposure to basic electrical laws.
2. Understand the response of different types of electrical circuits
3. Understand the response of different types of electrical Theorems
4. Understand different types of Excitations.
5. Understand the basic characteristics of transformers and electrical machines.

LIST OFEXPERIMENTS

PART-A

1. Verification of Ohms Law
2. Verification of KVL and KCL
3. Transient Response of Series RL and RC circuits using DC excitation
4. Transient Response of RLC Series circuit using DC excitation
5. Resonance in series RLC circuit.
6. Verification of Super position theorem.
7. Verification of Thevenin's Theorem.
8. Verification of Norton's Theorem.

PART-B

9. O.C. & S.C. Tests on Single Phase Transformer.
10. Load Test on Single Phase Transformer (Calculate Efficiency and Regulation).
11. Performance Characteristics of a Separately/Self Excited DC Shunt/Compound Motor.
12. Torque-Speed Characteristics of a Separately/Self Excited DC Shunt/Compound Motor.
13. Performance Characteristics of a Three-phase Induction Motor
14. Torque-Speed Characteristics of a Three-phase Induction Motor

*Note: Any five experiments from Part-A and Part-B.

TEXTBOOKS

1. Basic Electrical Engineering - D.P. Kothari and I.J. Nagrath, 3rdedition2010,Tata
2. McGraw Hill.
3. D.C. Kulshreshtha, "Basic Electrical Engineering", McGrawHill,2009.
4. L.S.Bobrow,FundamentalsofElectricalEngineering",OxfordUniversityPress, 2011
5. Electrical and Electronics Technology, E. Hughes, 10th Edition,Pearson,2010

REFERENCEBOOKS

1. Electrical Engineering Fundamentals, Vincent Deltoro, Second Edition,Prentice Hall India,1989.
2. P.V.Prasad, S.sivanagaraju, R.Prasad, "BasicElectricalandElectronics Engineering" Cengage Learning, 1stEdition,2013.
3. V. D. Toro, – Electrical Engineering Fundamentals Prentice HallIndia,1989.

WEBREFERENCES

1. https://www.electrical4u.com/
2. http://www.basicsofelectricalengineering.com/
3. https://www.khanacademy.org/science/physics/circuits-topic/circuits-resistance/a/ee-voltage-and-current
4. https://circuitglobe.com/

E –TEXTBOOKS

1. https://easyengineering.net/basic-electrical-engineering-by-wadhwa/
2. https://easyengineering.net/objective-electrical-technology-by-mehta/

MOOCSCOURSE

1. https://nptel.ac.in/courses/108108076/1
2. https://nptel.ac.in/courses/108102146/
3. https://nptel.ac.in/courses/108108076/35

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

ELECTRONIC DEVICES AND CIRCUITS

II B. TECH- I SEMESTER (R20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EC301PC	B.Tech	3	1	0	4	30	70	100

COURSE OBJECTIVES

To learn

1. To introduce components such as diodes, to know the applications of components.
2. To introduce components such as BJTs, to know the applications of components.
3. To introduce components such as FETs, to know the applications of components
4. To know the characteristics of special components
5. To give understanding of varioustypes of amplifier circuits

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Know the characteristics of various components.
2. Understand the utilization of components.
3. Understand the biasing techniques
4. Understand the utilization of special components.
5. Design and analyze small signal amplifier circuits.

UNIT-I	DIODE AND APPLICATIONS	Classes: 12

Diode - Static and Dynamic resistances, Equivalent circuit, Load line analysis, Diffusion and Transition Capacitances, Diode Applications: Switch-Switchingtimes.

Rectifier - Half Wave Rectifier, Full Wave Rectifier, Bridge Rectifier, Rectifiers with Capacitive and Inductive Filters, Clippers-Clipping at two independent levels, Clamper-Clamping Circuit Theorem, Clamping Operation, Types of Clampers.

UNIT-II	BIPOLAR JUNCTION TRANSISTOR(BJT)	Classes: 12

Principle of Operation, Common Emitter, Common Base and Common Collector Configurations, Transistor as a switch, switching times, Transistor Biasing and Stabilization-Operating point, DC & AC load lines, Biasing-Fixed Bias, Self Bias, Bias Stability, Bias Compensation using Diodes.

UNIT-III	JUNCTION FIELD EFFECT TRANSISTOR (FET)	Classes: 12

Junction Field Effect Transistor (FET): Construction, Principle of Operation, Pinch-Off Voltage, Volt- Ampere Characteristic, Comparison of BJT and FET, Biasing of FET, FET as Voltage Variable Resistor. Special Purpose Devices: Zener Diode - Characteristics,

Voltage Regulator. Principle of Operation - SCR, Tunnel diode, UJT, Varactor Diode.		
UNIT-IV	**ANALYSIS AND DESIGN OF SMALL SIGNAL LOW FREQUENCY BJTAMPLIFIERS**	**Classes: 12**
Analysis and Design of Small Signal Low Frequency BJT Amplifiers: Transistor Hybrid model, Determination of h-parameters from transistor characteristics, Typical values of h-parameters in CE, CB and CC configurations, Transistor amplifying action, Analysis of CE, CC, CB Amplifiers and CE Amplifier with emitter resistance, low frequency response of BJT Amplifiers, effect of coupling and bypass capacitors on CE Amplifier.		
UNIT-V	**FET AMPLIFIERS**	**Classes: 12**
Small Signal Model, Analysis of JFET Amplifiers, Analysis of CS, CD, CG JFET Amplifiers. MOSFET Characteristics in Enhancement and Depletion mode, Basic Concepts of MOS Amplifiers.		

TEXT BOOKS

1. Electronic Devices and Circuits-Jacob Millman, McGraw Hill Education
2. Electronic Devices and Circuits theory–Robert L. Boylestead, Louis Nashelsky, 11th Edition, 2009, Pearson.

REFERENCE BOOKS

1. The Art of Electronics, Horowitz, 3rd Edition Cambridge University Press
2. Electronic Devices and Circuits, David A. Bell– 5th Edition, Oxford.
3. Pulse, Digital and Switching Waveforms–J. Millman, H.TaubandMothikiS. Prakash Rao, 2 Ed., 2008, McGraw Hill.

WEB REFERENCES

1. https://nptel.ac.in/courses/113/106/113106062/
2. https://nptel.ac.in/courses/113/106/113106065/
3. https://nptel.ac.in/courses/108/108/108108122/

E -TEXT BOOKS

1. Electronic Devices And Circuits, 2nd Edition Jacob Millman and Christos C. Halkias
2. Electronic Devices And Circuits, 2ndEdition David A. Bell.

MOOCS COURSE

1. https://www.edx.org/course/principle-of-semiconductor-devices-part-ii-field-effect-transistors-and-mosfets-2
2. https://www.coursera.org/lecture/electronics/4-1-introduction-to-pn-junctions-xr0ZQ

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

NETWORK ANALYSIS AND TRANSMISSIONS LINES

II B. TECH- I SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EC302PC	B.Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

To learn

1. To understand the basic concepts on RLC circuits.
2. To know the behavior of the steady states and transients states in RLC circuits.
3. To know the basic Laplace transforms techniques in periods waveforms.
4. To understand the two port network parameters.
5. To understand the properties of LC networks and filters.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Gains the knowledge on Basic network elements.
2. Learns and analyze the RLC circuits' behavior in detail.
3. Analyze the performance of periodic waveforms.
4. Learns and gain the knowledge in characteristics of 2 port network parameters (Z, Y, ABCD, h & g).
5. To analyze the filter design concepts in real world applications.

UNIT-I	NETWORK TOPOLOGY AND MAGNETIC CIRCUITS	Classes: 9

Network Topology, Basic cut-set and tie-set matrices for planar networks, Magnetic Circuits, Self and Mutual inductances, dot convention, impedance, reactance concept, Impedance transformation and coupled circuits, co-efficient of coupling, equivalent T for Magnetically coupled circuits, Ideal Transformer.

UNIT-II	STEADY STATE AND TRANSIENT ANALYSIS	Classes: 9

Transient and steady state analysis of RC, RL and RLC Circuits, Sinusoidal and Step responses. RC Circuits as integrator and Differentiators. 2nd order series and parallel RLC Circuits, Root locus, damping factor, over damped, under damped and critically damped cases, quality factor and bandwidth for series and parallel resonance, resonance curves.

UNIT-III	TWO PORT NETWORK PARAMETERS	Classes: 9

Two port network parameters, Z, Y, ABCD, h and g parameters, Characteristic impedance, Image transfer constant, image and iterative impedance, network function,

driving point and transfer functions – using transformed (S) variables, Poles and Zeros. Standard T, π, L Sections, Characteristic impedance, image transfer constants, Design of Attenuators, impedance matching network.

UNIT-IV	TRANSMISSION LINES-I	Classes: 9

Types, Parameters, Transmission Line Equations, Primary & Secondary Constants, Equivalent Circuit, Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line Concepts, Lossless / Low Loss Characterization, Types of Distortion, Condition for Distortion less line, Minimum Attenuation, Loading - Types of Loading.

UNIT-V	TRANSMISSION LINES-II	Classes: 9

Transmission Lines – II: Input Impedance Relations, SC and OC Lines, Reflection Coefficient, VSWR. λ/4, λ/2, λ/8 Lines – Impedance Transformations, Smith Chart – Configuration and Applications, Single StubMatching.

TEXT BOOKS

1. Network Analysis – ME Van Valkenburg, Prentice Hall of India, 3rd Edition, 2000.
2. Networks, Lines and Fields - JD Ryder, PHI, 2nd Edition, 1999.

REFERENCE BOOKS

1. Engineering Circuit Analysis – William Hayt and Jack E Kemmerly, MGH, 5th Edition, 1993.
2. Electric Circuits – J. Edminister and M.Nahvi – Schaum's Outlines, Mc Graw Hill Education,1999.
3. Network Theory – Sudarshan and Shyam Mohan, Mc Graw Hill Education.
4. Joseph A. Edminister (2002), Schaum's outline of Electrical Circuits, 4th edition, Tata McGraw Hill Publications, New Delhi, India
5. A. Chakrabarthy (2010), Electrical Circuits, 5rd edition, Dhanpat Rai & Sons Publications, New Delhi.

WEB REFERENCES

1. https://nptel.ac.in/courses/108102042/
2. https://lecturenotes.in/subject/537/network-analysis-na
3. https://nptel.ac.in/courses/108/104/108104139/
4. https://nptel.ac.in/courses/108/105/108105065/

E -TEXT BOOKS

1. https://menglim498.files.wordpress.com/2013/04/schaum_s_outlines_-_basic_circuit_analysis.pdf
2. https://bookboon.com/en/electrical-electronic-engineering-ebooks

MOOCS COURSE

1. https://www.courses.com/electrical-engineering
2. https://www.edx.org/course/circuits-and-electronics-1-basic-circuit-analysis

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

DIGITAL SYSTEM DESIGN

II B. TECH- I SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EC303PC	B. Tech	3	1	0	4	30	70	100

COURSE OBJECTIVES

To learn

1. To understand common forms of number representation in logic circuits
2. To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems
3. To understand the concepts of combinational logic circuits and sequential circuits
4. To understand the Realization of Logic Gates Using Diodes & Transistors

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. **Identify,** manipulate different number systems and use different coding techniques like Hamming Codes to detect and correct the errors.
2. **Remember** the theorems and postulates of Boolean algebra and also learn how to use K-Map and Tabular Method (QM) to minimize digital functions.
3. **Discuss** combinational, sequential circuits and use standard functions/ building blocks to build larger and more complex circuits.
4. **Analyze** sequential circuits and use standard sequential functions/building blocks to build larger & more complex circuits.
5. **Understand** Logic Families and realize Logic Gates using Diodes & Transistors

UNIT-I	NUMBER SYSTEMS	Classes: 12

Number systems, Complements of Numbers, Codes- Weighted and Non-weighted codes and its Properties, Parity check code and Hamming code.

Boolean Algebra: Basic Theorems and Properties, Switching Functions- Canonical and Standard Form, Algebraic Simplification, Digital Logic Gates, EX-OR gates, Universal Gates, Multilevel NAND/NOR realizations.

UNIT-II	MINIMIZATION OF BOOLEAN FUNCTIONS	Classes: 12

Karnaugh Map Method –Two variable K-Map,3-variable K-Map,4 variable K-Map, Five Variable K-Map, Don't Care Map Entries, Sum of Products, Product of Sums, Tabular Method.

Combinational Logic Circuits: Adders, Subtractors, Comparators, Multiplexers, Demultiplexers, Encoders, Decoders and Code converters, Hazards and Hazard Free Relations.

UNIT-III	SEQUENTIAL CIRCUITS	Classes: 12

Sequential Circuits Fundamentals: Basic Architectural Distinctions between Combinational and Sequential circuits, SR Latch, Flip Flops: SR, JK, JK Master Slave, D and T Type Flip Flops, Excitation Table of all Flip Flops, Timing and Triggering Consideration, Conversion from one type of Flip-Flop toanother.

Registers and Counters: Shift Registers – Left, Right and Bidirectional Shift Registers, Applications of Shift Registers - Design and Operation of Ring and Twisted Ring Counter, Operation of Asynchronous and Synchronous Counters.

UNIT-IV	SEQUENTIAL MACHINES	Classes:12

Sequential Machines: Finite State Machines, Synthesis of Synchronous Sequential Circuits- Serial Binary Adder, Sequence Detector, Parity-bit Generator, Synchronous Modulo N –Counters. Finite state machine-capabilities and limitations, Mealy and Moore models.

UNIT-V	REALIZATION OF LOGIC GATES USING DIODES & TRANSISTORS	Classes: 12

AND, OR and NOT Gates using Diodes and Transistors, DCTL, RTL, DTL, TTL, CML and CMOS Logic Families and its Comparison, Classification of Integrated circuits, comparison of various logic families, standard TTL NAND Gate- Analysis & characteristics, TTL open collector O/Ps, Tristate TTL, MOS & CMOS open drain and tri- state outputs, CMOS transmission gate, IC interfacing- TTL driving CMOS & CMOS driving TTL.

TEXT BOOKS

1. Digital Design- Morris Mano, PHI, 4th Edition,2006
2. Introduction to Switching Theory and Logic Design – Fredriac J. Hill, Gerald R. Peterson, 3rd Ed, John Wiley & Sons Inc.
3. Fundamentals of Logic Design- Charles H. Roth, Cengage Learning, 5th, Edition, 2004.

REFERENCE BOOKS

1. Switching and Finite Automata Theory – Zvi Kohavi & Niraj K. Jha, 3rd Edition, Cambridge, 2010.
2. Digital Principles, 3/e, Roger L. Tokheim, Schaum's outline series, 1994.
3. Modern Digital electronics RP Jain 4th Edition, McGraw Hill
4. Switching Theory and Logic Design – A Anand Kumar, PHI, 2013.

WEB REFERENCES

1. http://blog.digitalelectronics.co.in/
2. www.nesoacademy.org/electronics-engineering/digital-electronics/digital
3. https://www.slideshare.net/JournalsPubwwwjourna/international-journal-of-digital-electronics-vol-2-issue-2
4. https://lecturenotes.in/subject/203/switching-theory-and-logic-design-stld
5. http://www.infocobuild.com/education/audio-video-courses/electronics/DigitalCircuitsSystems
6. https://nptel.ac.in/courses/117105080/

E -TEXT BOOKS
1. https://pages.uoregon.edu/rayfrey/DigitalNotes.pdf 2. https://easyengineering.net/fundamentals-of-digital-circuits-by-anand-kumar/
MOOCS COURSE
1. https://www.smartzworld.com/notes/digital-logic-design-dld/ 2. https://swayam.gov.in/courses/1392-digital-circuits-and-systems 3. https://swayam.gov.in/courses/4410-synthesis-of-digital-systems

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

SIGNALS AND SYSYTEMS

II B. TECH- I SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EC304PC	B.Tech	3	1	0	4	30	70	100

COURSE OBJECTIVES

To learn

1. This gives the basics of Signals and Systems required for all Electronics and CommunicationEngineering related courses.
2. To understand the behavior of signal in time and frequency domain
3. To understand the characteristics of LTI systems
4. This gives concepts of Signals and Systems and its analysis using different transform techniques.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Differentiate various signal functions.
2. Represent any arbitrary signal in time and frequency domain.
3. Understand the characteristics of linear time invariant systems.
4. Relate different transform techniques
5. Perform the Sampling, Reconstruction of signals and Correlation of signals.

UNIT-I	SIGNAL ANALYSIS	Classes: 12

Analogy between Vectors and Signals, Orthogonal Signal Space, Signal approximation using Orthogonal functions, Mean Square Error, Closed or complete set of Orthogonal functions, Orthogonality in Complex functions, Classification of Signals and systems, Exponential and Sinusoidal signals, Concepts of Impulse function, Unit Step function, Signum function.

UNIT-II	FOURIER SERIES AND FOURIER TRANSFORMS	Classes: 12

Fourier series: Representation of Fourier series, Continuous time periodic signals, Properties of Fourier Series, Dirichlet's conditions, Trigonometric Fourier Series and Exponential Fourier Series, Complex Fourier spectrum.

Fourier Transforms: Deriving Fourier Transform from Fourier series, Fourier Transform of arbitrary signal, Fourier Transform of standard signals, Fourier Transform of Periodic Signals, Properties of Fourier Transform, Fourier Transforms involving Impulse function and Signum function, Introduction to Hilbert Transform.

UNIT-III	SIGNAL TRANSMISSION THROUGH LINEAR SYSTEMS	Classes: 12

Linear System, Impulse response, Response of a Linear System, Linear Time Invariant(LTI) System, Linear Time Variant (LTV) System, Transfer function of a LTI System, Filter characteristic of Linear System, Distortion less transmission through a system, Signal bandwidth, System Bandwidth, Ideal LPF, HPF, and BPF characteristics, Causality and Paley-Wiener criterion for physical realization, Relationship between Bandwidth and rise time, Convolution and Correlation of Signals, Concept of convolution in Time domain and Frequency domain, Graphical representation of Convolution.

UNIT-IV	LAPLACE TRANSFORMS AND Z-TRANSFORMS	Classes: 12

Laplace Transforms: Laplace Transforms (L.T), Inverse Laplace Transform, Concept of Region of Convergence (ROC) for Laplace Transforms, Properties of L.T, Relation between L.T and F.T of a signal, Laplace Transform of certain signals using waveform synthesis.

Z–Transforms: Concept of Z- Transform of a Discrete Sequence, Distinction between Laplace, Fourier and Z Transforms, Region of Convergence in Z-Transform, Constraints on ROC for various classes of signals, Inverse Z-transform, Properties of Z-transforms.

UNIT-V	SAMPLING THEOREM AND CORRELATION	Classes: 12

Sampling theorem: Graphical and analytical proof for Band Limited Signals, Impulse Sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples, Effect of under sampling –Aliasing, Introduction to Band Pass Sampling.

Correlation: Cross Correlation and Auto Correlation of Functions, Properties of Correlation Functions, Energy Density Spectrum, Parsevals Theorem, Power Density Spectrum, Relation between Autocorrelation Function and Energy/Power Spectral Density Function, Relation between Convolution and Correlation, Detection of Periodic Signals in the presence of Noise by Correlation, Extraction of Signal from Noise by Filtering.

TEXT BOOKS

1. Signals, Systems & Communications - B.P. Lathi, 2013, BSP.
2. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawabi, 2 Ed.

REFERENCE BOOKS

1. Signals and Systems – Simon Haykin and Van Veen, Wiley 2 Ed.,
2. Signals and Systems – A. Rama Krishna Rao, 2008, TMH
3. Fundamentals of Signals and Systems - Michel J. Robert, 2008, MGH International Edition
4. Signals, Systems and Transforms - C. L. Philips, J.M.Parr and Eve A.Riskin, 3 Ed., 2004, PE
5. Signals and Systems – K. Deergha Rao, Birkhauser, 2018.

WEB REFERENCES

1. https://nptel.ac.in/noc/individual_course.php?id=noc19-ee07
2. https://nptel.ac.in/courses/108106075/8
3. https://nptel.ac.in/courses/117105134/13
4. https://nptel.ac.in/courses/117102059/4

E -TEXT BOOKS

1. SIGNALS & SYSTEMS 2nd Edition Paperback – 1 Jul 2017by H Hsu (Author), R Ranjan (Author)
2. Signals and Systems 2nd edition 2nd Edition (English, Paperback, Alan V. Oppenheim, Alan S. Willsky, S. Hamid Nawab)

MOOCS COURSE

1. https://ocw.mit.edu/resources/res-6-007-signals-and-systems-spring-2011/
2. https://www.coursera.org/lecture/dsp/5-3-c-the-sampling-theorem-DcFxD

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

PROBABILITY THEORY AND STOCHASTIC PROCESSES

II B. TECH- I SEMESTER (R20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EC305ES	B.Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

1. This gives basic understanding of random signals and processing
2. Utilization of Random signals and systems in Communications and Signal Processing areas.
3. To know the Spectral and temporal characteristics of Random Process.
4. To Learn the Basic concepts of Noise sources.

COURSE OUTCOMES

Upon completion of the subject, students will be able to compute:

1. Simple probabilities using an appropriate sample space
2. Simple probabilities and expectations from probability density functions (pdfs)
3. Likelihood ratio tests from pdfs for statistical engineering problems.
4. Least -square & maximum likelihood estimators for engineering problems.
5. Mean and covariance functions for simple random processes.

UNIT-I	PROBABILITY & RANDOM VARIABLE	Classes: 9

Probability introduced through Sets and Relative Frequency: Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Joint Probability, Conditional Probability, Total Probability, Bay's Theorem, Independent Events, *Random Variable*- Definition, Conditions for a Function to be a Random Variable, Discrete, Continuous and Mixed Random Variable, Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh, Methods of defining Conditioning Event, Conditional Distribution, Conditional Density and theirProperties.

UNIT-II	OPERATIONS ON SINGLE & MULTIPLE RANDOM VARIABLES – EXPECTATIONS	Classes: 9

Expected Value of a Random Variable, Function of a Random Variable, Moments about the Origin, Central Moments, Variance and Skew, Chebychev's Inequality, Characteristic Function, Moment Generating Function, Transformations of a Random Variable: Monotonic and Non-monotonic Transformations of Continuous Random Variable, Transformation of a Discrete RandomVariable.

Vector Random Variables, Joint Distribution Function and its Properties, Marginal

Distribution Functions, Conditional Distribution and Density – Point Conditioning, Conditional Distribution and Density – Interval conditioning, Statistical Independence. Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem, (Proof not expected). Unequal Distribution, Equal Distributions. Expected Value of a Function of Random Variables: Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variable case, Properties, Transformations of Multiple Random Variables, Linear Transformations of Gaussian RandomVariables.

UNIT-III	RANDOM PROCESSES – TEMPORAL CHARACTERISTICS	Classes: 9

The Random Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, concept of Stationarity and Statistical Independence. First-Order Stationary Processes, Second- Order and Wide-Sense Stationarity, (N-Order) and Strict-Sense Stationarity, Time Averages and Ergodicity, Mean-Ergodic Processes, Correlation-Ergodic Processes, Autocorrelation Function and Its Properties, Cross-Correlation Function and Its Properties, Covariance Functions, Gaussian Random Processes, Poisson Random Process. Random Signal Response of Linear Systems: System Response – Convolution, Mean and Mean-squared Value of System Response, autocorrelation Function of Response, Cross-Correlation Functions of Input and Output.

UNIT-IV	RANDOM PROCESSES – SPECTRAL CHARACTERISTICS	Classes: 9

The Power Spectrum: Properties, Relationship between Power Spectrum and Autocorrelation Function, The Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Spectrum and Cross-Correlation Function. Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Density Spectrums of Input and Output.

UNIT-V	NOISE SOURCES & INFORMATION THEORY	Classes: 9

Resistive/Thermal Noise Source, Arbitrary Noise Sources, Effective Noise Temperature, Noise equivalent bandwidth, Average Noise Figures, Average Noise Figure of cascaded networks, Narrow Band noise, Quadrature representation of narrow band noise & its properties. Entropy, Information rate, Source coding: Huffman coding, Shannon Fano coding, Mutual information, Channel capacity of discrete channel, Shannon-Hartley law; Trade -off between bandwidth and SNR.

TEXT BOOKS

1. Probability, Random Variables & Random Signal Principles - Peyton Z. Peebles, TMH, 4th Edition, 2001.
2. Principles of Communication systems by Taub and Schilling (TMH),2008

REFERENCE BOOKS

1. Random Processes for Engineers-Bruce Hajck, Cambridge unipress,2015
2. Probability, Random Variables and Stochastic Processes – Athanasios Papoulis and S. Unnikrishna Pillai, PHI, 4th Edition, 2002.
3. Probability, Statistics & Random Processes-K. Murugesan, P.Guruswamy, Anuradha Agencies, 3rd Edition, 2003.
4. Signals, Systems & Communications - B.P. Lathi, B.S. Publications, 2003.
5. Statistical Theory of Communication – S.P Eugene Xavier, New Age Publications, 2003

WEB REFERENCES

1. https://nptel.ac.in/courses/111102111/
2. http://nptel.ac.in/courses/106106097
3. http://nptel.ac.in/courses/117106090
4. http://nptel.ac.in/courses/117105085

E -TEXT BOOKS

1. Probability, Statistics And Random Processes-T.Veerarajan, 2nd EditionTata McGraw-Hill Education, 01-Nov-2002 - Engineering.
2. Probability and Random Processes-Geoffrey Grimmett, Publisher by Oxford University Press.
3. Probability, Random Variables, and Random Processes: Theory and Signal Processing Applications 1st Edition, Kindle Edition,by John J. Shynk (Author).

MOOCS COURSE

1. https://lecturenotes.in/subject/473/probability-theory-and-stochastic-processes-ptsp
2. https://www.coursera.org/learn/introductiontoprobability
3. https://ocw.mit.edu/courses/mathematics/18-s096-topics-in-mathematics-with-applications-in-finance-fall-2013/video-lectures/lecture-6-regression-analysis/

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

ELECTRONIC DEVICES AND CIRCUITS LAB

II B. TECH- I SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EC306PC	B.Tech	0	0	2	1	30	70	100

COURSE OBJECTIVES

To learn

1. To observe the characteristics of PN Junction diode & Zener diode.
2. To Understand the concept of Half wave and full wave rectifiers with & without filters
3. To Understand Switching characteristics of Transistor
4. To observe the characteristics of SCR & UJT.
5. To analyze different transistor Biasing characteristics

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Understand the diode and transistor characteristics.
2. Verify the rectifier circuits using diodes and implement them using hardware.
3. Analyze the concepts of SCR and observe its characteristics.
4. Understand the Switching characteristics of Transistor.
5. Observe the Input and output characteristics of CB, CE, and CS configurations.

LIST OF EXPERIMENTS

1. PN Junction diode characteristics A) Forward bias B) Reversebias.
2. Zener diode characteristics and Zener as voltageRegulator
3. Full Wave Rectifier with & withoutfilters
4. Input and output characteristics of BJT in CEConfiguration
5. Input and output characteristics of FE in CSConfiguration
6. Common Emitter AmplifierCharacteristics
7. Common Base AmplifierCharacteristics
8. Common Source amplifierCharacteristics
9. Measurement of h-parameters of transistor in CB, CE, CCconfigurations
10. Switching characteristics of atransistor
11. SCRCharacteristics.
12. Types of Clippers at different referencevoltages
13. Types of Clampers at different referencevoltages
14. The steady state output waveform of clampers for a square waveinput

TEXT BOOKS

1. Electronic Devices and Circuits-Jacob Millman, McGraw Hill Education
2. Electronic Devices and Circuits theory–Robert L. Boylestead, Louis Nashelsky, 11th Edition, 2009, Pearson.

REFERENCE BOOKS

1. The Art of Electronics, Horowitz, 3rd Edition Cambridge University Press
2. Electronic Devices and Circuits, David A. Bell– 5th Edition, Oxford.
3. Pulse, Digital and Switching Waveforms–J. Millman, H.TaubandMothikiS. Prakash Rao, 2 Ed., 2008, McGraw Hill.

WEB REFERENCES

1. https://nptel.ac.in/courses/113/106/113106062/
2. https://nptel.ac.in/courses/113/106/113106065/
3. https://nptel.ac.in/courses/108/108/108108122/

E -TEXT BOOKS

1. Electronic Devices and Circuits, 2nd Edition Jacob Millman and Christos C. Halkias
2. Electronic Devices and Circuits, 2ndEdition David A. Bell.

MOOCS COURSE

1. https://www.edx.org/course/principle-of-semiconductor-devices-part-ii-field-effect-transistors-and-mosfets-2
2. https://www.coursera.org/lecture/electronics/4-1-introduction-to-pn-junctions-xr0ZQ

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

DIGITAL SYSTEM DESIGN LABORATORY

II B. TECH- I SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EC307PC	B. Tech	0	0	2	1	30	70	100

COURSE OBJECTIVES

To learn

1. To understand the use of logic gates and to design basic gates using universal gates
2. To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems
3. To understand the concepts and design techniques of combinational logic circuits
4. To understand the concepts and design techniques of sequential logic circuits

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. **Design** and Realization of Boolean Expressions using logic gates
2. **Understand** how to generate different logic gates using Universal gates
3. **Design** of clock generator using NAND/NOR gates
4. **Analyze** and design combinational circuit like Adder/Subtractor , Comparators, MUX etc.
5. **Design** and develop sequential circuits like Shift Registers, Counters and understand memory elements

LIST OF EXPERIMENTS

1. Realization of Boolean Expressions usingGates
2. Design and realization logic gates using universalgates
3. Generation of clock using NAND / NORgates
4. Design a 4 – bit Adder /Subtractor
5. Design and realization of a 4 – bit gray to Binary and Binary to GrayConverter
6. Design and realization of an 8 bit parallel load and serial out shift register usingflip-flops.
7. Design and realization of a Synchronous and Asynchronous counter usingflip-flops
8. Design and realization of Asynchronous counters usingflip-flops
9. Design and realization of 8x1 MUX using 2x1MUX
10. Design and realization of 4 bitcomparator
11. Design and Realization of a sequence detector-a finite statemachine

TEXT BOOKS

1. Digital Design- Morris Mano, PHI, 4th Edition,2006
2. Introduction to Switching Theory and Logic Design – Fredriac J. Hill, Gerald R. Peterson, 3rd Ed, John Wiley & Sons Inc.
3. Fundamentals of Logic Design- Charles H. Roth, Cengage Learning, 5th, Edition, 2004.

REFERENCE BOOKS

1. Switching and Finite Automata Theory – Zvi Kohavi & Niraj K. Jha, 3rd Edition, Cambridge, 2010.
2. Digital Principles, 3/e, Roger L. Tokheim, Schaum's outline series, 1994.
3. Modern Digital electronics RP Jain 4th Edition, McGraw Hill
4. Switching Theory and Logic Design – A Anand Kumar, PHI, 2013.

WEB REFERENCES

1. http://blog.digitalelectronics.co.in/
2. www.nesoacademy.org/electronics-engineering/digital-electronics/digital
3. https://www.slideshare.net/JournalsPubwwwjourna/international-journal-of-digital-electronics-vol-2-issue-2
4. https://lecturenotes.in/subject/203/switching-theory-and-logic-design-stld
5. http://www.infocobuild.com/education/audio-video-courses/electronics/DigitalCircuitsSystems
6. https://nptel.ac.in/courses/117105080/

E -TEXT BOOKS

1. https://pages.uoregon.edu/rayfrey/DigitalNotes.pdf
2. https://easyengineering.net/fundamentals-of-digital-circuits-by-anand-kumar/

MOOCS COURSE

1. https://www.smartzworld.com/notes/digital-logic-design-dld/
2. https://swayam.gov.in/courses/1392-digital-circuits-and-systems
3. https://swayam.gov.in/courses/4410-synthesis-of-digital-systems

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

BASIC SIMULATION LABORATORY

II B. TECH- I SEMESTER (R20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EC308ES	B.Tech	0	0	2	1	30	70	100

COURSE OBJECTIVES

To learn

1. This gives the basics of Signals and Systems required for all Electronics and Communication Engineering related courses.
2. To understand the behavior of signal in time and frequency domain
3. To understand the characteristics of LTI systems
4. This gives concepts of Signals and Systems and its analysis using different transform techniques.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. **Understand** Basics of MATLAB syntax, functions and programming and Analyze the generation Various Signals and Sequences in MATLAB, including the operations on Signals and Sequences.
2. **Analyze** the Fourier Transform of a given signal and plotting its magnitude and phase spectrum and Sampling Theorem.
3. **Determine** the Convolution and Correlation between Signals and sequences and Verification of Linearity and Time Invariance Properties of a given Continuous/Discrete System.
4. **Understand** the Waveform Synthesis using Laplace Transform and Remember for Locating the Zeros and Poles and plotting the Pole-Zero maps in S-plane and Z-Plane for the given transfer function.
5. **Verification** of Weiner-Khinchine Relations and random processes for stationary in wide-sense.

LIST OF EXPERIMENTS

1. Basic Operations onMatrices.
2. Generation of Various Signals and Sequences (Periodic and Aperiodic), such as Unit Impulse, Unit Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp,Sinc.
3. Operations on Signals and Sequences such as Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and AveragePower.
4. Finding the Even and Odd parts of Signal/Sequence and Real and Imaginary parts ofSignal.
5. Convolution for Signals andsequences.
6. Auto Correlation and Cross Correlation for Signals andSequences.
7. Verification of Linearity and Time Invariance Properties of a given Continuous/Discrete System.
8. Computation of Unit sample, Unit step and Sinusoidal responses of the given LTI system and verifying its physical realiazability and stabilityproperties.
9. Gibbs PhenomenonSimulation.
10. Finding the Fourier Transform of a given signal and plotting its magnitude and phase spectrum.
11. Waveform Synthesis using LaplaceTransform.
12. Locating the Zeros and Poles and plotting the Pole-Zero maps in S-plane and Z-Plane for the given transferfunction.
13. Generation of Gaussian noise (Real and Complex), Computation of its mean, M.S. Value and its Skew, Kurtosis, and PSD, Probability DistributionFunction.
14. Verification of SamplingTheorem.
15. Removal of noise by Autocorrelation / Crosscorrelation.
16. Extraction of Periodic Signal masked by noise usingCorrelation.
17. Verification of Weiner-KhinchineRelations.
18. Checking a Random Process for Stationarity in Widesense.

TEXT BOOKS

1. Signals, Systems & Communications - B.P. Lathi, 2013, BSP.
2. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawabi, 2 Ed.

REFERENCE BOOKS

1. Signals and Systems – Simon Haykin and Van Veen, Wiley 2 Ed.,
2. Signals and Systems – A. Rama Krishna Rao, 2008, TMH
3. Fundamentals of Signals and Systems - Michel J. Robert, 2008, MGH International Edition
4. Signals, Systems and Transforms - C. L. Philips, J.M.Parr and Eve A.Riskin, 3 Ed., 2004, PE
5. Signals and Systems – K. Deergha Rao, Birkhauser, 2018.

WEB REFERENCES

1. https://nptel.ac.in/noc/individual_course.php?id=noc19-ee07
2. https://nptel.ac.in/courses/108106075/8
3. https://nptel.ac.in/courses/117105134/13
4. https://nptel.ac.in/courses/117102059/4

E -TEXT BOOKS

1. SIGNALS & SYSTEMS 2nd Edition Paperback – 1 Jul 2017by H Hsu (Author), R Ranjan (Author)
2. Signals and Systems 2nd edition 2nd Edition (English, Paperback, Alan V. Oppenheim, Alan S. Willsky, S. Hamid Nawab)

MOOCS COURSE

1. https://ocw.mit.edu/resources/res-6-007-signals-and-systems-spring-2011/
2. https://www.coursera.org/lecture/dsp/5-3-c-the-sampling-theorem-DcFxD

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

CONSTITUTION OF INDIA

II B. TECH- I SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
*CI309MC	B.Tech	3	0	0	0	100	-	100

COURSE OBJECTIVES

To learn

1. Sovereign -independent to conduct internal as well as external affairs
2. Socialist - preventing concentration of wealth into few hands
3. Secular - respecting all religions equally
4. Democratic- government by the people, of the people, for the people
5. Republic - Head of the state will be elected not hereditary

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. To understand the basic concepts of democracy, republicanism, constitutionalism and to know about the constitutional theories, virtues and constitutional interpretation
2. To study and analyze the quasi-federal nature of Indian Constitution and the basic function of a written constitution regarding the allocation of State power, the functions, powers and limits of the organs of state
3. To analyze elaborately regarding the emergency and amendment procedures; the need for granting of special status or special provisions to some states
4. To know about Panchayats, Municipalities, Scheduled and Tribal areas

UNIT-I	INTERDUCTION TO INDIAN CONSTITUTION	Classes: 9

1. Meaning and importance of Constitution
2. Making of Indian Constitution
3. Salient features and the Preamble
4. Fundamental rights
5. Fundamental duties
6. Directive Principles

UNIT-II	THE AMENDMENT OF THE CONSTITUTION	Classes: 8

1. Need for Amendment
2. Types of Amendment
3. Judicial Review of Constituent Power

4. Doctrine of Basic Structure
5. Major Amendments and their Constitutional Values

UNIT-III	UNION & STATE EXECUTIVE AND LEGISLATURE	Classes:10

1. Lok Sabha & Rajya Sabha (Composition, Powers & Functions)
2. President & Prime Minister (Powers,Functions, position)
3. Supreme Court-Composition, Powers & Functions
4. The President: Powers, Functions and Procedure for Impeachment
5. Judicial Review of Presidents Actions
6. Governor: Powers, Functions
7. Legislative Power of the Executive – Ordinance
8. Parliament and State Legislature
9. Privileges of Legislature
10. Council of Ministers - Prime Minister

UNIT-IV	MAJOR FUNCTIONARIES & EMERGENCY POWERS	Classes: 8

1. Union Public Service Commission
2. Election Commission
3. Planning Commission (NITI)
4. Significance of Emergency Powers
5. National Emergency – Grounds – Suspension of Fundamental Rights
6. State Emergency – Grounds – Judicial Review
7. Financial Emergency

UNIT-V	INDIAN JUDICIARY	Classes: 10

1. Supreme Court of India – Appointment of Judges – Composition
2. Jurisdiction: Original, Appellate and Writ Jurisdiction
3. Prospective Overruling and Judge - Made Laws in India (Art. 141)
4. Review of Supreme Court Decision
5. High Courts – Judges - Constitution
6. Jurisdiction: Original, Appellate, Writ Jurisdiction and Supervisory Jurisdiction

TEXT BOOKS

1. H.M. Seervai: Constitutional Law of India
2. M.P. Jain: Indian Constitutional Law
3. Mahendra P. Singh: V. N. Shukla's Constitution of India
4. Granville Austin: The Indian Constitution: Cornerstone of a Nation
5. D.D. Basu: Shorter Constitution of India

REFERENCE BOOKS
1. An Introduction to the Constitution of India by Dr.Durga Das Basu 2. An Introduction to the Constitution of India by M.V.Pylee 3. Indian Constitutional Law by M.P. Jain
WEB REFERENCES
1. http://www.wdl.org/en/item/2672/ 2. https://nptel.ac.in/courses/109103135/24
E -TEXT BOOKS
1. https://iasexamportal.com/ebook/the-constitution-of-india 2. https://www.india.gov.in/my-government/documents/e-books
MOOCS COURSE
1. http://nludelhi.ac.in/images/moocs/moocs-courses.pdf 2. https://www.classcentral.com/tag/constitutional-law

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

TRANSFORMATIONS, COMPLEX VARIABLES AND NUMERICAL TECHNIQUES

II B.TECH- II SEMESTER (R20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
MA401BS	B.Tech	3	1	0	4	30	70	100

COURSE OBJECTIVES

To learn

1. The Laplace transforms and inverse Laplace transform of a given function using shifting theorems
2. How to determine the Fourier coefficients for various functions in a given period
3. The nature of theFourierintegral
4. The Evaluation of integrals using Cauchy'sintegralformulaand Cauchy'sresidue theorem
5. The concept of numerical solutions of ordinary differential equations to the real-world problems of physics, biology and electrical circuits

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Understand the concept of Laplace transforms to the real-world problems of electrical circuits, harmonic oscillators,optical devices, and mechanical systems
2. Estimate the value for the given data using interpolation and Find the numerical solutions for a given ordinary differential equations
3. Define Differentiation and integration of complex valued functions
4. Analyze thecomplexfunctionwithreference totheir analyticity,integrationusing Cauchy'sintegral and residue theorems
5. Apply numerical methods to obtain approximate solutions to Taylors, Eulers, Modified Eulers and Runge-Kutta methods of ordinary differential equations

UNIT-I	LAPLACE TRANSFORMS	Classes: 12

Laplace Transforms: Laplace Transforms of Standard Functions, Shifting Theorems, Derivatives and Integrals, Properties (Without Proof),Unit Step Function, Dirac's Delta Function, Periodic Function. Inverse Laplace Transforms: Convolution Theorem (Without Proof).Applications: Solving Ordinary Differential Equations (Initial Value Problems) Using Laplace Transforms.

UNIT-II	COMPLEX VARIABLES (DIFFERENTIATION)	Classes: 14

Limit,Continuity and Differentiation of Complex functions, Analyticity,Cauchy-Riemann equations (withoutproof), finding harmonic conjugate; elementary analytic functions (exponential,trigonometric, logarithm) and their properties.

UNIT-III	COMPLEX VARIABLES (INTEGRATION)	Classes: 12
Lineintegral, Cauchy's theorem, Cauchy's Integral formula, Zeros of analytic functions, Singularities, Taylor's series, Laurent's series; Residues, Cauchy Residue theorem.		
UNIT-IV	**NUMERICAL METHODS – I**	**Classes: 12**
Solution of polynomial and transcendental equations – Bisection method, Iteration Method, Newton- Raphson method and Regula-Falsi method. Finite differences- forward differences- backward differences-central differences-symbolic relations and separation of symbols; Interpolation using Newton's forward and backward difference formulae. Central difference interpolation: Gauss's forward and backward formulae; Lagrange's method of interpolation.		
UNIT-V	**NUMERICAL METHODS–II**	**Classes: 12**
Numerical Integration: Trapezoidal Rule, Simpson's 1/3rd Rule and 3/8 Rules. Numerical Solution of Ordinary Differential Equations: Taylor's Series, Picard's Method, Euler and Modified Euler's Methods; Runge-Kutta Method of fourth order.		

TEXT BOOKS

1. Advanced Engineering Mathematics by Kreyszig, John Wiley &Sons
2. Higher Engineering Mathematics By Dr.B.S Grewal, Khanna Publishers
3. Churchill R.V., "Complex Variable and its Applications", McGraw Hill, New York, 9th edition 2013.

REFERENCE BOOKS

1. Mathematical Methods by T.K.V.Iyengar, B.Krishna Gandhi & Others, S.Chand
2. Introductory Methods by Numerical Analysis By S.S.Sastry, PHI Learning Pvt. Ltd

WEB REFERENCES

1. https://www.efunda.com/math/laplace_transform/index.cfm
2. https://www.efunda.com/math/fourier_transform/index.cfm
3. https://www.efunda.com/math/complex_numbers/complex.cfm

E -TEXT BOOKS

1. https://www.e-booksdirectory.com/details.php?ebook=10602
2. https://www.e-booksdirectory.com/details.php?ebook=4708

MOOCS COURSE

1. https://swayam.gov.in/
2. https://swayam.gov.in/NPTEL

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

ELECTROMAGNETIC FIELDS AND WAVES

II B. TECH- II SEMESTER (R20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EC402PC	B.Tech	3	0	0	3	30	70	100

To learn

1. To learn the Basic Laws, Concepts and proofs related to Electrostatic Fieldsand Magneto static Fields, and apply them to solve physics and engineeringProblems.
2. To distinguish between static and time-varying fields, and understand thesignificance and utility of Maxwell's Equations and Boundary Conditions, andGain ability to provide solutions to communication engineering problems.
3. To analyze the characteristics of Uniform Plane Waves (UPW), determine theirpropagation parameters and estimate the same for dielectric and dissipativeMedia.
4. To conceptually understand the UPW Polarization features and PoyntingTheorem, and apply them for practical problems.
5. To determine the basic Transmission Line Equations and telephone lineparameters and estimate the distortions present and to understand the concepts of RF Lines and their characteristics, Smith Chart and its applications, acquire knowledge to configure circuit elements.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Get the knowledge of Basic Laws, Concepts and proofs related to Electrostatic Fields and Magnetostatic fields
2. Distinguish between the static and time-varying fields, establish the Corresponding sets of Maxwell's Equations and Boundary Conditions, and usethem forsolving engineering problems knowthe characteristics of various components.
3. Analyze the Wave Equations for good conductors and good dielectrics, and evaluate the UPW Characteristics for several practical media of interest understand the utilization of components.
4. Estimate the polarization features, reflection andtransmission coefficients for UPW propagation, distinguish between Brewsterand Critical Angles, and acquire knowledge of their applications.Understand the biasing techniques.
5. Analyze the RF Line features and configure them as SC, OC Lines, QWTs andHWTs, and design the same for effective impedance transformation.Study the Smith Chart profile and stub matching features.

UNIT-I	ELECTROSTATICS	Classes: 12

Coulomb's Law, Electric Field Intensity – Fields due to Different Charge Distributions, Electric Flux Density, Gauss Law and Applications, Electric Potential, Relations Between E and V, Maxwell's Two Equations for Electrostatic Fields, Energy Density. Convection and Conduction Currents, Dielectric Constant, Isotropic and Homogeneous Dielectrics, Continuity Equation, Relaxation Time, Poisson's and Laplace's Equations, Capacitance – Parallel Plate, Coaxial, Spherical Capacitors.

UNIT-II	MAGNETOSTATICS	Classes: 12

Biot-Savart's Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Maxwell's Two Equations for Magnetostatic Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Ampere's Force Law.

UNIT-III	MAXWELL'S EQUATIONS (TIME VARYING FIELDS)	Classes: 12

Faraday's Law and Transformer EMF, Inconsistency of Ampere's Law and Displacement Current Density, Maxwell's Equations in Different Forms, Conditions at a Boundary Surface - Dielectric-Dielectric and Dielectric-Conductor Interfaces.

UNIT-IV	EM WAVE CHARACTERISTICS	Classes: 12

Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves – Definitions, Relation between E & H, Sinusoidal Variations, Wave Propagation in Lossless and Conducting Media, Conductors & Dielectrics – Characterization, Wave Propagation in Good Conductors and Good Dielectrics, Polarization.

Reflection and Refraction of Plane Waves – Normal and Oblique Incidences for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection, Surface Impedance, Poynting Vector and Poynting Theorem.

UNIT-V	WAVEGUIDES	Classes: 12

Electromagnetic Spectrum and Bands. Rectangular Waveguides – Solution of Wave Equations in Rectangular Coordinates, TE/TM mode analysis, Expressions for Fields, Characteristic Equation and Cut-off Frequencies, Dominant and Degenerate Modes, Sketches of TE and TM mode fields in the cross-section, Phase and Group Velocities, Wavelengths and Impedance Relations, Equation of Power Transmission, Impossibility of TEM Mode. Microstrip Lines – Z_oRelations, Effective DielectricConstant.

TEXT BOOKS

1. Principles of Electromagnetics – Matthew N.O. sadiku and S.V. Kulkarni, 6th Ed., Oxford University Press, Aisan Edition, 2015.
2. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, 2nd Ed. 2000, PHI.
3. Transmission Lines and Networks – UmeshSinha, SatyaPrakashan, 2001, (Tech. India Publications), New Delhi

REFERENCE BOOKS

1. Engineering Electromagnetics – Nathan Ida, 2nd Ed., 2005, Springer (India) Pvt. Ltd., New Delhi
2. Networks, Lines and Fields– John D. Ryder, 2nd Ed., 1999,PHI.

3. Engineering Electromagnetics – William H. Hayt Jr. and John A. Buck, 7th Ed., 2006, MC GRAW HILL EDUCATION

WEB REFERENCES

1. https://nptel.ac.in/courses/108/106/108106073/
2. https://nptel.ac.in/courses/108/104/108104087/
3. https://nptel.ac.in/courses/117/103/117103065/

E -TEXT BOOKS

1. Principles of Electromagnetics – Matthew N.O. sadiku and S.V. Kulkarni, 6th Ed., Oxford University Press, Aisan Edition, 2015
2. Electromagnetics and Applications- David H. Staelin

MOOCS COURSE

1. https://ocw.mit.edu/courses/physics/8-311-electromagnetic-theory-spring-2004/
2. https://www.mooc-list.com/tags/electromagnetic-field

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

ANALOG AND DIGITAL COMMUNICATIONS

II B. TECH- II SEMESTER (R20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EC403PC	B.Tech	3	1	0	4	30	70	100

COURSE OBJECTIVES

1. To develop ability to analyze system requirements of analog communicationsystems.
2. To understand the need formodulation.
3. To understand the generation, detection of various analog modulation techniques and also perform the mathematical analysis associated with thesetechniques.
4. To acquire knowledge to analyze the noise performance of analog modulation techniques.
5. To acquire theoretical knowledge of each block in AM and FMreceivers.
6. To understand the pulse modulationtechniques.

COURSEOUTCOMES

Upon successful completion of the course, the student is able to

1. Able to analyze and design various modulation and demodulation analogsystems.
2. Understand the characteristics of noise present in analogsystems.
3. Studyofsignal to NoiseRatio (SNR) performance,ofvariousAnalog Communicationsystems.
4. Analyze and design the various Pulse ModulationSystems.
5. Understand the concepts of Multiplexing: Time Division Multiplexing (TDM) and Frequency Division Multiplexing(FDM).

UNIT-I	AMPLITUDE MODULATION	Classes: 12

Need for modulation, Amplitude Modulation - Time and frequency domain description, single tone modulation, power relations in AM waves, Generation of AM waves - Switching modulator, Detection of AM Waves - Envelope detector, DSBSC modulation - time and frequency domain description, Generation of DSBSC Waves - Balanced Modulators, Coherent detection of DSB-SC Modulated waves, COSTAS Loop, SSB modulation - time and frequency domain description, frequency discrimination and Phase discrimination methods for generating SSB, Demodulation of SSB Waves, principle of Vestigial side bandmodulation

UNIT-II	ANGLE MODULATION	Classes: 12

Basic concepts of Phase Modulation, Frequency Modulation: Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave using Bessel functions, Narrow band FM, Wide band FM, Constant Average Power, Transmission bandwidth of FM Wave - Generation of FM Signal- Armstrong Method, Detection of FM Signal: Balanced slope detector, Phase locked loop, Comparison of FM and AM., Concept of Pre-emphasis andde-emphasis.

UNIT-III	TRANSMITTERS AND RECEIVERS	Classes: 12

Transmitters: Classification of Transmitters, AM Transmitters, FM Transmitters
Receivers: Radio Receiver - Receiver Types - Tuned radio frequency receiver, Superhetrodyne receiver, RF section and Characteristics - Frequency changing and tracking, Intermediate frequency, Image frequency, AGC, Amplitude limiting, FM Receiver, Comparison of AM and FM Receivers.

UNIT-IV	PULSE MODULATION	Classes: 12

Pulse Modulation: Types of Pulse modulation- PAM, PWM and PPM. Comparison of FDM and TDM. Pulse Code Modulation: PCM Generation and Reconstruction, Quantization Noise, Non-Uniform Quantization and Companding, DPCM, Adaptive DPCM, DM and Adaptive DM, Noise in PCM and DM.

UNIT-V	DIGITAL MODULATION TECHNIQUES	Classes: 12

Digital Modulation Techniques: ASK- Modulator, Coherent ASK Detector, FSK- Modulator, Non- Coherent FSK Detector, BPSK- Modulator, Coherent BPSK Detection. Principles of QPSK, Differential PSK andQAM.
Baseband Transmission and Optimal Reception of Digital Signal: A Baseband Signal Receiver, Probability of Error, Optimum Receiver, Coherent Reception, ISI, Eye Diagrams.

TEXT BOOKS

1. Analog and Digital Communications – Simon Haykin, John Wiley,2005.
2. Electronics Communication Systems-Fundamentals through Advanced-Wayne Tomasi, 5th Edition, 2009, PHI.

REFERENCE BOOKS

1. Principles of Communication Systems - Herbert Taub, Donald L Schilling, Goutam Saha, 3rd Edition, McGraw-Hill,2008.
2. Electronic Communications – Dennis Roddy and John Coolean , 4th Edition , PEA,2004
3. Electronics & Communication System – George Kennedy and Bernard Davis, TMH2004
4. Analog and Digital Communication – K. Sam Shanmugam, Willey,2005

WEB REFERENCES

1. https://nptel.ac.in/courses/117/105/117105143/
2. https://nptel.ac.in/courses/117/102/117102059/
3. https://nptel.ac.in/courses/117/108/117108107/

E -TEXT BOOKS
1. Analog Communications 4th Edition by Anand Kumar Person Publication. 2. Communication Systems by MIllman & Taub, TMH, 3rd Edition.
MOOCS COURSE
1. https://swayam.gov.in/nd1_noc19_ee46 2. https://www.coursera.org/learn/c-plus-plus-a

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

LINEAR IC APPLICATIONS

II B. TECH- II SEMESTER (R20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EC404PC	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

To learn

1. To introduce the basic building blocks of linear integrated circuits.
2. To introduce the theory and applications of analog multipliers and PLL
3. To teach the linear and non - linear applications of operational amplifiers.
4. To introduce the theory and applications of 555 timer and PLL.
5. To teach the theory of ADC and DAC.
6. To introduce the concepts of waveform generation and introduce some special function ICs.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. A thorough **understanding** of operational amplifiers with linear integrated circuits.
2. To **design** circuits using operational amplifiers for various applications and to study different kinds of voltage regulators.
3. To **analyze** different active filters and to introduce the concepts of waveform generation, oscillators
4. To develop the **knowledge** in functional diagrams and applications using linear ICs like 555, 565 and to study oscillators.
5. To develop the knowledge in data convertersand**Evaluate** the specifications of ADCs and DACs.

UNIT-I	INTEGRATEDCIRCUITS	Classes: 12

Classification, chip size and circuit complexity, Basic information of Op-Amp, Introduction to ideal and practical Op-Amp, Block Diagram of Op-Amp internal circuits, Op-Amp characteristics, DC and AC Characteristics, 741 Op-Amp and its features, modes of operation-inverting, non-inverting, differential.

UNIT-II	OP-AMP AND APPLICATIONS:	Classes: 12

Basic information of Op-amp, AC amplifier, V to I and I to V converters, Sample & Hold circuits, Multipliers and Dividers, Differentiators and Integrators, Comparators, Schmitt Trigger, Instrumentation Amplifier, Multi Vibrators, Introduction to Voltage Regulators, features of 723

UNIT-III	ACTIVE FILTERS & OSCILLATORS:	Classes: 12
Introduction, 1st order LPF, HPF filters, Band Pass, Band Reject and All Pass filters. Oscillator types and principle of operation - RC, Wien and Quadrature type, Waveform generators - Triangular, Saw tooth, Square Wave and VCO.		
UNIT-IV	**TIMERS & PHASE LOCKED LOOPS:**	**Classes: 12**
Introduction to 555 Timer, functional diagram, Mono Stable and Astable Operations of 555 Timer, Schmitt Trigger. PLL - introduction, block schematic, principles and description of individual blocks of 565.		
UNIT-V	**D-A AND A-D CONVERTERS:**	**Classes: 12**
Introduction, Basic DAC techniques, Weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, and IC 1408 DAC, Different types of ADCs - Parallel Comparator type ADC, Counter type ADC, Successive Approximation ADC, Dual Slope Integration type ADC, DAC and ADC Specifications.		

TEXT BOOKS

1. Linear Integrated Circuits, D. Roy Chowdhury, New Age International (p) Ltd.
2. Op-Amps & Linear ICs, Ramakanth A. Gayakwad, PHI

REFERENCE BOOKS

1. Operational Amplifiers & Linear Integrated Circuits, R.F. Coughlin & Fredrick F. Driscoll, PHI.
2. Operational Amplifiers & Linear Integrated Circuits: Theory & Applications, Denton J. Daibey, TMH.
3. Design with Operational Amplifiers & Analog Integrated Circuits, Sergio Franco, McGraw Hill.
4. Digital Fundamentals - Floyd and Jain, Pearson Education.

WEB REFERENCES

1. https://nptel.ac.in/courses/117/106/108106105/
2. https://nptel.Ac.In/Courses/117103063/26

E -TEXT BOOKS

1. https://open.umn.edu/opentextbooks/textbooks/574
2. https://books.google.co.in/books/about/Linear_Integrated_Circuits.html?id=-zAe0P33BAcC

MOOCS COURSE

1. https://www.electronics-tutorials.ws/waveforms/555_timer.htm
2. https://circuitdigest.com/article/555-timer-ic

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

ELECTRONIC CIRCUIT ANALYSIS

II B. TECH- II SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EC405PC	B.Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

1. Learn the concepts of high frequency analysis oftransistors
2. To give understanding of various types of amplifier circuits such as small signal,
3. To give understanding of cascaded
4. To give understanding large signal and tunedamplifiers.
5. To familiarize the Concept of feedback in amplifiers so as to differentiate between negative and positivefeedback

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Design the multistage amplifiers.
2. Understand the concepts of High Frequency Analysis of Transistors.
3. Utilize the Concepts of negative feedback to improve the stability of amplifiers
4. Design positive feedback to generate sustainedoscillations
5. Design and realize different classes of Power Amplifiers and tuned amplifiers useable for audio and Radioapplications.

UNIT-I	MULTISTAGE AMPLIFIERS & TRANSISTOR AT HIGH FREQUENCY	Classes: 12

Multistage Amplifiers: Classification of Amplifiers, Distortion in amplifiers, Different coupling schemes used in amplifiers, Frequency response and Analysis of multistage amplifiers, Cascade RC Coupled amplifiers, Cascode amplifier, Darlingtonpair. Transistor at High Frequency: Hybrid - model of Common Emitter transistor model, fα, fβ and unity gain bandwidth, Gain-bandwidth product.

UNIT-II	FEEDBACK AMPLIFIERS	Classes: 12

Feedback Amplifiers: Concepts of feedback – Classification of feedback amplifiers – General characteristics of Negative feedback amplifiers – Effect of Feedback on Amplifier characteristics – Voltage series, Voltage shunt, Current series and Current shunt Feedback configurations – Simple problems.

UNIT-III	OSCILLATORS	Classes: 12

Oscillators: Condition for Oscillations, RC type Oscillators-RC phase shift and Wien-bridge Oscillators, LC type Oscillators –Generalized analysis of LC Oscillators, Hartley and Colpitts Oscillators, Frequency and amplitude stability of Oscillators, Crystal Oscillator.

UNIT-IV	LARGE SIGNAL AMPLIFIERS	Classes: 12

Large Signal Amplifiers: Class A Power Amplifier- Series fed and Transformer coupled, Conversion Efficiency, Class B Power Amplifier- Push Pull and Complimentary Symmetry configurations, Conversion Efficiency, Principle of operation of Class AB and Class –C Amplifiers.

Tuned Amplifiers: Introduction, single Tuned Amplifiers – Q-factor, frequency response of tuned amplifiers, Concept of stagger tuning and synchronous tuning.

UNIT-V	MULTIVIBRATORS	Classes: 12

Analysis and Design of Bistable, Monostable, Astable Multivibrators and Schmitt trigger using Transistors.

Time Base Generators: General features of a Time base Signal, Methods of Generating Time Base Waveform, concepts of Transistor Miller and Bootstrap Time Base Generator, Methods of Linearity improvement.

TEXT BOOKS

1. Integrated Electronics, Jacob Millman, Christos C Halkias, McGraw HillEducation.
2. Electronic Devices Conventional and current version -Thomas L. Floyd 2015,Pearson.

REFERENCE BOOKS

1. Electronic Devices and Circuits, David A. Bell – 5th Edition,Oxford.
2. Electronic Devices and Circuits theory– Robert L. Boylestead, Louis Nashelsky, 11th Edition, 2009,Pearson

WEB REFERENCES

1. https://nptel.ac.in/courses/108/106/108106105/
2. https://nptel.ac.in/courses/117/105/117105147/
3. https://nptel.ac.in/courses/117/108/117108047/
4. http://www.chipcenter.com/power/powaarch.htm
5. http://www.amasci.com/amateur/elehob.html

E -TEXT BOOKS

1. Circuit Analysis by John E. Whitehouse, Horwood Engineering Science Series
2. Analog Circuits, Edited by Yuping Wu

MOOCS COURSE
1. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-002-circuits-and-electronics-spring-2007/video-lectures/lecture-9-part-1/ 2. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-002-circuits-and-electronics-spring-2007/video-lectures/lecture-10/ 3. https://www.coursera.org/learn/linear-circuits-ac-analysis

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

ANALOG AND DIGITAL COMMUNICATIONS LAB

II B. TECH- II SEMESTER (R20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EC406PC	B.Tech	0	0	3	1.5	30	70	100

COURSE OBJECTIVES

1. This gives the basics of communications required for all Electronics and Communication Engineering related courses.
2. To understand the behavior of Analog and Pulse Modulations.
3. To understand the characteristics of AGC, Time & Frequency Division Multiplexing.
4. To Verify the Sampling Theorem
5. To Understand Frequency Synthesizer & PLL as FM Demodulator

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. **Understand** Basics of MATLAB syntax, functions and programming and Analyze the generation Analog Modulations in MATLAB.
2. **Analyze** the Fourier Transform of a given signal and plotting its magnitude spectrum of Time & Frequency Multiplexing.
3. **Determine** the differences between Time & Frequency domain between Signals Amplitude & Frequency Spectrum.
4. **Understand** the Waveform of Frequency Synthesizers and PLL Operations
5. **Verification** of Sampling Theorem in Time Domain.

LIST OF EXPERIMENTS

1. (i) Amplitude modulationand demodulation (ii) Spectrum analysis ofAM
2. (i) Frequency modulationand demodulation (ii) Spectrum analysis ofFM
3. DSB-SC Modulator &Detector
4. SSB-SC Modulator & Detector (Phase ShiftMethod)
5. Frequency Division Multiplexing & Demultiplexing
6. Pulse Amplitude Modulation &Demodulation
7. Pulse Width Modulation &Demodulation
8. Pulse Position Modulation &Demodulation
9. PCM Generation and Detection
10. DeltaModulation
11. Frequency Shift Keying: Generation andDetection
12. Binary Phase Shift Keying: Generation andDetection
13. Generation and Detection (i) DPSK (ii)QPSK

TEXT BOOKS

1. Communication Systems by Simon Haykins John Wiley & Sons, 4th Edition.
2. Electronics & Communication System – George Kennedy and Bernard Davis, McGraw Hill Education 2004.

REFERENCE BOOKS

1. Communication theory, thomas,2 edition, McGraw-Hill Education
2. Communication Systems, 2E, R. P. Singh, S. D. Sapre, McGraw-Hill Education, 2008.
3. Analog and Digital Communication – K. Sam Shanmugam, Willey, 2005
4. Electronics Communication Systems- Wayne Tomasi, 6th Edition, Person 2009.

WEB REFERENCES

1. https://nptel.ac.in/courses/117/105/117105143/
2. https://nptel.ac.in/courses/117/102/117102059/
3. https://nptel.ac.in/courses/117/108/117108107/
4. https://nptel.ac.in/courses/117/105/117105143/

E -TEXT BOOKS

1. Analog Communications 4th Edition by Anand Kumar Person Publication.
2. Communication Systems by MIllman & Taub, TMH, 3rd Edition.

MOOCS COURSE

1. https://swayam.gov.in/nd1_noc19_ee46
2. https://www.coursera.org/learn/c-plus-plus-a

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

IC APPLICATIONS LAB

II B. TECH- II SEMESTER (R20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EC407PC	B.Tech	0	0	3	1.5	30	70	100

COURSE OBJECTIVES

To learn

1. To introduce the basic building blocks of linear integrated circuits.
2. To introduce the theory and applications of analog multipliers and PLL
3. To teach the linear and non - linear applications of operational amplifiers.
4. To introduce the theory and applications of 555 timer and PLL.
5. To teach the theory of ADC and DAC.
6. To introduce the concepts of waveform generation and introduce some special function ICs.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. A thorough **understanding** of operational amplifiers with linear integrated circuits.
2. To **design** circuits using operational amplifiers for various applications and to study different kinds of voltage regulators.
3. To **analyze** different active filters and to introduce the concepts of waveform generation, oscillators
4. To develop the **knowledge** in functional diagrams and applications using linear ICs like 555, 565 and to study oscillators.
5. To develop the knowledge in data convertersand**Evaluate** the specifications of ADCs and DACs.

LIST OF EXPERIMENTS

1. Inverting and Non-Inverting Amplifiers using OpAmps
2. Adder and Subtractor using OpAmp.
3. Comparators using OpAmp.
4. Integrator Circuit using IC741.
5. Differentiator Circuit using OpAmp.
6. Active filter Applications-LPF, HPF (FirstOrder)
7. IC 741 waveform Generators-Sine, Square wave and TriangularWaves.
8. Mono-Stable Multivibrator using IC555.
9. Astable multivibrator using IC555.
10. Schmitt Trigger Circuits using IC741.
11. IC 565-PLLApplications.
12. Voltage Regulator using IC723
13. Three terminal voltage regulators-7805, 7809,7912

TEXT BOOKS

1. Linear Integrated Circuits, D. Roy Chowdhury, New Age International (p) Ltd.
2. Op-Amps & Linear ICs, Ramakanth A. Gayakwad, PHI

REFERENCE BOOKS

1. Operational Amplifiers & Linear Integrated Circuits, R.F. Coughlin & Fredrick F. Driscoll, PHI.
2. Operational Amplifiers & Linear Integrated Circuits: Theory & Applications, Denton Daibey, TMH.
3. Design with Operational Amplifiers & Analog Integrated Circuits, Sergio Franco, McGraw Hill.
4. Digital Fundamentals - Floyd and Jain, Pearson Education.

WEB REFERENCES

1. https://nptel.ac.in/courses/117/106/108106105/
2. https://nptel.Ac.In/Courses/117103063/26

E -TEXT BOOKS

1. https://open.umn.edu/opentextbooks/textbooks/574
2. https://books.google.co.in/books/about/Linear_Integrated_Circuits.html?id=-zAe0P33B

MOOCS COURSE

1. Https://Www.Electronics-Tutorials.Ws/Waveforms/555_Timer.Htm
2. Https://Circuitdigest.Com/Article/555-Timer-Ic

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

ELECTRONIC CIRCUIT ANALYSIS LAB

II B. TECH- II SEMESTER (R20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EC408PC	B.Tech	0	0	2	1	30	70	100

COURSE OBJECTIVES

1. To understand the importance of MULTISIM software.
2. To indentify the basic electronic devices like diode, transistor.
3. To analyze the applications of Diode like clipper and clamper circuits.
4. To analyze transistor amplifiers and their frequency responses.
5. To analyze the oscillator circuits.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. **Understand** the diode and transistor characteristics.
2. **Verify** the Amplifier Frequency Response using software.
3. **Design** the biasing circuits like self biasing.
4. **Design** various amplifiers like CE, CC, common source FET amplifiers and also observe their frequency responses.
5. **Design** the biasing circuits like self biasing.

LIST OF EXPERIMENTS

1. Common Emitter Amplifier(*)
2. Two Stage RC CoupledAmplifier
3. Cascode amplifier Circuit(*)
4. Darlington PairCircuit
5. Current Shunt Feedback amplifierCircuit
6. Voltage Series Feedback amplifier Circuit(*)
7. RC Phase shift Oscillator Circuit(*)
8. Hartley and Colpitt's OscillatorsCircuit
9. Class A poweramplifier
10. Class B Complementary symmetry amplifier(*)
11. Design a MonostableMultivibrator
12. The output voltage waveform of Miller SweepCircuit

TEXT BOOKS

1. Integrated Electronics, Jacob Millman, Christos C Halkias, McGraw HillEducation.
2. Electronic Devices Conventional and current version -Thomas L. Floyd 2015,Pearson.

REFERENCE BOOKS

1. Electronic Devices and Circuits, David A. Bell – 5th Edition,Oxford.
2. Electronic Devices and Circuits theory– Robert L. Boylestead, Louis Nashelsky, 11th Edition, 2009,Pearson

WEB REFERENCES

1. https://nptel.ac.in/courses/108/106/108106105/
2. https://nptel.ac.in/courses/117/105/117105147/
3. https://nptel.ac.in/courses/117/108/117108047/
4. http://www.chipcenter.com/power/powaarch.htm
5. http://www.amasci.com/amateur/elehob.html

E -TEXT BOOKS

1. Circuit Analysis by John E. Whitehouse, Horwood Engineering Science Series.
2. Analog Circuits, Edited by Yuping Wu

MOOCS COURSE

1. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-002-circuits-and-electronics-spring-2007/video-lectures/lecture-9-part-1/
2. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-002-circuits-and-electronics-spring-2007/video-lectures/lecture-10/
3. https://www.coursera.org/learn/linear-circuits-ac-analysis

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

GENDER SENSITIZATION LAB

II B. TECH- II SEMESTER (R20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
*GS409MC	B. Tech	0	0	2	0	100	-	100

COURSE OBJECTIVES

1. To develop students' sensibility with regard to issues of gender in contemporary India.
2. To provide a critical perspective on the socialization of men and women.
3. To introduce students to information about some key biological aspects of genders.
4. To expose the students to debates on the politics and economics of work.
5. To help students reflect critically on gender violence.
6. To expose students to more egalitarian interactions between men and women.

COURSEOUTCOMES

Upon successful completion of the course, the student is able to

1. Students will have developed a better understanding of important issues related to gender in contemporary India.
2. Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
3. Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
4. Students will acquire insight into the gendered division of labour and its relation to politics and economics.
5. Men and women students and professionals will be better equipped to work and live together as equals.
6. Students will develop a sense of appreciation of women in all walks of life.
7. Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.

UNIT-I	UNDERSTANDING GENDER	Classes: 12

UNDERSTANDING GENDER: Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Construction of Gender-Socialization: Making Women, Making Men - Preparing for Womanhood. Growing up Male. First lessons in Caste.

UNIT-II	GENDER ROLES AND RELATIONS	Classes: 12
GENDER ROLES AND RELATIONS: Two or Many? -Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles Gender Roles and Relationships Matrix-Missing Women-Sex Selection and Its Consequences Declining Sex Ratio. Demographic Consequences-Gender Spectrum: Beyond the Binary		
UNIT-III	**GENDER AND LABOUR**	**Classes: 12**
GENDER AND LABOUR: Division and Valuation of Labour-Housework: The Invisible Labor- "My Mother doesn't Work." "Share the Load."-Work: Its Politics and Economics - Fact and Fiction. Unrecognized and Unaccounted work. -Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming		
UNIT-IV	**GENDER - BASED VIOLENCE**	**Classes: 12**
Gender - Based Violence: The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment: Say No! - Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "Chupulu". Domestic Violence: Speaking OutIs Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Thinking about Sexual Violence Blaming the Victim-"I Fought for my Life."		
UNIT-V	**GENDER AND CULTURE**	**Classes: 12**
GENDER AND CULTURE: Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature- Gender Development Issues-Gender Issues-Gender Sensitive Language-Gender and Popular Literature - Just Relationships: Being Together as Equals Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Rosa Parks The Brave Heart.		

TEXT BOOKS

1. Towards a World of Equals: A Bilingual Textbook on Gender" written by A.Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu and published by Telugu Akademi, Hyderabad,Telangana State in the year 2015.

REFERENCE BOOKS

1. Menon, Nivedita. Seeing like a Feminist. New Delhi: Zubaan-Penguin Books, 2012
2. Abdulali Sohaila. "I Fought For My Life…and Won."Available online at:http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/

WEB REFERENCES

1. Modified on 2015/05/14 10:40 by Sean Zheng — Categorized as: Chapter 2 – Education.
2. Hedman, Birgitta, Francesca Perucci and Pehr Sundström (1996). Engendering Statistic: A Tool for Change. Stockholm: Statistics Sweden.
3. Milek, Anne, Stork Christoph and Alison Gillwald (2011) Engendering communication: a perspective on ICT access and usage in Africa, Info, vol. 13 No. 3, pp.125-141. Bingley, United Kingdom: Emerald Group Publishing.
4. Hedman, Birgitta, Francesca Perucci and Pehr Sundström (1996). Engendering Statistic: A Tool for Change. Stockholm: Statistics Sweden.

E -TEXT BOOKS

1. Gender Sensitization Hardcover – 2012 by Dr. Tanuja Trivedi (Author).

MOOCS COURSE

1. https://www.mooc-list.com › tags › gender-equality
2. https://www.udemy.com › course › gender-equality-and-sexual-diversity
3. https://www.edx.org › learn › gender-studies

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

MICROPROCESSORS AND MICROCONTROLLERS

III B. TECH- I SEMESTER (R20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EC501PC	B.Tech	3	1	0	4	30	70	100

COURSE OBJECTIVES

To learn

1. To familiarize the architecture of microprocessors and microcontrollers
2. To provide the knowledge about interfacing techniques of bus &memory.
3. To understand the concepts of ARMarchitecture
4. To study the basic concepts of Advanced ARMprocessors

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Understand the internal architecture and organization of 8086 microprocessor and can develop assembly language programming to design microprocessor based systems.
2. Discuss the internal architecture and organization of 8051 microprocessor.
3. Apply the interfacing techniques to 8051 and can develop assembly language programming to design micro controller based systems.
4. Analyze the internal architecture and organization of ARM processors
5. Appraise advanced Arm cortex and OMAP processor

UNIT-I	8080 ARCHITECTURE	Classes: 12

8086 Architecture-Functional diagram, Register Organization, Memory Segmentation, Programming Model, Memory addresses, Physical Memory Organization, Architecture of 8086, Signal descriptions of 8086, interrupts of 8086.

Instruction Set and Assembly Language Programming of 8086: Instruction formats, Addressing modes,InstructionSet,AssemblerDirectives,Macros,andSimpleProgramsinvolvingLogical ,Branch and Call Instructions, Sorting, StringManipulations.

UNIT-II	8051 MICROCONTROLLER	Classes: 12

Introduction to Microcontrollers: Overview of 8051 Microcontroller, Architecture, I/O Ports, Memory Organization, Addressing Modes and Instruction set of 8051.

8051 Real Time Control: Programming Timer Interrupts, Programming External Hardware Interrupts, Programming the Serial Communication Interrupts, Programming 8051 Timers and Counters

UNIT-III	I/O AND MEMORY INTERFACE	Classes: 12

I/**O And Memory Interface**: LCD, Keyboard, External Memory RAM, ROM Interface, ADC, DAC Interface to 8051.

Serial Communication and Bus Interface: Serial Communication Standards, Serial Data Transfer Scheme, On board Communication Interfaces-I2C Bus, SPI Bus, UART; External Communication Interfaces-RS232,USB.

UNIT-IV	ARM ARCHITECTURE	Classes: 12

ARM Processor fundamentals, ARM Architecture – Register, CPSR, Pipeline, exceptions and interrupts interrupt vector table, ARM instruction set – Data processing, Branch instructions,loadstoreinstructions,Softwareinterruptinstructions,Programstatusregisterinstructions, loading constants, Conditional execution, Introduction to Thumbinstructions

UNIT-V	ADVANCED ARM PROCESSORS	Classes: 12

Introduction to CORTEX Processor and its architecture, OMAP Processor and its Architecture.

TEXT BOOKS

1. Advanced Microprocessors and Peripherals – A. K. Ray and K. M. Bhurchandani, TMH, 2nd Edition2006.
2. ARMSystemDevelopersguide,AndrewNSLOSS,DominicSYMES,ChrisWRIGHT,Elsevier, 2012

REFERENCE BOOKS

1. The 8051 Microcontroller, Kenneth. J. Ayala, Cengage Learning, 3rd Ed,2004.
2. Microprocessors and Interfacing, D. V. Hall, TMGH, 2nd Edition2006.
3. The 8051 Microcontrollers, Architecture and Programming and Applications -K. Uma Rao, Andhe Pallavi, Pearson, 2009.
4. Digital Signal Processing and Applications with the OMAP- L138 Experimenter, Donald Reay, WILEY2012.

WEB REFERENCES

1. https://nptel.ac.in/noc/individual_course.php?id=noc18-ec03
2. https://nptel.ac.in/noc/individual_course.php?id=noc19-ee1
3. http://www.infocobuild.com/education/audio-video-courses/electronics/MicroprocessorsMicrocontrollers-IIT-Kharagpur/lecture-49.html

E -TEXT BOOKS

1. Advanced Microprocessors and Peripherals – A. K. Ray and K. M. Bhurchandani, TMH, 2nd Edition2006.
2. ARMSystemDevelopersguide,AndrewNSLOSS,DominicSYMES,ChrisWRIGHT,Elsevier, 2012

MOOCS COURSES
1. https://onlinecourses.nptel.ac.in/noc18_ec03 2. https://www.youtube.com/watch?v=liRPtvj7bFU 3. https://www.mooc-list.com/course/introduction-arm-ost 4. https://www.mooc-list.com/tags/microprocessors 5. https://www.mooc-list.com/tags/microcontroller 6. https://freevideolectures.com/course/3018/microprocessors-and-microcontrollers 7. http://e-box.co.in/micro-processor-and-micro-controller.shtml 8. https://ieeexplore.ieee.org/document/7020281 9. https://ict.iitk.ac.in/product/microprocessors-and-microcontrollers/ 10. https://www.classcentral.com/course/nptel-microprocessors-and-microcontrollers-9894

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

DATA COMMUNICATIONS AND NETWORKS

III B. TECH- I SEMESTER (R20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EC502PC	B. Tech	3	1	0	4	30	70	100

COURSE OBJECTIVES

To learn

1. To introduce the Fundamentals of data communication networks and Functions of Physical layer
2. To demonstrate the Functions of various protocols of Data link layer.
3. To demonstrate Functioning of various Routing protocols.
4. To introduce the Functions of various Transport layer protocols.
5. To understand the significance of application layer protocols

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Know the Categories and functions of various Data communication Networks
2. Design and analyze various error detection techniques.
3. Demonstrate the mechanism of routing the data in network layer
4. Know the significance of various Flow control and Congestion control Mechanisms
5. Know the Functioning of various Application layer Protocols

UNIT-I	INTRODUCTION TO DATA COMMUNICATIONS	Classes: 12

Components, Data Representation, Data Flow, Networks-Distributed Processing, Network Criteria, Physical Structures, Network Models, Categories of Networks Interconnection of Networks, The Internet - A Brief History, The Internet Today, Protocol and Standards Protocols, Standards, Standards Organizations, Internet Standards. Network Models, Layered Tasks, OSI model, Layers in OSI model, TCP/IP Protocol Suite, Addressing Introduction,
Physical Layer: Guided Transmission media: twisted pairs, coaxial cable, fiber optics, Wireless transmission. Wireless Links and Network Characteristics, Wi-Fi: 802.11 Wireless LANs -The 802.11 Architecture,

UNIT-II	DATA LINK LAYER	Classes: 11

Links, Access Networks, and LANs- Introduction to the Link Layer, The Services Provided by the Link Layer, Types of errors, Redundancy, Detection vs Correction, Forward error correction Versus Retransmission Error-Detection and Correction Techniques, Parity Checks, Check summing Methods, Cyclic Redundancy Check (CRC) , Framing, Flow Control and Error Control protocols , Noisy less Channels and Noisy Channels, HDLC, Multiple Access Protocols, Random-access ,ALOHA, Controlled access, Channelization Protocols. 802.11 MAC Protocol, IEEE 802.11Fram

UNIT-III	THE NETWORK LAYER	Classes: 13
Introduction, Forwarding and Routing, Network Service Models, Virtual Circuit andDatagram Networks-Virtual-Circuit Networks, Datagram Networks, Origins of VC and Datagram Networks, inside a Router-Input Processing, Switching, Output Processing, Queuing, The Routing Control Plane, The Internet Protocol (IP): Forwarding and Addressing in the Internet-Datagram format,Ipv4 Addressing,DHCP, Internet Control Message Protocol (ICMP), IPv6, Routing algorithms: shortest path routing, Flooding, Hierarchical routing, Broadcast, Multicast, distance vector routing		
UNIT-IV	**TRANSPORT LAYER**	**Classes: 11**
Introduction and Transport Layer Services : Relationship Between Transport and Network Layers, Overview of the Transport Layer in the Internet, Multiplexing and De-multiplexing, Connectionless Transport: UDP -UDP Segment Structure, UDP Checksum, Principles of Reliable Data Transfer-Building a Reliable Data Transfer Protocol, Pipelined Reliable Data Transfer Protocols, Go-Back-N(GBN), Selective Repeat(SR), Connection Oriented Transport: TCP - The TCP Connection, TCP Segment Structure, Round-Trip Time Estimation and Timeout, Reliable Data Transfer, Flow Control, TCP Connection Management, Principles of Congestion Control - The Cause and the Costs of Congestion, Approaches to Congestion Control		
UNIT-V	**APPLICATION LAYER**	**Classes: 11**
Principles of Networking Applications – Network Application Architectures, Processes Communicating, Transport Services Available to Applications, Transport Services Provided by the File Transfer: FTP, -FTP Commands and Replies, Electronic Mail in the Internet- STMP, Comparison with HTTP, DNS-The Internet's Directory Service – Service Provided by DNS, Overview of How DNS Works, DNS Records and messages.		

TEXT BOOKS

1. Computer Networking A Top-Down Approach – Kurose James F, Keith W, 6th Edition, Pearson.
2. Data Communications and Networking Behrouz A. Forouzan 4th Edition McGraw-Hill Education

REFERENCE BOOKS

1. Data communication and Networks - Bhusan Trivedi, Oxford university press, 2016
2. Computer Networks -- Andrew S Tanenbaum, 4th Edition, Pearson Education
3. Understanding Communications and Networks, 3rd Edition, W. A. Shay, Cengage Learning.

WEB REFERENCES

1. https://math.dartmouth.edu/archive/m19f03/public_html/
2. https://nptel.ac.in/courses/106/106/106106094/
3. https://www.freetechbooks.com/communication-networks-t1026.html

E -TEXT BOOKS

1. Data Communications and Network, Bhusan Trivedi, Oxford university press, 2016

MOOCS COURSES

1. https://www.edx.org/learn/datacommuncationnetworks
2. https://www.udemy.com/course/datacommunicationnetwoorks/

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

CONTROL SYSTEMS

III B. TECH- I SEMESTER (R20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EC503PC	B.Tech	3	1	0	4	30	70	100

COURSE OBJECTIVES

To learn

1. To understand the different ways of system representations such as Transfer function representation and state space representations and to assess the system dynamic response
2. To assess the system performance using time domain analysis and methods for improving it
3. To assess the system performance using frequency domain analysis and techniques for improving the performance
4. To design various controllers and compensators to improve system performance
5. To understand state space, linear models and their transfer functions.

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

1. **List** the basic elements and structures of feedback control systems with reduction and signal flow graph techniques
2. **Demonstrate** the errors existing in the time domain analysis to correlate the pole-zero configurations.
3. **Analyze** control system performance in the frequency domain in terms to achieve the desired performance
4. **Investigate** the stability of the control system and to collaborate stability to the given control system and Design simple feedback controllers.
5. **Describe** state space and linear models and their transfer function representation.

UNIT-I	INTRODUCTION TO CONTROL PROBLEM	Classes: 12

Introduction to Control Problem: Industrial Control examples. Mathematical models of physical systems. Control hardware and their models. Transfer function models of linear time-invariant systems. Feedback Control: Open-Loop and Closed-loop systems. Benefits of Feedback. Block diagram algebra. Representation by signal flow graph-Reduction using mason's gain formula.

UNIT-II	TIME RESPONSE ANALYSIS OF STANDARD TEST SIGNALS	Classes:12

Time Response Analysis of Standard Test Signals: Time response of first and second order systems for standard test inputs. Application of initial and final value theorem. Design specifications for second- order systems based on the time-response. Concept of Stability. Routh-Hurwitz Criteria. Relative Stability analysis. Root-Locus technique. Construction of Root-loci. Steady state errors and error constants.

UNIT-III	FREQUENCY-RESPONSE ANALYSIS	Classes:12

Frequency-Response Analysis: Relationship between time and frequency response, Polar plots, Bode plots. Nyquist stability criterion. Relative stability using Nyquist criterion – gain and phase margin. Closed-loop frequency response.

UNIT-IV	INTRODUCTION TO CONTROLLER DESIGN	Classes: 12

Introduction to Controller Design: Stability, steady-state accuracy, transient accuracy, disturbance rejection, insensitivity and robustness of control systems. Root-loci method of feedback controller design. Design specifications in frequency-domain. Frequency-domain methods of design. Application of Proportional, Integral and Derivative Controllers, Lead and Lag compensation in designs. Analog and Digital implementation of controllers

UNIT-V	STATE VARIABLE ANALYSIS AND CONCEPTS OF STATE VARIABLES	Classes: 12

State Variable Analysis and Concepts of State Variables: State space model. Diagonalization of State Matrix. Solution of state equations. Eigen values and Stability Analysis. Concept of controllability and Observability. Pole-placement by state feedback. Discrete-time systems. Difference Equations. State-space models of linear discrete-time systems. Stability of linear discrete-time systems.

TEXT BOOKS

1. 1. M. Gopal, “Control Systems: Principles and Design”, McGraw Hill Education, 1997.
2. 2. B. C. Kuo, “Automatic Control System”, Prentice Hall, 1995.

REFERENCE BOOKS

1. 1. K. Ogata, “Modern Control Engineering”, Prentice Hall, 1991.
2. 2. I. J. Nagrath and M. Gopal, “Control Systems Engineering”, New Age International, 2009.

WEB REFERENCES

1. www.nptelvideos.com/video.php?id=1417&c=14
2. https://nptel.ac.in/courses/108/101/108101037/
3. https://nptel.ac.in/courses/108/102/108102043/

E-TEXT BOOKS

1. https://www.amazon.in/Control-Systems-Kumar/dp/8120349393
2. https://www.flipkart.com/control-systems-engineering/p/itmey3mbkcsytumg

MOOCS COURSES

1. https://swayam.gov.in/nd1_noc19_ee42/preview
2. https://onlinecourses.nptel.ac.in/noc20_ee90/preview

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

BUSINESS ECONOMICS AND FINANCIAL ANALYSIS

III B. TECH- I SEMESTER (R20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
SM504MS	B. Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

To learn

1. To learn the basic Business types, impact of the Economy on Business and firms specifically. To analyze the Business from the Financial Perspective.
2. To Plan production and cost concepts for maximizing profit.
3. To Construct financial statement in accordance with generally accepted accounting principles
4. To Analyze the Financial performance of business through Ratios
5. To Estimate investment proposals through Capital Budgeting Methods

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Understand Business with the use of economic theories and business structure
2. Learn Production and cost concepts for maximizing profit
3. Construct financial statement in accordance with generally accepted accounting principles.
4. Analyze the Financial performance of business through Ratios.
5. Estimate investment proposals through Capital Budgeting Methods

UNIT-I	INTRODUCTION TO BUSINESS AND ECONOMICS	Classes: 10

Business: Characteristic features of Business, Features and evaluation of Private Enterprises and Public Enterprises.
Economics: Significance of Economics, types, Concepts and Importance of National Income, Inflation, Nature and Scope of Business Economics.
Demand Analysis: Demand Definition, Types of Demand, Demand Function, Law of Demand, Elasticity of Demand, Types of Elasticity of Demand, Demand Forecasting Methods.

UNIT-II	THEORY OF PRODUCTION AND COST ANALYSIS	Classes:8

Theory of Production: Factors of Production, Production Function, Production Function with one variable input, Production function with two variable inputs (ISO Quants and ISO Costs), Scale of Production with Law of Returns , Cobb-Douglas Production Function.
Cost Analysis: Types of Costs, Short run and Long run Cost Functions, Break Even Analysis.

UNIT-III	MARKET STRUCTURES, PRICING & FINANCIAL ACCOUNTING	Classes: 10

Market Structures, Pricing: Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, and Monopolistic Competition, Types of Pricing.
Financial Accounting: Accounting concepts and Conventions, Accounting Equation, Double-Entry system of Accounting, Rules for maintaining Books of Accounts, Journal, Posting to Ledger, Preparation of Trial Balance, Elements of Financial Statements, and Preparation of Final Accounts.

UNIT-IV	FINANCIAL ANALYSIS THROUGH RATIOS	Classes: 8

Concept of Ratio Analysis, Liquidity Ratios, Turnover Ratios, Capital Structure Ratios and Profitability Ratios, (simple problems), Cash Flow Statement (simple problems) and Funds Flow Statement (simple problems)

UNIT-V	CAPITAL BUDGETING	Classes: 8

Capital, significance, Types of Capital, Methods and sources of raising finance.
Nature of Capital Budgeting features of Capital Budgeting proposals, Methods of Capital Budgeting: Pay Back Period Method (PBP), Accounting Rate of Return (ARR), Net Present Value Method (NPV) Simple problems.

TEXT BOOKS

1. D. D. Chaturvedi, S. L. Gupta, Business Economics - Theory and Applications, International Book House Pvt. Ltd. 2013.
2. Dhanesh K Khatri, Financial Accounting, Tata Mc –Graw Hill, 2011.
3. Geethika Ghosh, Piyali Gosh, Purba Roy Choudhury, Managerial Economics, 2 Tata Mc Graw Hill Education Pvt. Ltd. 2012.

REFERENCE BOOKS

1. Paresh Shah, Financial Accounting for Management 2e, Oxford Press, 2015.
2. S. N. Maheshwari, Sunil K Maheshwari, Sharad K Maheshwari, Financial Accounting, 5e, Vikas Publications, 2013.

WEB REFERENCES

1. https://nptel.ac.in/courses/110106050/17
2. https://nptel.ac.in/courses/110106050/39
3. https://nptel.ac.in/courses/110106050/38

E -TEXT BOOKS

1. https://www.sciencedirect.com/book/9780750644549/business-economics
2. http://www.freebookcentre.net/Business/Economics-Books.html

MOOCS COURSES

1. https://nptel.ac.in/courses/110106050/
2. https://nptel.ac.in/courses/110106050/11

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

MICROPROCESSORS AND MICROCONTROLLERS LAB

III B. TECH- I SEMESTER (R20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EC505PC	B.Tech	0	0	3	1.5	30	70	100

COURSE OBJECTIVES

To learn

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

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Understand the internal architecture and organization of 8086 microprocessor and can develop assembly language programming to design microprocessor based systems.
2. Discuss the internal architecture and organization of 8051 microprocessor.
3. Apply the interfacing techniques to 8051 and can develop assembly language programming to design micro controller based systems.
4. Analyze the internal architecture and organization of ARM processors
5. Appraise advanced Arm cortex and OMAP processor

CYCLE-1	USING 8086 PROCESSOR KITS AND/OR ASSEMBLER	5 Weeks

Assembly Language Programs to 8086 toPerform

1. Arithmetic, Logical, String Operations on 16 Bit and 32-BitData.
2. Bit level Logical Operations, Rotate, Shift, Swap and BranchOperations.

CYCLE-2	USING 8051 MICROCONTROLLER KITS	6 Weeks

Introduction toIDE

1. Assembly Language Programs to Perform Arithmetic (Both Signed and Unsigned) 16 Bit Data Operations, Logical Operations (Byte and Bit Level Operations), Rotate, Shift, Swap and Branch Instructions
2. Time delay Generation Using Timers of8051.
3. Serial Communication from / to 8051 to / from I/Odevices.
4. Program Using Interrupts to Generate Square Wave 10 KHZ Frequency on P2.1 Using Timer08051in8bitAutoreloadModeandConnecta1HZPulsetoINT1pinandDisplay on Port 0. Assume Crystal Frequency as 11.0592MHZ

CYCLE-3	INTERFACING I/O DEVICES TO 8051	5 Weeks

1. 7 Segment Display to8051.
2. Matrix Keypad to8051.
3. Sequence Generator Using Serial Interface in8051.
4. 8 bit ADC Interface to8051.
5. Triangular Wave Generator through DAC interfaces to8051.

TEXT BOOKS

1. Advanced Microprocessors and Peripherals – A. K. Ray and K. M. Bhurchandani, TMH, 2nd Edition2006.
2. ARMSystemDevelopersguide,AndrewNSLOSS,DominicSYMES,ChrisWRIGHT ,Elsevier, 2012

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

DATA COMMUNICATIONS AND NETWORKS LAB

III B. TECH- I SEMESTER (R 20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EC506PC	B. Tech	0	0	3	1.5	30	70	100

COURSE OBJECTIVES

To learn

1. Core programming basics and program design with functions using NSG2.1 and NS 3.1 programming language.
2. A range of Object-Oriented Programming, as well as in-depth data and information processing techniques.
3. The high-performance programs designed to strengthen the practical expertise.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Write, test, and debug simple TCL Scripts.
2. Implement NSG2.1 programswith ParametersThroughput, Packet Delivery Ratio, Delay.
3. Develop NSG2.1 programs step-wise by defining Performance likeDrop Tail, RED queue management schemes
4. To able capture the packet using Wireshark

LIST OF EXPERIMENTS

Note:

A. Minimum of 12 Experiments have to be conducted

B. All the Experiments may be Conducted using Network Simulation software like NS-2, NSG-2.1and Wire SHARK/equivalent software

1. Writing a TCL Script to create two nodes and links between nodes
2. Writing a TCL Script to transmit data between nodes
3. Evaluate the performance of various LAN Topologies
4. Evaluate the performance of Drop Tail and RED queue management schemes
5. Evaluate the performance of CBQ and FQ Scheduling Mechanisms
6. Evaluate the performance of TCP and UDP Protocols
7. Evaluate the performance of TCP, New Reno and Vegas
8. Evaluate the performance of AODV and DSR routing protocols
9. Evaluate the performance of AODV and DSDV routing protocols
10. Evaluate the performance of IEEE 802.11 and IEEE 802.15.4
11. Evaluate the performance of IEEE 802.11 and SMAC
12. Capturing and Analysis of TCP and IP Packets
13. Simulation and Analysis of ICMP and IGMP Packets
14. Analyze the Protocols SCTP, ARP, NetBIOS, IPX VINES

15. Analysis of HTTP, DNS and DHCP Protocols
16. Simulation Of Distance Vector Routing Algorithm
17. Simulation Of Link State Routing Algorithm

Major Equipment Required:
Required software (Open Source) like NS-2, NSG-2.1 and Wire SHARK

TEXT BOOKS

1. Computer Networking A Top-Down Approach – Kurose James F, Keith W, 6th Edition, Pearson.
2. Data Communications and Networking Behrouz A. Forouzan 4th Edition McGraw-Hill Education.

REFERENCE BOOKS

1. Data communication and Networks - Bhusan Trivedi, Oxford university press, 2016
2. Computer Networks -- Andrew S Tanenbaum, 4th Edition, Pearson Education
3. Understanding Communications and Networks, 3rd Edition, W. A. Shay, Cengage Learning

WEB REFERENCES

1.https://math.dartmouth.edu/archive/m19f03/public_html/
2.https://nptel.ac.in/courses/106/106/106106094/
3.https://www.freetechbooks.com/communication-networks-t1026.html

E -TEXT BOOKS

1. Data Communications and Network, Bhusan Trivedi, Oxford university press, 2016

MOOCS COURSES

1. https://www.edx.org/learn/datacommuncationnetworks
2. https://www.udemy.com/course/datacommunicationnetwoorks/

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

ADVANCED COMMUNICATION SKILLS LAB

III B.TECH- I SEMESTER (R20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EN506HS	B. Tech	0	0	2	1	30	70	100

INTRODUCTION

The introduction of the Advanced Communication Skills Lab is considered essential at 3rd year level. At this stage, the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalized context.

The proposed course should be a laboratory course to enable students to use 'good' English and perform the following:

- Gathering ideas and information to organize ideas relevantly and coherently.
- Engaging in debates.
- Participating in group discussions.
- Facing interviews.
- Writing project/research reports/technical reports.
- Making oral presentations.
- Writing formal letters.
- Transferring information from non-verbal to verbal texts and vice-versa.
- Taking part in social and professional communication.

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.

SYLLABUS

The following course content to conduct the activities is prescribed for the Advanced English Communication Skills (AECS) 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/ – 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/ emails/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-conference and Mock Interviews.

MINIMUM REQUIREMENT:

The Advanced English Communication Skills (AECS) Laboratory shall have the following infrastructural facilities to accommodate at least 35 students in the lab:

- Spacious room with appropriate acoustics.
- Round Tables with movable chairs
- Audio-visual aids
- LCD Projector
- Public Address system
- P – IV Processor, Hard Disk – 80 GB, RAM–512 MB Minimum, Speed – 2.8 GHZ
- T. V, a digital stereo & Camcorder
- Headphones of High quality

SUGGESTED SOFTWARE:

The software consisting of the prescribed topics elaborated above should be procured and used.

- Oxford Advanced Learner's Compass, 7th Edition
- DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.
- Lingua TOEFL CBT Insider, by Dream tech
- TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)

TEXT BOOKS

1. Effective Technical Communication by M Asharaf Rizvi. McGraw Hill Education (India) Pvt. Ltd.2nd Edition.

2. Academic Writing: A Handbook for International Students by Stephen Bailey, Routledge, 5th Edition.

REFERENCE BOOKS

1. Learn Correct English – A Book of Grammar, Usage and Composition by Shiv K. Kumar and Hemalatha Nagarajan. Pearson 2007
2. Professional Communication by Aruna Koneru, McGraw Hill Education (India) Pvt. Ltd, 2016.
3. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
4. Technical Communication by Paul V. Anderson. 2007. Cengage Learning pvt. Ltd. New Delhi
5. English Vocabulary in Use series, Cambridge University Press 2008
6. Handbook for Technical Communication by David A. McMurrey& Joanne Buckley. 2012. Cengage Learning.
7. Communication Skills by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
8. Job Hunting by Colm Downes, Cambridge University Press 2008.
9. English for Technical Communication for Engineering Students, AyshaVishwamohan, Tata Mc Graw-Hill 2009.

WEB REFERENCES

1. https://www.asha.org/PRPSpecificTopic.aspx?folderid=8589935321&section=References
2. Argyle,MichaelF.,Alkema,Florisse,&Gilmour,Robin."Thecommunicationof friendly and hostile attitudes: Verbal and nonverbal signals." European Journalof Social Psychology, 1, 385-402:1971
3. Blumer, Herbert. Symbolic interaction: Perspective and method. Engle wood Cliffs; NJ: PrenticeHall.1969

E –TEXTBOOKS

1. Mc corry Laurie Kelly Mc Corry Jeff Mason, Communication Skills forthe Healthcare Professional, 1st edition,ISBN:1582558140, ISBN-13:9781582558141
2. RobertEOwens,Jr,LanguageDevelopment, 9th edition, ISBN:0133810364,9780133810363

MOOCS COURSES

1. https://www.coursera.org/specializations/improve-english
2. https://www.edx.org/professional-certificate/upvalenciax-upper-intermediate-english

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

INTELLECTUAL PROPERTY RIGHTS

III B. TECH- I SEMESTER (R 20)

Course Code	Programme	Hours /Week			Credits	MaximumMarks		
		L	T	P	C	CIE	SEE	Total
*MC510	B.Tech	3	0	0	0	100	-	100

COURSEOBJECTIVES:

1. To acquaint the learners with the basic concepts of Intellectual Property Rights.
2. To develop expertise in the learners in IPR related issues and sensitize the learners with the emerging issues in IPR and the rationale for the protection of IPR.

COURSEOUTCOMES:

Upon successful completion of the course

1. Gain knowledge on Intellectual Property assets and generate economic wealth.
2. Assist individuals and organizations in capacity building and work as a platform for development, promotion, protection, compliance, and enforcement of Intellectual Property & knowledge.
3. Gather knowledge about Intellectual Property Rights which is important for students of engineering in particular as they are tomorrow's technocrats and creator of new technology.
4. Discover how IPR are regarded as a source of national wealth and mark of an economic leadership in context of global market scenario.
5. Study the national & International IP system.
6. Summarize that it is an incentive for further research work and investment in R & D, leading to creation of new and better products and generation of economic and social benefits.

UNIT-I	INTELLECTUAL PROPERTY ACT AND LAW	Classes:7

Introduction to intellectual property Act and Law-the evolutionary pasttheIPR tool kit- legal tasks in intellectual property law-ethical obligationsin Para legal tasks in intellectual property law

UNIT-II	INTRODUCTION TO TRADE MARK	Classes:8

Introduction to trade mark – Trade mark registration process-Post registration procedures-Trade mark maintenance – transfer of rights- inter party's proceeding – Infringement-Dilution ownership of trade mark likelihood of confusion – trademark claims- trademark litigations

UNIT-III	INTRODUCTION TO COPY RIGHTS	Classes:6
Introduction to copy rights- principles of copyright – subjects matter of copy right- rights afforded by copyright law- copyright ownership- transfer and duration – right to prepare derivative works- right of distribution right to perform the work publicity- copyright		
UNIT-IV	**INTRODUCTION TO PATENT LAW**	**Classes:7**
Introduction to patent law- Rights and limitations- Rights under patent law- patent requirements- ownership – transfer- patent application process patent infringement- patent litigation, Patent information and database, Licensing and transfer of technology		
UNIT-V	**INTRODUCTION TO TRANSACTIONAL LAW**	**Classes:6**
Introduction to transactional law- creating wealth and managing risk – employment relationship in the Internet and technological sector- contact for internet and technological sector		

TEXTBOOKS

1. Kompal Bansal and Praishit Bansal, "Fundamentals of IPR for Engineers", 1st Edition, BS Publications, 2012.
2. Prabhuddha Ganguli, "Intellectual Property Rights",1st Edition, TMH, 2012.

REFERENCE BOOKS

1. R Radha Krishnan & S Balasubramanian, "Intellectual PropertyRights", 1st Edition,Excel Books, 2012.
2. M Ashok Kumar & mohd Iqbal Ali, "Intellectual PropertyRights", 2nd Edition, Serial publications, 2011.

WEBREFERENCES

1. http://libgen.rs/book/index.php?md5=C4A6559ECCAEFC767CE71BD91A1BAD41
2. http://libgen.rs/book/index.php?md5=6463CAD16544B347B19335FB19D6917C

E –TEXTBOOKS

1. http://libgen.rs/book/index.php?md5=13C4B3A45B1C95B4A388F94729CCCFBC
2. https://maklaw.in/intellectual-property-rights/?gclid=EAIaIQobChMIsprsv_WI7QIVilVgCh29HwPzEAAYASAAEgK5YvD_BwE

MOOCSCOURSES

1. https://nptel.ac.in/courses/110/105/110105139/
2. https://nptel.ac.in/courses/109/106/109106137/

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

ANTENNAS AND WAVE PROPAGATION

III B. TECH- II SEMESTER (R20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EC601PC	B.Tech	3	1	0	4	30	70	100

COURSE OBJECTIVES

To learn

1. To understand the concept of radiation, antenna definitions and significance of antenna parameters, to derive and analyze the radiation characteristics of thin wire dipole antennas and solve numerical problems.
2. To analyze the characteristics and design relations of UHF, VHF and Microwave Antennas.
3. To identify the antenna array requirements, to determine the characteristics of ULAs and estimate the patterns of BSA, EFA, and Binomial Arrays.
4. To understand the concepts and set-up requirements for microwave measurements, and familiarize with the procedure to enable antenna measurements.
5. To define and distinguish between different phenomenon of wave propagation (ground wave, space wave and sky wave), their frequency dependence, and estimate their characteristics, identifying their profiles and parameters involved.

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

1. Understand various antenna parameters such as radiation pattern, antenna efficiency, beam efficiency, radiation resistance etc., in the field evaluation under various conditions.
2. Discuss the operation of fundamental antennas like Yagi-Uda, Horn antennas and helical structure.
3. Analyze the electric and magnetic field emission, feed methods of various basic antennas such as patch antenna, parabolic reflectors, lens antenna and mathematical emulation of the analysis.
4. Determine the field under application of different currents to the individual elements of antenna array and explain various antenna measurement techniques
5. Remember the wave spectrum and respective band antenna usage and also to know the propagation of the waves at different frequencies through different layers in the existing layered free space environment structure

UNIT-I	ANTENNA BASICS AND INTRODUCTION ABOUT THIN LINEAR WIRE ANTENNAS	Classes: 12

Antenna Basics: Basic Antenna Parameters – Patterns, Beam Area, Radiation Intensity, Beam Efficiency, Directivity-Gain-Resolution, Antenna Apertures, Effective Height, Input Impedance, Antenna Temperature, Fields from Oscillating Dipole, Field Zones, Front - to-back Ratio, Antenna Theorems, Radiation, Retarded Potentials – Helmholtz Theorem

Thin Linear Wire Antennas – Radiation from Small Electric Dipole, Quarter Wave Monopole and Half Wave Dipole – Current Distributions, Field Components, Radiated Power, Radiation Resistance, Beam Width, Directivity, Effective Area and Effective Height, Natural Current Distributions, Far Fields and Patterns of Thin Linear Centre-fed Antennas of Different Lengths. Loop Antennas - Small Loop, Comparison of Far Fields of Small Loop and Short Dipole, Radiation Resistances and Directivities of Small Loops (Qualitative Treatment).

UNIT-II	VHF, UHF AND MICROWAVE ANTENNAS-I	Classes:11

VHF, UHF and Microwave Antennas - I: Arrays with Parasitic Elements, Yagi-Uda Array, Folded Dipoles and their Characteristics, Helical Antennas – Helical Geometry, Helix Modes, Practical Design Considerations for Monofilar Helical Antenna in Axial and Normal Modes, Horn Antennas – Types, Fermat's Principle, Optimum Horns, Design Considerations of Pyramidal Horns.

UNIT-III	VHF, UHF AND MICROWAVE ANTENNAS-II	Classes:10

VHF, UHF and Microwave Antennas - II: Micro strip Antennas – Introduction, Features, Advantages and Limitations, Rectangular Patch Antennas – Geometry and Parameters, Characteristics of Micro strip Antennas. Reflector Antennas – Introduction, Flat Sheet and Corner Reflectors, Paraboloidal Reflectors – Geometry, Pattern Characteristics, Feed Methods, Reflector Types – Related Features. Design of Simple Antenna.

UNIT-IV	ANTENNA ARRAYS AND ANTENNA MEASUREMENTS	Classes:10

Antenna Arrays: Point Sources – Definition, Patterns, arrays of 2 Isotropic Sources - Different Cases, Principle of Pattern Multiplication, Uniform Linear Arrays – Broadside Arrays, Endfire Arrays, EFA with Increased Directivity, Derivation of their Characteristics and Comparison, BSAs with Non-Uniform Amplitude Distributions – General Considerations and Binomial Arrays. **Antenna Measurements:** Introduction, Concepts - Reciprocity, Near and Far Fields, Coordinate System, Sources of Errors. Patterns to be Measured, Directivity Measurement, Gain Measurements (by Comparison, Absolute and 3-Antenna Methods)

UNIT-V	WAVE PROPAGATION	Classes:10

Wave Propagation - Definitions, Categorizations and General Classifications, Different Modes of Wave Propagation, Ray/Mode Concepts, Ground Wave Propagation –Plane Earth Reflections, Space and Surface Waves, Wave Tilt, Curved Earth Reflections. Space Wave Propagation –Field Strength Variation with Distance and Height, Effect of Earth's Curvature, Absorption, Super Refraction, M-Curves and Duct Propagation, Scattering Phenomena, Troposphere Propagation. Sky Wave Propagation –Structure of Ionosphere, Refraction and Reflection of Sky Waves by Ionosphere, Ray Path, Critical Frequency, MUF, LUF, OF, Virtual Height and Skip Distance, Relation between MUF and Skip Distance, Multi-hop Propagation

TEXT BOOKS

1. Antennas and Wave Propagation – J.D. Kraus, R.J. Marhefka and Ahmad S. Khan, TMH, New Delhi, 4th ed., (Special Indian Edition), 2010.

2. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2nd ed., 2000.

REFERENCE BOOKS

1. Antenna Theory - C.A. Balanis, John Wiley & Sons, 3rd Ed., 2005.
2. Antennas and Wave Propagation – K.D. Prasad, Satya Prakashan, Tech India Publications, New Delhi, 2001.
3. Radio Engineering Handbook- Keith henney, 3rd edition TMH. 4. Antenna Engineering Handbook –John Leonidas Volakis, 3rd edition, 2007

WEB REFERENCES

1. https://lecturenotes.in/subject/263/antenna-and-wave-propagation-awp
2. https://www.tutorialspoint.com/antenna_theory/antenna_theory_types_of_propagation.htm

E -TEXT BOOKS

1. https://books.google.co.in/books/about/Antennas_and_Wave_Propagation.html?id=icy-_fN8vVsC
2. https://books.google.com/books/about/Antenna_and_Wave_Propagation.html?id=g6VrngEACAAJ

MOOCS COURSES

1. https://www.classcentral.com/course/swayam-antennas-7924
2. https://training.uark.edu/antenna
3. https://www.thetechnologyacademy.com/online-course/rf502-rf-and-microwave-antenna-basics
4. https://www.udemy.com/topic/antenna
5. https://www.coursera.org/lecture/satellite-communications/antennas-BQhQ6

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

DIGITAL SIGNAL PROCESSING

III B. TECH- II SEMESTER (R20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EC602PC	B.Tech	3	1	0	4	30	70	100

COURSE OBJECTIVES

To learn

1. To provide background and fundamental material for the analysis and processing of digital signals and acquaint in Multi-rate signal processing techniques.
2. To understand the fast computation of DFT and appreciate the FFT processing.
3. To design IIR digital filters, analyze and synthesize for a given specifications.
4. To design FIR digital filters using window techniques, analyze and synthesize for a given specifications.
5. To realize digital filter techniques and understand the concepts of finite word length effects.

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

1. To**Understand** the operations on signals and characteristics of Linear Shift Invariant system and Multi rate DSP Techniques.
2. To**Build** the relationship among Z-Transform, DFT, FFT and various Transforms.
3. To **Design** of infinite impulse response filters for a given specification.
4. To **Evaluate** the Performance of finite impulse response filters
5. To A**nalyze** the finite length word effects and to realize Digital Filters.

UNIT-I	INTRODUCTION	Classes: 12

Introduction to Digital Signal Processing: Discrete Time Signals & Sequences, conversion of continuous to discrete signal, Normalized Frequency, Linear Shift Invariant Systems, Stability, and Causality, linear differential equation to difference equation, Linear Constant Coefficient Difference Equations, Frequency Domain Representation of Discrete Time Signals and Systems.

Multirate Digital Signal Processing: Introduction, Down Sampling, Decimation, Up sampling, Interpolation, Sampling Rate Conversion. Applications of Multirate Digital Signal Processing.

UNIT-II	DISCRETE FOURIER SERIES AND FAST FOURIER TRANSFORMS	Classes: 12

Discrete Fourier series: Fourier Series, Review of Transforms, DFS Representation of Periodic Sequences, Properties of Discrete Fourier Series, Discrete Fourier Transforms: Properties of DFT, Twiddle Factor, Linear Convolution of Sequences using DFT, Computation of DFT: Over-Lap Add Method, Over-Lap Save Method, Relation between DTFT, DFS, DFT and Z-Transform.

Fast Fourier Transforms: Fast Fourier Transforms (FFT) - Radix-2 Decimation-in-Time and Decimation-in-Frequency FFT Algorithms, Inverse FFT.

UNIT-III	IIR DIGITAL FILTERS	Classes: 10

IIR Digital Filters: Analog filter approximations – Butterworth and Chebyshev, Design of IIR Digital Filters from Analog Filters, Step and Impulse Invariant Techniques, Bilinear Transformation Method, Spectral Transformations.

UNIT-IV	FIR DIGITAL FILTERS	Classes: 10

FIR Digital Filters: Characteristics of FIR Digital Filters, Frequency Response. Design of FIR Filters: Fourier Method, Digital Filters using Window Techniques, Frequency Sampling Technique, Comparison of IIR & FIR filters.

UNIT-V	REALIZATION OF DIGITAL FILTERS AND FINITE WORD LENGTH EFFECTS	Classes: 10

Realization of Digital Filters: Realization of Digital Filters – Direct, Canonic, Cascade and Parallel Forms.

Finite Word Length Effects: Limit cycles, Overflow Oscillations, Round-off Noise in IIR Digital Filters, Computational Output Round Off Noise, Methods to Prevent Overflow, Trade Off Between Round Off and Overflow Noise, Measurement of Coefficient Quantization Effects through Pole-Zero Movement, Dead Band Effects.

TEXT BOOKS

1. Discrete Time Signal Processing – A. V. Oppenheim and R.W. Schaffer, PHI, 2009
2. Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis, Dimitris G. Manolakis, Pearson Education / PHI, 2007.

REFERENCE BOOKS

1. Digital Signal Processing – Fundamentals and Applications – Li Tan, Elsevier, 2008
2. Fundamentals of Digital Signal Processing using MATLAB – Robert J. Schilling, Sandra L.Harris, Thomson, 2007
3. Digital Signal Processing – S. Salivahanan, A. Vallavaraj and C. Gnanapriya, TMH, 2009
4. Digital Signal Processing - A Practical approach, Emmanuel C. Ifeachor and Barrie W. Jervis, 2nd Edition, Pearson Education, 2009

WEB REFERENCES

1. ttps://freevideolectures.com/course/2339/digital-signal-processing-iitkharagpur/17
2. http://study.aisectonline.com/DisplaySub2SubProgramme.aspx?Sub2Cat=10141
3. https://nptel.ac.in/noc/individual_course.php?id=noc18-ee30
4. http://www.infocobuild.com/education/audio-video-courses/electronics/DiscreteTimeSignalProcessing-IIT-Kharagpur/lecture-06.html

E -TEXT BOOKS

1. https://www.google.co.in/books/edition/DIGITAL_SIGNAL_PROCESSING/cLAbjlSN7qQC?hl=en&gbpv=1&dq=inauthor:%22NAGOORKANI%22&printsec=frontcover
2. https://fmipa.umri.ac.id/wp-content/uploads/2016/03/Andreas-Intoniou-Digital-signal-processing.9780071454247.31527.pdf
3. https://www.riverpublishers.com/pdf/ebook/RP_E9788792982032.pdf

MOOCS COURSES
1. https://nptel.ac.in/courses/108105055/10 2. http://freevideolectures.com/Course/2339/Digital-ztransforms-IITKharagpur 3. http://study.aisectonline.com/Login.aspx?CID=CoursesSelect.aspx?courseid=11589#https://www.youtube.com/watch?v=V-kLaH4139o 4. https://cosmolearning.org/video-lectures/digital-filter-design-12020/

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

VLSI DESIGN

III B. TECH- II SEMESTER (R20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EC603PC	B.Tech	3	1	0	4	30	70	100

COURSE OBJECTIVES

To learn

1. Give exposure to different steps involved in the fabrication of ICs.
2. Explain electrical properties of MOS and BiCMOS devices to analyze the behavior of inverters designed with various loads.
3. Give exposure to the design rulesto be followed to draw the layout of any logic circuit.
4. Provide design concepts to design building blocks of datapath of any system using gates.
5. Understand basic programmable logic devices and testing of CMOS circuits.

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

1. Understand the steps involved in fabrication of IC's using MOS, CMOS, BiCMOS transistors, studying electrical behavior of MOS transistors and implementation of basic circuits
2. Experiment with VLSI design flow using Stick diagrams, Design rules and Layouts
3. Design the gate level circuits using gates
4. Analyze the steps to design various circuits using data path sub systems and memories.
5. Evaluate different types of PLD's and test the CMOS circuits.

UNIT-I	INTRODUCTION	Classes: 12

Introduction to IC Technology–MOS, PMOS, NMOS, CMOS & BiCMOS Fabrication Techniques.

Basic Electrical Properties: Basic Electrical Properties of MOS and BiCMOS Circuits: I_{ds}-V_{ds} relationships, MOS transistor threshold Voltage, g_m, g_{ds}, Figure of merit; Pass transistor, NMOS Inverter, Various pull ups, CMOS Inverter analysis and design, Bi-CMOS Inverters.

UNIT-II	VLSI CIRCUIT DESIGN PROCESSES	Classes:12

VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules andLayout, Transistors Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOScircuits.

UNIT-III	GATE LEVEL DESIGN	Classes:12
Logic Gates and Other complex gates, Switch logic, Alternate gate circuits, Time delays, Driving large capacitive loads,Wiring Capacitance, Fan–in,Fan– out.		
UNIT-IV	**DATA PATH SUBSYSTEMS**	**Classes: 12**
Subsystem Design, Shifters, Adders, ALUs, Multipliers, Parity generators, Comparators, Zero/One Detectors, Counters. **ArraySubsystems:** SRAM, DRAM, ROM, Serial Access Memories.		
UNIT-V	**PROGRAMMABLE LOGIC DEVICES**	**Classes: 12**
Design Approach– PLA, PAL, Standard Cells FPGAs, CPLDs. **CMOS Testing:** CMOS Testing, Test Principles, Design Strategies for test, Chip level Test Techniques, BIST Architecture.		

TEXT BOOKS

1. Essentials of VLSI circuits and systems–Kamran Eshraghian, Eshraghian Dougles and A.Pucknell, PHI, 2005 Edition
2. CMOS VLSI Design–A Circuits and Systems Perspective, Neil H.E Weste, David Harris, Ayan Banerjee, 3rdEd, Pearson, 2009.

REFERENCE BOOKS

1. Introduction to VLSI Systems: A Logic, Circuit and System Perspective– Ming-BOLin, CRCPress, 2011
2. CMOS logic circuit Design- John.P.Uyemura, Springer, 2007.
3. Modern VLSI Design –Wayne Wolf, Pearson Education, 3rd Edition, 1997.
4. VLSI Design-K.LalKishore, V.S.V.Prabhakar, I.K International, 2009.

WEB REFERENCES

1. https://books.google.co.in/books/about/Basic_VLSI_Design.html?id=FCJTAAAAMAAJ
2. https://docs.google.com/file/d/0Bxo5NRLCo5Sqbmt5V1NDd3Q4MTg/view?resourcekey=0-BsHQYeJB6BOa-wMTll_v9A

E -TEXT BOOKS

1. VLSI DESIGN by Wayne wolf
2. Basic VLSI Design-Eshraghian Dougles and A.Pucknell

MOOCS COURSES

1. https://nptel.ac.in/courses/117/101/117101058/
2. https://nptel.ac.in/courses/117/106/117106093/

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

DIGITAL SIGNAL PROCESSING LAB

III B. TECH- II SEMESTER (R20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EC604PC	B. Tech	0	0	3	1.5	30	70	100

COURSE OBJECTIVES

1. To provide background and fundamentals of MATLAB tool for the analysis and processing of signals and to generate various continuous and discrete time signals.
2. To study the designs and structures of digital (IIR and FIR) filters from analysis to synthesis for a given specifications.
3. To familiarize the relationships between continuous-time and discrete-time signals and systems.
4. To verify the Circular Convolution, Noise removal and DTMF filtering.
5. To analyze the FFT algorithm, multi-rate signal processing techniques.

COURSE OUTCOMES

Upon successful completion of the course, the student is able

1. **Understand** Basics of MATLAB syntax, functions andprogrammingandfindthe generation Various Signals and Sequences in MATLAB, including the operations on Signals andSequences.
2. **Explain** the Convolution and Correlation between Signals andsequences, Verificationof noise removal in a signal
3. **Analyze** the Fourier Transform of a given signal and plotting its magnitude and phase spectrum
4. **Remember** for impulse response of finite and infinite
5. **Construct** the multi rate signal processing and Identify Spectrograms and DTMF Filtering.

LIST OF EXPERIMENTS

The Programs shall be implemented in Software (Using MATLAB / Lab View / C Programming/ Equivalent) and Hardware (Using TI / Analog Devices / Motorola / Equivalent DSP processors).

Note: - Minimum of 12 experiments has to be conducted.

List of Experiments:

1. Generation of Sinusoidal Waveform / Signal based on Recursive Difference Equations
2. Histogram of White Gaussian Noise and Uniformly Distributed Noise.
3. Impulse Response of First order and Second Order Systems.
4. To find Frequency Response of a given System given in Transfer Function/ Differential equationform.
5. To find DFT / IDFT of given DT Signal
6. To find circular convolution of given two sequences.
7. Obtain Fourier series coefficients by formula and using FFT and compare for half sine wave.
8. Implementation of FFT of given Sequence
9. Determination of Power Spectrum of a given Signal(s).
10. Implementation of LP & HP FIR Filter for a given Sequence/Signal.
11. Implementation of LP & HP IIR Filter for a given Sequence/Signal
12. Generation of Narrow Band Signal through Filtering
13. Generation of DTMF Signals
14. Implementation of Decimation Process
15. Implementation of Interpolation Process
16. Implementation of I/D Sampling Rate Converters

TEXT BOOKS

1. Discrete Time Signal Processing – A. V. Oppenheim and R.W. Schaffer, PHI, 2009
2. Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis, Dimitris G. Manolakis, Pearson Education / PHI, 2007.

REFERENCE BOOKS

1. Digital Signal Processing – Fundamentals and Applications – Li Tan, Elsevier, 2008
2. Fundamentals of Digital Signal Processing using MATLAB – Robert J. Schilling, Sandra L. Harris, Thomson, 2007
3. Digital Signal Processing – S. Salivahanan, A. Vallavaraj and C. Gnanapriya, TMH, 2009
4. Digital Signal Processing - A Practical approach, Emmanuel C. Ifeachor and Barrie W. Jervis, 2nd Edition, Pearson Education, 2009

WEB REFERENCES

1. https://freevideolectures.com/course/2339/digital-signal-processing-iitkharagpur/17
2. http://study.aisectonline.com/DisplaySub2SubProgramme.aspx?Sub2Cat=10141
3. https://nptel.ac.in/noc/individual_course.php?id=noc18-ee30
4. http://www.infocobuild.com/education/audio-video-

courses/electronics/DiscreteTimeSignalProcessing-IIT-Kharagpur/lecture-06.html

E -TEXT BOOKS

1. https://www.google.co.in/books/edition/DIGITAL_SIGNAL_PROCESSING/cLAbjlSN7qQC?hl=en&gbpv=1&dq=inauthor:%22NAGOORKANI%22&printsec=frontcover
2. https://fmipa.umri.ac.id/wp-content/uploads/2016/03/Andreas-Intoniou-Digital-signal-processing.9780071454247.31527.pdf
3. https://www.riverpublishers.com/pdf/ebook/RP_E9788792982032.pdf

MOOCS COURSES

1. https://nptel.ac.in/courses/108105055/10
2. http://freevideolectures.com/Course/2339/Digital-ztransforms-IITKharagpur
3. http://study.aisectonline.com/Login.aspx?CID=CoursesSelect.aspx?courseid=11589#https://www.youtube.com/watch?v=V-kLaH4139o
4. https://cosmolearning.org/video-lectures/digital-filter-design-12020/

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

e- CAD LAB

III B. TECH- II SEMESTER (R 20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EC605PC	B. Tech	0	0	3	1.5	30	70	100

COURSE OBJECTIVES

1. To learn Hardware Descriptive Language (Verilog/VHDL)
2. To learn the fundamental principles of VLSI circuit design in digital domain
3. To familiarize implementation of logical modules on FPGAs
4. To understandbasicprogrammablelogicdevicesandtestingofCMOScircuits using FPGA.
5. To build and test digital circuits, including the use of CAD tools. Behavioral, register-transfer, logic, and physical-level structured VLSI design using CAD tools and hardware description languages

COURSE OUTCOMES

Upon successful completion of the course, the student is able

1. An ability to design CMOS logic circuits. Simulate circuits within a CAD tool and compare to design specifications.
2. Design, implement, and simulate circuits using VHDL.
3. Write machine language programs and assembly language programs for the simple computer.
4. To learn by using Xilinx Foundation tools and Hardware Description Language (VHDL).
5. To analyze the results of logic and timing simulations and to use these simulation results to debug digital systems.

LIST OF EXPERIMENTS

Part -I

All thefollowingexperimentshavetobeimplemented usingHDL

1. Realize all the logic gates
2. Design of 8-to-3 encoder (without and with priority) and 2-to-4 decoder.
3. Design of 8-to-1 multiplexer and1-to-8 demultiplexer
4. Design of 4 bit binary to gray code converter
5. Design of 4 bit comparator
6. Design of Full adder using 3 modeling styles
7. Design of flipflops: SR, D, JK, T
8. Design of 4-bit binary, BCD counters (synchronous/asynchronous reset) or any sequence counter
9. Finite State Machine Design
10. Sequence Detector

Part-II

Layout, physical verification, placement & route for complex design, static timing analysis, IR drop analysis and cross talk analysis for the following:

1. Basic logic gates
2. CMOS inverter
3. CMOS NOR/NAND gates
4. CMOS XOR and MUX gates
5. Static/Dynamic logic circuit (register cell)
6. Latch
7. Pass transistor
8. Layout of any combinational circuit (complex CMOS logic gate).

TEXT BOOKS

1. Essentials of VLSI circuits and systems–Kamran Eshraghian, Eshraghian Dougles and A.Pucknell, PHI, 2005 Edition
2. CMOS VLSI Design–A Circuits and Systems Perspective, Neil H.E Weste, David Harris, Ayan Banerjee, 3rd Ed, Pearson, 2009.

REFERENCE BOOKS

1. Introduction to VLSI Systems: A Logic, Circuit and System Perspective–Ming-BOLin, CRC Press, 2011
2. CMOS logic circuit Design-John.P.Uyemura, Springer, 2007.
3. Modern VLSI Design –Wayne Wolf, Pearson Education, 3rd Edition, 1997.
4. VLSI Design- K.Lal Kishore, V.S.V.Prabhakar, I.K International, 2009.

WEB REFERENCES

1. https://books.google.co.in/books/about/Basic_VLSI_Design.html?id=FCJTAAAAMAAJ
2. https://docs.google.com/file/d/0Bxo5NRLCo5Sqbmt5V1NDd3Q4MTg/view?resourcekey=0-BsHQYeJB6BOa-wMTll_v9A

E -TEXT BOOKS

1. VLSI DESIGN by Waynewolf
2. Basic VLSI Design-Eshraghian Dougles and A.Pucknell

MOOCS COURSES

1. https://nptel.ac.in/courses/117/101/117101058/
2. https://nptel.ac.in/courses/117/106/117106093/

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

SCRIPTING LANGUAGES LAB

III B. TECH- II SEMESTER (R 20)

Course Code	Programme	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EC606PC	B. Tech	0	0	3	1.5	30	70	100

COURSE OBJECTIVES

To learn

1. To Understand the concepts of scripting languages for developing web-based projects
2. To understand the applications the of Ruby, TCL, Perl scripting languages.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Ability to understand the differences between Scripting languages and programming languages
2. Able to gain some fluency programming in Ruby, Perl, Tcl.

LIST OF EXPERIMENTS

1. Write a Ruby script to create a new string which is n copies of a given string where n is a nonnegative integer
2. Write a Ruby script which accept the radius of a circle from the user and compute the parameter and area.
3. Write a Ruby script which accept the user's first and last name and print them in reverse order with a space between them
4. Write a Ruby script to accept a filename from the user print the extension of that
5. Write a Ruby script to find the greatest of three numbers
6. Write a Ruby script to print odd numbers from 10 to 1
7. Write a Ruby script to check two integers and return true if one of them is 20 otherwise return their sum
8. Write a Ruby script to check two temperatures and return true if one is less than 0 and the other is greater than 100
9. Write a Ruby script to print the elements of a given array
10. Write a Ruby program to retrieve the total marks where subject name and marks of a student stored in a hash
11. Write a Ruby program to print Fibonacci series
12. Ruby program to count the number of digits in a number
13. Write a TCL script to find the factorial of a number
14. Write a TCL script that multiplies the numbers from 1 to 10
15. Write a TCL script for Sorting a list using a comparison function
16. Write a TCL script to (i)create a list (ii) append elements to the list (iii)Traverse the list

(iv)Concatenate the list
17. Write a TCL script to comparing the file modified times.
18. Write a TCL script to Copy a file and translate to native format.
19. Write a TCL script that sums the numbers in a list
20. Write a TCL script that uses the Euclidean Algorithm to print the GCD (greatest common divisor) of two numbers
21. a) Write a Perl script to find the largest number among three numbers.
b) Write a Perl script to print the multiplication tables from 1-10 using subroutines.
22. Write a Perl program to implement the following list of manipulating functions
a)Shift b) Unshift c) Push
23. a) Write a Perl script to substitute a word, with another word in a string.
b) Write a Perl script to validate IP address and email address.
24. Write a Perl script to print the file in reverse order using command line arguments
25.Write a Perl script by using hash

TEXT BOOKS

1. Practical Programming in Tcl and Tk by Brent Welch, Ken Jones
2. Tcl and the Tk Toolkit by John K. Oosterhout.
3. The Ruby Programming Language by David Flanagan, Yukihiro Matsumoto,O'Reilly Media, Inc.
4. Programming Perl, 4th Edition by Tom Christiansen, briand foy, Larry Wall, Jon Orwant Released February 2012Publisher(s): O'Reilly Media, Inc.

REFERENCE BOOKS

1. Programming Perl 4e: Unmatched Power for Text Processing and Scripting Paperback – 16 March 2012 by Tom Christiansen (Author), Brian D. Foy (Author), Larry Wall (Author), Jon Orwant (Author)

WEB REFERENCES

1. https://www.perl.org/books/beginning-perl/
2. http://www.tcl.tk/scripting/index.tml
3. https://ruby-doc.com/docs/ProgrammingRuby/

E -TEXT BOOKS

1. Effective Ruby: 48 Specific Ways to Write Better Ruby (Effective Software Development Series) 1st Edition, Kindle Edition by Peter J. Jones
2. TCL for Web Nerds by Hal Abelson, Philip Greenspun, Lydia Sandon

MOOCS COURSES

1. https://www.udemy.com/courses/search/?src=ukw&q=PERL
2. https://www.udemy.com/course/vsd-tcl-programming-from-novice-to-expert-part-2/
3. https://www.udemy.com/courses/search/?src=ukw&q=RUBY

St. Martin's Engineering College

UGC Autonomous
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Dhulapally, Secunderabad-500 100
www.smec.ac.in

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

ENVIRONMENTAL SCIENCE

III B. TECH- II SEMESTER (R 20)

Course Code	Category	Hours / Week		Credits	Maximum Marks		
		T	P	C	CIE	SEE	Total
*ES607MC	B. Tech	0	0	0	100	-	100

COURSE OBJECTIVES

To learn

1. Analyze the inter relationship between living organism and environment
2. Describe various types of natural resources available on the earth surface
3. Identify the values, threats of biodiversity, endangered and endemic species of India along with the conservation of biodiversity
4. Explain the causes, effects and control measures of various types of environmental pollutions
5. Understand the importance of environment by assessing its impact on the human world

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Differentiate between various biotic and a biotic components of ecosystem
2. Describe the various types of natural resources
3. Examine the values, threats of biodiversity, the methods of conservation, endangered and endemic species of India
4. Illustratecauses,effects,andcontrolmeasuresofvarioustypesofenvironmentalpollutions
5. Understand technologies on the basis of ecological principles environmental regulations which in turn helps in sustainable development

UNIT-I	ECOSYSTEMS	Classes: 8

Definition, Scope, and Importance of ecosystem. Classification, structure and function of an ecosystem, food chains, food webs and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnifications.

UNIT-II	NATURAL RESOURCES	Classes: 8

Classification of Resources: Living and Non-Living resources.
Water Resources: Use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems.
Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources
Land resources: Forest resources. Energy resources: growing energy needs, renewable and non-renewable energy sources, use of alternate energy source, case studies.

UNIT-III	BIODIVERSITY AND BIOTIC RESOURCES	Classes: 7

Introduction, Definition, genetic, species and eco system diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic, optional values and hotspots of biodiversity. Endangered and endemic species of India, Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation.

UNIT-IV	ENVIRONMENTAL POLLUTION	Classes: 9

Types of pollution, Causes, effects and prevention and control measures of air, water, soil, noise and thermal pollution. Solid waste and e-waste management.

UNIT-V	ENVIRONMENTAL POLICY AND SUSTAINABLE DEVELOPEMENT	Classes: 10

Concept of sustainable development: Sustainable development goals. Threats to sustainability: Population explosion- crazy consumerism. Green building concept. Water conservation, Rainwater harvesting, watershed management. Environmental Policies and Legislations: Environment Protection Act, Air (Prevention and Control of Pollution)Act, Forest(conservation) Act, 1980. Wildlife Protection Act.

TEXT BOOKS

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission
2. Environmental Studies by R. Rajagopalan, Oxford UniversityPress.
3. Textbook of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications
4. Dr. P. D Sharma, "Ecology and Environment", Rastogi Publications, New Delhi,12 Edition, 2015

REFERENCE BOOKS

1. Environmental Studies by Anubha Kaushik, 4th Edition, New age internationalpublishers
2. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Pvt. Ltd, NewDelhi
3. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHL Learning Pvt. Ltd, NewDelhi
4. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIAedition

WEB REFERENCES

1. https://www.britannica.com/science/ecosystem
2. https://ocw.mit.edu/resources/#EnvironmentandSustainability

E -TEXT BOOKS

1. P N Palani samy Environmental Science ISBN:9788131773253, eISBN:97899332509771 Edition: Second edition
2. Environmental Studies. Author, Dr. J. P. Sharma. Publisher, Laxmi Publications, 2009 ISBN, 8131806413, 9788131806418.

MOOCS COURSES

1. https://nptel.ac.in/courses/122103039/38
2. https://nptel.ac.in/courses/106105151/12

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

MICROWAVE AND OPTICAL COMMUNICATION

IV B. TECH- I SEMESTER (R 20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EC701PC	B.Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

To learn

1. To get familiarized with microwave frequency bands, their applications and to understand the limitations and losses of conventional tubes at these frequencies.
2. To distinguish between different types of microwave tubes, their structures and principles of microwave power generation
3. To understand the concepts of waveguide components
4. To impart the knowledge of Scattering Matrix, its formulation and utility, and establish the S-Matrix for various types of microwave junctions
5. Understand the utility of Optical Fibres in Communications

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

1. Known power generation at microwave frequencies and derive the performance characteristics
2. To realize the need for solid state microwave sources and understand the principles of solid State devices.
3. Distinguish between the different types of waveguide and ferrite components, and select proper components for engineering applications
4. Understand the utility of S-parameters in microwave component design and learn the measurement procedure of various microwave parameters
5. Understand the mechanism of light propagation through Optical Fibers.

UNIT-I	MICROWAVE TUBES	Classes:12

MicrowaveTubes:Limitations and Losses of conventional Tubes at Microwave Frequencies, Microwave Tubes – O Type and M Type Classifications, O-type Tubes: 2 Cavity Klystrons – Structure, Reentrant Cavities, Velocity Modulation Process and Applegate Diagram, Bunching Process and Small Signal Theory – Expressions for O/P Power and Efficiency. Reflex Klystrons – Structure, Velocity Modulation and Applegate Diagram, Mathematical Theory of Bunching, Power Output, Efficiency, Oscillating

Modes and O/P Characteristics.

Helix TWTs: Types and Characteristics of Slow Wave Structures; Structure of TWT and Amplification Process (qualitative treatment), Suppression of Oscillations, Gain Considerations

UNIT-II	M-TYPE TUBES	Classes:12

Introduction, Cross-field Effects, Magnetrons – Different Types, Cylindrical Traveling Wave Magnetron– Hull Cut-off and Hartree Conditions, Modes of Resonance and PI-Mode Operation, Separation of PI- Mode, o/p characteristics,

Microwave Solid State Devices: Introduction, Classification, Applications. TEDs – Introduction, Gunn Diodes – Principle, RWH Theory, Characteristics, Modes of Operation - Gunn Oscillation Modes, Principle of operation of IMPATT, TRAPATT Devices and BARITT Diodes.

UNIT-III	WAVEGUIDE COMPONENTS	Classes:12

Coupling Mechanisms– Probe, Loop, Aperture types. Waveguide Discontinuities– Waveguide Windows, Tuning Screws and Posts, waveguide terminators .Waveguide Attenuators–Different Types, Resistive Card and Rotary Vane Attenuators; Waveguide Phase Shifters Types, Dielectric and Rotary Vane Phase Shifters, Waveguide Multiport Junctions - E plane and Hplane Tees. Ferrites– Composition and Characteristics, Faraday Rotation, Ferrite Components –Gyrator,Isolator,

UNIT-IV	SCATTERING MATRIX	Classes:11

Scattering Matrix Properties, Directional Couplers – 2 Hole, Bethe Hole, [s] matrix of Magic Tee and Circulator.

Microwave Measurements: Description of Microwave Bench – Different Blocks and their Features, Errors and Precautions, Measurement of Attenuation, Frequency. Standing Wave Measurements, measurement of Low and High VSWR, Cavity Q, Impedance Measurements, Measurements of phase

UNIT-V	OPTICAL FIBER TRANSMISSION MEDIA	Classes:10

Optical Fiber types, Light Propagation, Optical fiber Configurations, Optical fiber classifications, Losses in Optical Fiber cables, Light Sources, Optical Sources, Light Detectors, LASERS, WDM Concepts,Optical Fiber System link budget

TEXT BOOKS

1. Microwave Devices and Circuits– Samuel Y.Liao, Pearson, 3rd Edition, 2003.
2. Electronic Communications Systems- Wayne Tomasi, Pearson,5th Edition

REFERENCE BOOKS

1. Optical Fiber Communication– GerdKeiser, TMH,4th Ed.,2008.
2. Microwave Engineering-David M. Pozar, John Wiley & Sons (Asia) Pvt Ltd., 1989, red., 2011 Reprint.
3. Microwave Engineering- G.S.Raghuvanshi, Cengage Learning India Pvt.Ltd., 2012.
4. Electronic Communication System– George Kennedy, 6thEd., McGrawHill.

WEB REFERENCES

1. https://www.khanacademy.org/science/physics/magnetic-forces-and-magnetic-fields/magnetic-field-current-carrying-wire/v/magnetism-6-magnetic-field-due-to-current
E -TEXT BOOKS
1. https://www.electrical4u.com
MOOCS COURSES
1. https://nptel.ac.in/courses/108106073/ 2. https://nptel.ac.in/courses/108106073/7 3. https://nptel.ac.in/courses/108106073/23 4. https://nptel.ac.in/courses/108106073/38

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

PROFESSIONAL PRACTICE, LAW & ETHICS

IV B. TECH- I SEMESTER (R20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
SM702MS	B.Tech	2	0	0	2	30	70	100

COURSE OBJECTIVES

1. To make the students understand the types of roles they are expected to play in the society as practitioners of the civil engineering profession
2. To develop some ideas of the legal and practical aspects of their profession.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. The students will understand the importance of professional practice, Law and Ethics in their personal lives and professional careers.
2. The students will learn the rights and responsibilities as an employee, team member and a global citizen

UNIT-I	ECOSYSTEMS	Classes: 8

Definition, Scope, and Importance of ecosystem. Classification, structure and function of an ecosystem, food chains, food webs and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnifications.

UNIT-II	NATURAL RESOURCES	Classes: 8

Classification of Resources: Living and Non-Living resources.
Water Resources: Use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems.
Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources
Land resources: Forest resources. Energy resources: growing energy needs, renewable and non-renewable energy sources, use of alternate energy source, case studies.

UNIT-III	BIODIVERSITY AND BIOTIC RESOURCES	Classes: 7

Introduction, Definition, genetic, species and eco system diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic, optional values and hotspots of biodiversity. Endangered and endemic species of India, Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation.

UNIT-IV	ENVIRONMENTAL POLLUTION	Classes: 9
Types of pollution, Causes, effects and prevention and control measures of air, water, soil, noise and thermal pollution. Solid waste and e-waste management.		

UNIT-V	ENVIRONMENTAL POLICY AND SUSTAINABLE DEVELOPEMENT	Classes: 10
Concept of sustainable development: Sustainable development goals. Threats to sustainability: Population explosion- crazy consumerism. Green building concept. Water conservation, Rainwater harvesting, watershed management. Environmental Policies and Legislations: Environment Protection Act, Air (Prevention and Control of Pollution)Act, Forest(conservation) Act, 1980. Wildlife Protection Act.		

TEXT BOOKS

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission
2. Environmental Studies by R. Rajagopalan, Oxford UniversityPress.
3. Textbook of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications
4. Dr. P. D Sharma, “Ecology and Environment”, Rastogi Publications, New Delhi,12 Edition, 2015

REFERENCE BOOKS

1. Environmental Studies by Anubha Kaushik, 4 Edition, New age internationalpublishers
2. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Pvt. Ltd, NewDelhi
3. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHL Learning Pvt. Ltd, NewDelhi
4. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIAedition

WEB REFERENCES

1. https://www.britannica.com/science/ecosystem
2. https://ocw.mit.edu/resources/#EnvironmentandSustainability

E -TEXT BOOKS

1. P N Palani samy Environmental Science ISBN:9788131773253, eISBN:97899332509771 Edition: Second edition
2. Environmental Studies. Author, Dr. J. P. Sharma. Publisher, Laxmi Publications, 2009 ISBN, 8131806413, 9788131806418.

MOOCS COURSES

1. https://nptel.ac.in/courses/122103039/38
2. https://nptel.ac.in/courses/106105151/12

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

MICROWAVE AND OPTICAL COMMUNICATIONS LAB

IV B. TECH- I SEMESTER (R 20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EC703PC	B. Tech	0	0	2	2	30	70	100

COURSE OBJECTIVES

1. To understand Characteristics of reflex klystron.
2. To understand characteristic of gunn diodes
3. To understand the concepts of attenuation measurements.
4. To impart the knowledgeof VSWR measurement its formulation and utility
5. Understand the utility of Optical Fibers in Communications

COURSE OUTCOMES

Upon successful completion of the course, the student is able

1. Know the characteristic of reflex klystron and derive the its performance
2. To understand characteristic of gunn diodes
3. To understand the concepts of attenuation measurements.
4. To impart the knowledgeof VSWR measurement its formulation and utility
5. Understand the utility of optical fibers in communication

LIST OF EXPERIMENTS

1. Reflex Klystron Characteristics.
2. Gunn Diode Characteristics.
3. Attenuation measurement
4. Directional coupler Characteristics
5. Frequency measurement
6. Attenuation measurement
7. VSWR measurement
8. Characterization of LEDs
9. Characterization of Laser diodes
10. Intensity modulation of laser output through an optical fiber
11. Measurement of data rate aperture of fiber cable
12. Measurement of Numerical aperture of fiber cable
13. Measurement of losses of optical link

TEXT BOOKS

1. Microwave Devices and Circuits– Samuel Y. Liao, Pearson, 3rd Edition, 2003.
2. Electronic Communications Systems- Wayne Tomasi, Pearson, 5th Edition

REFERENCE BOOKS

1. Optical Fiber Communication– Gerd Keiser, TMH, 4th Ed., 2008.
2. Microwave Engineering-David M. Pozar, John Wiley & Sons (Asia) Pvt Ltd., 1989, 3rd ., 2011Reprint.
3. Microwave Engineering- G.S.Raghuvanshi, Cengage Learning India Pvt. Ltd., 2012.
4. Electronic Communication System– George Kennedy, 6thEd., McGrawHill.

WEB REFERENCES

1. https://www.khanacademy.org/science/physics/magnetic-forces-and-magnetic-fields/magnetic-field-current-carrying-wire/v/magnetism-6-magnetic-field-due-to-current

E -TEXT BOOKS

1. https://www.electrical4u.com

MOOCS COURSES

1. https://nptel.ac.in/courses/108106073/
2. https://nptel.ac.in/courses/108106073/7

List of Professional Electives

Professional Elective-I

EC511PE	Computer Organization & Operating Systems
EC512PE	Error Correcting Codes
EC513PE	Electronic Measurements and Instrumentation

Professional Elective-II

EC611PE	Object Oriented Programming through Java
EC612PE	Mobile Communications and Networks
EC613PE	Embedded System Design
EC614PE	Advanced Microcontrollers

Professional Elective-III

EC711PE	Artificial Neural Networks
EC712PE	Scripting Languages
EC713PE	Digital Image Processing
EC714PE	Advanced Digital Signal Processing

Professional Elective-IV

EC721PE	Biomedical Instrumentation
EC722PE	Database Management Systems
EC723PE	Network Security and Cryptography

Professional Elective-V

EC811PE	Satellite Communications
EC812PE	Radar Systems
EC813PE	Wireless Sensor Networks

Professional Elective-VI

EC821PE	System on Chip Architecture
EC822PE	Test and Testability
EC823PE	Low Power VLSI Design

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COMPUTER ORGANIZATION & OPERATING SYSTEMS

(Professional Elective-I)

III B. TECH- I SEMESTER (R 20)								
Course Code	**Programme**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
EC511PE	**B.Tech**	**3**	**0**	**0**	**3**	**30**	**70**	**100**

COURSE OBJECTIVES

To learn

1. To understand the structure of a computer and its operations.
2. To understand the RTL and Micro-level operations and control in a computer.
3. Understanding the concepts of I/O and memory organization and operating systems.

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

1. Able to visualize the organization of different blocks in a computer.
2. Able to use micro-level operations to control different units in a computer.
3. Able to use Operating systems in a computer.

UNIT-I	BASIC STRUCTURE OF COMPUTERS	Classes: 12

Basic Structure of Computers: Computer Types, Functional Unit, Basic OPERATIONAL Concepts,Bus Structures, Software, Performance, Multiprocessors and Multi Computers, Data Representation,FixedPointRepresentation,Floating–PointRepresentation.

Register Transfer Language and Micro Operations: Register Transfer Language, Register Transfer Bus and Memory Transfers, Arithmetic Micro Operations, Logic Micro Operations, Shift Micro Operations, Arithmetic Logic Shift Unit, Instruction Codes, Computer Registers Computer Instructions– Instruction Cycle, Memory – Reference Instructions, Input – Output and Interrupt, STACK Organization, Instruction Formats, Addressing Modes, DATA Transfer and Manipulation, Program Control, Reduced Instruction Set Computer.

UNIT-II	MICRO PROGRAMMED CONTROL	Classes:13

Micro Programmed Control: Control Memory, Address Sequencing, Microprogram Examples, Design of Control Unit, Hard Wired Control, Microprogrammed Control

The Memory System: Basic Concepts of Semiconductor RAM Memories, Read-Only Memories,Cache Memories Performance Considerations, Virtual Memories Secondary Storage, Introduction toRAID.

UNIT-III	INPUT-OUTPUT ORGANIZATION	Classes:10

Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer Modes, Priority Interrupt, Direct Memory Access, Input–Output Processor (IOP), Serial Communication; Introduction to Peripheral Components, Interconnect (PCI) Bus, Introduction to Standard Serial Communication Protocols like RS232, USB, IEEE1394.

UNIT-IV	OPERATING SYSTEMS OVERVIEW	Classes:12

Operating Systems Overview: Overview of Computer Operating Systems Functions, Protection and Security, Distributed Systems, Special Purpose Systems, Operating Systems Structures-Operating System Services and Systems Calls, System Programs, Operating Systems Generation

Memory Management: Swapping, Contiguous Memory Allocation, Paging, Structure of The Page Table, Segmentation, Virtual Memory, Demand Paging, Page-Replacement Algorithms, Allocation of Frames, Thrashing Case Studies - UNIX, Linux, Windows

Principles of Deadlock: System Model, Deadlock Characterization, Deadlock Prevention, DetectionandAvoidance,RecoveryfromDeadlock.

UNIT-V	SYSTEM INTERFACE	Classes: 12

File System Interface: The Concept of a File, Access Methods, Directory Structure, File System Mounting, File Sharing, Protection.

File System Implementation: File System Structure, File System Implementation, Directory Implementation, Allocation Methods,Free-Space Management

TEXT BOOKS

1. Computer Organization – Carl Hamacher, Zvonks Vranesic, Safea Zaky, Vth Edition, McGraw Hill.
2. Computer Systems Architecture –M.Moris Mano, IIIEdition, Pearson

REFERENCE BOOKS

1. Computer Organization and Architecture–William Stallings Sixth Edition, Pearson
2. Structured Computer Organization–Andrew S.Tanenbaum, 4th Edition PHI
3. Fundamentals of Computer Organization and Design-Sivaraama Dandamudi Springer Int.Edition.
4. Operating Systems– Internals and Design Principles, Stallings, sixthEdition–2009, Pearson Education.
5. Modern Operating Systems, Andrew S Tanenbaum 2nd Edition, PHI.
6. Principles of Operating Systems, B.L.Stuart, CengageLearning, IndiaEdition.

WEB REFERENCES

1. https://www.britannica.com/technology/operating-system
2. https://www.cise.ufl.edu/~mssz/CompOrg/CDAintro.html
3. https://en.wikipedia.org/wiki/Operating_system

E -TEXT BOOKS

1. https://www.smartzworld.com/notes/computer-organization-and-operating-systems-notes-pdf-coos-notes-pdf/

MOOCS COURSES
1. https://onlinecourses.swayam2.ac.in/cec20_cs06/preview 2. https://onlinecourses.nptel.ac.in/noc21_cs44/preview 3. https://www.computerscience.org/resources/online-courses

St. Martin's Engineering College
UGC Autonomous
NBA & NAAC A+ Accredited
Dhulapally, Secunderabad-500 100
www.smec.ac.in

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

ERROR CORRECTING CODES

(Professional Elective-I)

III B. TECH- I SEMESTER (R20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EC512PE	B.Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

To learn

1. To acquire the knowledge in measurement of information and errors.
2. To study the generation of various code methods used in communications.
3. To study the various application of codes.

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

1. Able to transmit and store reliable data and detect errors in data through coding.
2. Able to understand the designing of various codes like block codes, cyclic codes, convolution codes, turbo codes and space codes.

UNIT-I CODING AND BLOCK CODES — Classes: 12

Coding for Reliable Digital Transmission and storage: Mathematical model ofInformation, ALogarithmic Measure of Information, Average and Mutual Information and Entropy, Types of Errors, Error ControlStrategies.

Linear Block Codes: Introduction to Linear Block Codes, Syndrome and Error Detection, MinimumDistance of a Block code, Error-Detecting and Error-correcting Capabilities of a Block code, Standardarray and Syndrome Decoding, Probability of an undetected error for Linear Codes over a BSC,HammingCodes.ApplicationsofBlockcodesforErrorcontrol in datastorage system

UNIT-II CYCLIC CODES — Classes:13

Cyclic Codes: Description, Generator and Parity-check Matrices, Encoding, Syndrome Computation and Error Detection, Decoding, Cyclic Hamming Codes, Shortened cyclic codes, Error-trapping decoding for cyclic codes, Majority logic decoding for cyclic codes.

UNIT-III CONVOLUTIONAL CODES — Classes:10

Convolution Codes: Encoding of Convolutional Codes, Structural and Distance Properties, maximum likelihood decoding, Sequential decoding, Majority- logic decoding of Convolution codes. Application of Viterbi Decoding and Sequential Decoding, Applications of Convolution codes in ARQ system.

UNIT-IV	TURBO CODES	Classes:12

Turbo Codes: LDPC Codes- Codes based on sparse graphs, Decoding for binary erasure channel, Log-likelihood algebra, Brief propagation, Product codes, Iterative decoding of product codes, Concatenated convolutional codes- Parallel concatenation, The UMTS Turbo code, Serial concatenation, Parallel concatenation, Turbo decoding

UNIT-V	SPACE TIME CODES	Classes: 12

Space-Time Codes: Introduction, Digital modulation schemes, Diversity, Orthogonal space- Time Block codes, Altamonte's schemes, Extension to more than Two Transmit Antennas, Simulation Results, Spatial Multiplexing: General Concept, Iterative APP Preprocessing and Per-layer Decoding, Linear Multilayer Detection, Original BLAST Detection, QL Decomposition and Interface Cancellation, Performance of Multi – Layer Detection Schemes, Unified Description by Linear Dispersion Codes..

TEXT BOOKS

1. Error Control Coding- Fundamentals and Applications –Shu Lin, Daniel J. Costello, Jr, Prentice Hall, Inc.
2. Error Correcting Rhee Coding Theory-Man Young - 1989, McGraw-Hill

REFERENCE BOOKS

1. Error Correcting Coding Theory- Man Young Rhee-1989, McGraw–Hill Publishing, 19
2. Digital Communications- Fundamental and Application- Bernard Sklar, PE.
3. Digital Communications-John G. Proakis, 5th ed., 2008, TMH.
4. Introduction to Error Control Codes-SalvatoreGravano-oxford

WEB REFERENCES

1. https://www.sanfoundry.com/best-reference-books-error-correcting-codes/
2. https://en.wikipedia.org/wiki/Error_correction_code
3. https://en.wikipedia.org/wiki/Error_detection_and_correction

E -TEXT BOOKS

1. https://www.routledge.com/Error-Correcting-Codes-A-Mathematical-Introduction/Baylis/p/book/9780412786907
2. https://link.springer.com/book/10.1007/978-3-319-51103-0

MOOCS COURSES

1. https://ocw.mit.edu/courses/mathematics/18-413-error-correcting-codes-laboratory-spring-2004/
2. https://onlinecourses.nptel.ac.in/noc20_ee94/preview

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

(Professional Elective-I)

III B. TECH- I SEMESTER (R20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EC513PE	B.Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

To learn

1. It provides an understanding of various measuring system functioning and metrics for Performance analysis.
2. Provides understanding of principle of operation, working of different electronic instruments
3. Understanding the concepts and working principles of Oscilloscopes and Special Purpose Oscilloscopes.
4. Understanding the concepts of various measuring bridges and their balancing conditions.
5. Provides understanding of use of various measuring techniques for measurement of different physical parameters using different classes of transducers.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. **Identify** the various electronic instruments based on their specifications for carrying out a particular task of measurement.
2. **Analyze** various types of signal generators, signal analyzers for generating and analyzing various real-time signals.
3. **Understand** the working principles of Oscilloscopes and Special Purpose Oscilloscopes.
4. **Select** appropriate passive or active transducers for measurement of physical phenomenon.
5. **Measure** various physical parameters by appropriately selecting the transducers,discussdifferent types of bridges.

UNIT-I	INTRODUCTION OF MEASURING SYSTEMS	Classes: 12

Block Schematics of Measuring Systems , Performance Characteristics, Static Characteristics, Accuracy, Precision, Resolution, Types of Errors, Gaussian Error, Root Sum Squares formula, Dynamic Characteristics, Repeatability, Reproducibility, Fidelity, Lag.

Measuring Instruments: DC Voltmeters, D'Arsonval Movement, DC Current Meters, AC Voltmeters and Current Meters, Ohmmeters, Multimeters, Meter Protection, Extension of Range, True RMS Responding Voltmeters, Specifications of Instruments.

UNIT-II	SIGNAL ANALYZERS AND SIGNAL GENERATORS	Classes: 12

Signal Analyzers: AF, HF Wave Analyzers, Harmonic Distortion, Heterodyne wave Analyzers, Spectrum Analyzers, Digital Fourier analyzers, Power Analyzers, Capacitance-Voltage Meters, Oscillators.

Signal Generators: AF, RF Signal Generators, Sweep Frequency Generators, Pulse and Square wave Generators, Function Generators, Arbitrary Waveform Generator, Video Signal Generators, and Specifications

UNIT-III	OSCILLOSCOPES AND SPECIAL PURPOSE OSCILLOSCOPES	Classes: 12

Oscilloscopes: CRT, Block Schematic of CRO, Time Base Circuits, Lissajous Figures, CRO Probes, High Frequency CRO Considerations, Delay lines, Applications: Measurement of Time, Period and Frequency Specifications.

Special Purpose Oscilloscopes: Dual Trace, Dual Beam CROs, Sampling Oscilloscopes, Storage Oscilloscopes, Digital Storage CROs.

UNIT-IV	TRANSDUCERS	Classes: 12

Classification, Strain Gauges, Bounded, unbounded; Force and Displacement Transducers, Resistance Thermometers, Hotwire Anemometers, LVDT, Thermocouples, Thermistors and Sensistors, Synchros, Special Resistance Thermometers, Digital Temperature sensing system, Piezoelectric Transducers, Variable Capacitance Transducers, Magneto Strictive Transducers, gyroscopes, accelerometers.

UNIT-V	BRIDGES, MEASUREMENT OF PHYSICAL PARAMETERS	Classes: 12

Bridges: Wheat Stone Bridge, Kelvin Bridge, Maxwell Bridge, Schearing bridge.

Measurement of Physical Parameters: Flow Measurement, Displacement Meters, Liquid level Measurement, Measurement of Humidity and Moisture, Velocity, Force, Pressure – High Pressure, Vacuum level, Temperature -Measurements, Data Acquisition Systems.

TEXT BOOKS

1. Modern Electronic Instrumentation and Measurement Techniques: A.D. Helbincs, W. D.Cooper: PHI 5th Edition 2003.
2. Electronic Instrumentation: H. S. Kalsi – TMH, 2nd Edition 2004.

REFERENCE BOOKS

1. Electrical and Electronic Measurement and Measuring Instruments – A K Sawhney, Dhanpat Rai & Sons, 2013.
2. Electronic Instrumentation and Measurements – David A. Bell, Oxford Univ. Press, 1997.
3. Industrial Instrumentation: T.R. Padmanabham Springer 2009.
4. Electronic Measurements and Instrumentation – K. Lal Kishore, Pearson Education 2010.

WEB REFERENCES

1. https://nptel.ac.in/courses/108/105/108105153/
2. https://nptel.ac.in/noc/courses/noc19/SEM2/noc19-ee44/
3. https://www.btechguru.com/GATE--electrical-engineering--electrical-and-electronic-measurements-video-lecture--33--216.html
4. http://www.nptelvideos.in/2012/11/industrial-instrumentation.html

E -TEXT BOOKS

1. http://ads.baa.uk.com/measurements_and_instrumentation_gnanavadivel.pdf (Authors:U.A.Bakshi, A.V.Bakshi)
2. https://books.askvenkat.org/tag/electronic-measurements-and-instrumentation-by-kalsi-pdf-free-download.

MOOCS COURSES
1. https://onlinecourses.nptel.ac.in/noc19_ee44/preview 2. https://www.mooc-list.com/tags/electrical-instruments 3. https://www.coursera.org/lecture/quantitative-methods/4-02-measurement-structure-lR7MV

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

OBJECT ORIENTED PROGRAMMING THROUGH JAVA

(Professional Elective-II)

III B. TECH- II SEMESTER (R20)								
Course Code	**Programme**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
EC611PE	**B.Tech**	**3**	**0**	**0**	**3**	**30**	**70**	**100**

COURSE OBJECTIVES

To learn

1. Introduces Object Oriented Programming Concepts Using The Java Language
2. Introduces The Principles Of Inheritance And Polymorphism; And Demonstrates How They Relate To The Design Of Abstract Classes.
3. Introduces The Implementation Of Packages And Interfaces.
4. Introduces Exception Handling, Event Handling and Multithreading.
5. Introduces The Design Of Graphical User Interface Using Applets And Swings.

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

1. Develop Applications for Range of Problems Using Object-Oriented Programming Techniques
2. Design Simple Graphical User Interface Applications.

UNIT-I	OBJECT ORIENTED THINKING AND JAVA BASICS	Classes: 12

Need for OOP Paradigm, Summary of OOP Concepts, Coping with Complexity, Abstraction Mechanisms, A Way of Viewing World – Agents, Responsibility, Messages, Methods, History of Java, Java Buzzwords, Data Types, Variables, Scope and Life Time of Variables, Arrays, Operators, Expressions, Control Statements, Type Conversion and Casting, Simple
Java Program, Concepts of Classes, Objects, Constructors, Methods, Access Control, This Keyword, Garbage Collection, Overloading Methods and Constructors, Method Binding, Inheritance, Overriding and Exceptions, Parameter Passing, Recursion, Nested and Inner Classes, Exploring String Class.

UNIT-II	INHERITANCE, PACKAGES AND INTERFACES	Classes:13

Hierarchical Abstractions, Base Class Object, Subclass, Subtype, Substitutability, Forms of Inheritance- Specialization, Specification, Construction, Extension, Limitation, Combination, Benefits of Inheritance, Costs of Inheritance. Member Access Rules, Super Uses, Using Final with Inheritance, Polymorphism- Method Overriding, Abstract Classes, The Object
Class. Defining, Creating and Accessing a Package, Understanding Class path, Importing Packages, Differences between Classes and Interfaces, Defining an Interface,

Implementing Interface, Applying Interfaces, Variables in Interface and Extending Interfaces, Exploring Java.IO.

UNIT-III	EXCEPTION HANDLING AND MULTITHREADING	Classes:10

Concepts of Exception Handling, Benefits of Exception Handling, Termination or Resumptive Models, Exception Hierarchy, Usage of Try, Catch, Throw, Throws and Finally, Built in Exceptions, Creating Own Exception Sub Classes. String Handling, Exploring Java Util, Differences between Multi-Threading and Multitasking, Thread Life Cycle, Creating Threads, Thread Priorities, Synchronizing Threads, Interthread Communication, Thread Groups, Daemon Threads. Enumerations, Auto boxing, Annotations, Generics.

UNIT-IV	EVENT HANDLING	Classes:12

Events, Event Sources, Event Classes, Event Listeners, Delegation Event Model, Handling Mouse and Keyboard Events, Adapter Classes. The AWT Class Hierarchy, User Interface Components- Labels, Button, Canvas, Scrollbars, Text Components, Check Box, Check Box Groups, Choices, Lists Panels – Scrollpane, Dialogs, Menubar, Graphics, Layout Manager – Layout Manager Types – Border, Grid, Flow, Card and Grid Bag.

UNIT-V	APPLETS	Classes: 12

Applets: Concepts f Applets, Differences between Applets and Applications, Life Cycle of an Applet, Types of Applets, Creating Applets, Passing Parameters to Applets.
Swing: Introduction, Limitations of AWT, MVC Architecture, Components, Containers, Exploring Swing- Japplet, Jframe and Jcomponent, Icons and Labels, Text Fields, Buttons – The Jbutton Class, Check Boxes, Radio Buttons, Combo Boxes, Tabbed Panes, Scroll Panes, Trees, and Tables.

TEXT BOOKS

1. Java the Complete Reference, 7th Edition, Herbert Schildt, TMH.
2. Understanding OOP with Java Updated Edition, T. Budd, Pearson Education.

REFERENCE BOOKS

1. An Introduction to Programming and OO Design using Java, J. Nino and F.A. Hosch, JohnWiley & Sons.
2. An Introduction to OOP, Third Edition, T. Budd, Pearson Education.
3. Introduction to Java Programming, Y. Daniel Liang, Pearson Education.
4. An Introduction to Java Programming and Object-Oriented Application Development, R.A.Johnson- Thomson.
5. Core Java 2, Vol 1, Fundamentals, Cay. S. Horstmann and Gary Cornell, Eighth Edition,Pearson Education.
6. Core Java 2, Vol 2, Advanced Features, Cay. S. Horstmann and Gary Cornell, eighth Edition,Pearson Education

WEB REFERENCES

1. https://www.edureka.co/blog/object-oriented-programming/
2. https://www.w3schools.com/java/java_oop.asp
3. https://developer.mozilla.org/en-US/docs/Learn/JavaScript/Objects/Object-oriented_JS
4. https://searchapparchitecture.techtarget.com/definition/object-oriented-programming-OOP

E -TEXT BOOKS

1. https://books.google.co.in/books/about/OBJECT_ORIENTED_PROGRAMMIN

G_WITH_C++_AND.html?hl=sv&id=e4T6DiT4JA0C&redir_esc=y

2. https://libribook.com/ebook/6372/java-programming-intermediate-concepts-fundamentals-object-oriented-pr
3. https://dl.acm.org/doi/book/10.5555/515815

MOOCS COURSES

1. https://www.coursera.org/learn/object-oriented-java
2. https://java-programming.mooc.fi/

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

MOBILE COMMUNICATIONS AND NETWORKS

(Professional Elective-II)

III B. TECH- II SEMESTER (R 20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EC612PE	B.Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

To learn

1. To provide the student with an understanding of the cellular concept, frequency reuse, handoff strategies.
2. To provide the student with an understanding of Co-channel and Non-Co-Channel Interferences.
3. To give the student an understanding of cell coverage for signal and traffic, diversity techniques and channel assignment
4. To give the student an understanding types of handoff.
5. To understand challenges and application of Adhoc wireless Networks.

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

1. Known the evolution of cellular and mobile communication system.
2. The student will be able to understand Co-Channel and Non-Co-Channel interferences.
3. Understand impairments due to multipath fading channel and how to overcome the different fading effects.
4. Familiar with cell coverage for signal and traffic, diversity, techniques, frequency management, Channel assignment and types of handoff.
5. Know the difference between cellular and Adhoc Networks and design goals of MAC Layer protocol.

UNIT-I	INTRODUCTION TO CELLULAR MOBILE RADIO SYSTEMS	Classes: 12

Limitations of Conventional Mobile Telephone Systems. Basic Cellular Mobile System, First, Second, Third and Fourth Generation Cellular Wireless Systems. Uniqueness of Mobile Radio Environment-Fading-Tie Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time.

Fundamentals of Cellular Radio System Design: Concept of Frequency Reuse, Co-Channel

Interference, Co-Channel Interference Reduction Factor, Desired C/I from a Normal Case in a Omni Directional Antenna System, System Capacity Improving Coverage and Capacity in Cellular Systems-Cell Splitting, Sectoring, Microcell Zone Concept.

UNIT-II	CO-CHANNEL INTERFERENCE	Classes:13

Co-Channel Interference: Measurement of Real Time Co-Channel Interference, Design of Antenna System, Antenna Parameters and their effects, diversity techniques-space diversity, polarization diversity, frequency diversity, time diversity.
Non Co-Channel Interference: Adjacent Channel Interference, Near end far end interference, cross talk, effects on coverage and interference by power decrease, antenna height decrease, effects of cell site components.

UNIT-III	CELL COVERAGE FOR SIGNAL AND TRAFFIC	Classes:10

Signal Reflections in flat and Hilly Terrain, effects of Human Made Structures, phase difference between direct and reflected paths, constant standard deviation, straight line path loss slope, general formula for mobile propagation over water and flat open area, near and long-distance propagation, path loss from a point to point prediction model in different conditions, merits of lee model.
Frequency Management and Channel Assignment: Numbering and Grouping, Setup Access and Paging Channels, Channel Assignments to Cell Sites and Mobile Units.

UNIT-IV	HANDOFFS AND DROPPED CALLS	Classes:12

Handoffs and Dropped Calls: Handoff Initiation, types of Handoff, Delaying Handoff, advantages of Handoff, Power Difference Handoff, Forced Handoff, Mobile Assisted and Soft Handoff, Intersystem handoff, Introduction to Dropped Call Rates and their Evaluation.

UNIT-V	AD HOC WIRELESS NETWORKS	Classes: 12

Ad Hoc Wireless Networks: Introduction, Cellular and Ad Hoc wireless Networks, Applications and Ad Hoc Wireless Networks, Issues in Ad Hoc Wireless Networks, Ad Hoc Wireless Internet, MAC Protocols for Ad Hoc Wireless, Introduction, issues in designing AMAC Protocol for Ad Hoc wireless Networks, Design Goals of AMAC protocol for Ad Hoc Wireless Networks, Classification of MAC Protocols.

TEXT BOOKS

1. Mobile Cellular Telecommunications-W.C.Y. Lee, Mc Graw Hill, 2nd Edn., 1989.
2. Wireless Communications-Theodore. S. Rapport, Pearson Education, 2nd Edn., 2002.

REFERENCE BOOKS

1. Ad Hoc Wireless Networks: Architectures and Protocols-C. Siva ram Murthy and B.S. Manoj,2004, PHI.
2. Modern Wireless Communications-Simon Haykin, Michael Moher, Pearson Education, 2005.
3. Wireless Communications and Networking, Vijay Garg, Elsevier Publications, 2007.
4. Wireless Communications-Andrea Goldsmith, Cambridge University Press, 2005.

WEB REFERENCES

1. https://www.cse.wustl.edu/~jain/refs/wir_refs.htm
2. https://ieeexplore.ieee.org/document/8613272
3. https://www.inderscience.com/jhome.php?jcode=ijmc
4. https://www.sciencedirect.com/journal/digital-communications-and-networks

E -TEXT BOOKS

1. https://www.tarc.edu.my/files/library/003BB4C0-D93D-46D2-836E-B58687AF94D6.pdf

2. coursera.org
3. https://www.bol.com/be/nl/p/mobile-telecommunications-networks/9200000035778265/

MOOCS COURSES

1. https://www.mooc-list.com/tags/mobile-communications
2. https://www.coursera.org/learn/wireless-communications
3. https://www.quora.com/Which-is-best-online-course-for-wireless-communication-Something-like-Coursera-or-edX

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

EMBEDDED SYSTEM DESIGN

(Professional Elective-II)

III B. TECH- II SEMESTER (R20)								
Course Code	**Programme**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
EC613PE	**B.Tech**	**3**	**0**	**0**	**3**	**30**	**70**	**100**

COURSE OBJECTIVES

To learn

1. To provide an overview of Design Principles of Embedded System.
2. To provide clear understanding about the role of firmware.
3. To understand the necessity of operating systems in correlation with hardware systems.
4. To learn the methods of interfacing and synchronization for tasking.

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

1. To understand the selection procedure of Processors in the embedded domain.
2. Design Procedure for Embedded Firmware.
3. To visualize the role of Real time Operating Systems in Embedded Systems.
4. To evaluate the Correlation between task synchronization and latency issues

UNIT-I	INTRODUCTION TO EMBEDDED SYSTEMS	Classes: 12

Introduction to Embedded Systems: Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

UNIT-II	TYPICAL EMBEDDED SYSTEM	Classes:13

Typical Embedded System: Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS), Memory: ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: Onboard and External Communication Interfaces.

UNIT-III	EMBEDDED FIRMWARE	Classes:10

Embedded Firmware: Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

UNIT-IV	RTOS BASED EMBEDDED SYSTEM DESIGN	Classes:12

RTOS Based Embedded System Design: Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.

UNIT-V	TASK COMMUNICATION	Classes: 12

Task Communication: Shared Memory, Message Passing, Remote Procedure Call and Sockets,
Task Synchronization: Task Communication/Synchronization Issues, Task Synchronization Techniques, Device Drivers, Methods to Choose an RTOS.

TEXT BOOKS

1. Introduction to Embedded Systems - Shibu K.V, Mc Graw Hill.

REFERENCE BOOKS

1. Embedded Systems - Raj Kamal, TMH.
2. Embedded System Design - Frank Vahid, Tony Givargis, John Wiley.
3. Embedded Systems – Lyla, Pearson, 2013
4. An Embedded Software Primer - David E. Simon, Pearson Education.

WEB REFERENCES

1. http://laboratorios.fi.uba.ar/lse/seminario/bibliografia-y-referencias.html?hl=en
2. https://ptolemy.berkeley.edu/projects/chess/eecs149/references.html
3. https://www.sanfoundry.com/best-reference-books-embedded-systems/
4. https://www.embeddedrelated.com/books-11/nf/all/all.php

E -TEXT BOOKS

1. https://www.e-booksdirectory.com/details.php?ebook=5392
2. https://books.google.co.in/books/about/Embedded_Systems_World_Class_Designs.html?id=-U_Kt_8EpuwC&redir_esc=y

MOOCS COURSES

1. https://www.mooc-list.com/tags/embedded-systems
2. https://onlinecourses.nptel.ac.in/noc20_cs14/preview

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

ADVANCED MICROCONTROLLERS

(Professional Elective-II)

III B. TECH- II SEMESTER (R20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EC614PE	B.Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

To learn

This subject focuses on the study of advanced microcontroller along with the use of microcontroller It also briefs the students about interfacing of memory and various I/O devices like A to D converter, D to A converter LED, LCD to advanced microcontrollers. The students learn the Programming language (Embedded C) used for microcontrollers. They will be able to use the advanced fast microcontroller in electrical engineering.

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

1. Understand how microcontroller and its peripherals function.
2. Interface to external peripherals
3. Program an embedded system in assembly and C
4. Design, implement and test a single-processor embedded systems for real-time applications
5. Optimizing embedded software for speed and size for industrial applications.

UNIT-I	ADVANCED CONCEPTS IN 8051 ARCHITECTURE	Classes:12

Review of 8051 architecture, concept of synchronous serial communication, SPI and I2C communication protocols, study of SPI port on 89LP 51RD2, study of SAR ADC/DAC MCP3304 / MCP 33, interfacing concepts for SPI based ADC/DAC, study of watchdog timer, study of PCA timer in different modes like capture mode, PWM generation mode, High speed output toggle mode Embedded 'C' programming for the above peripherals

UNIT-II	INTRODUCTION TO ARM CORTEX M PROFILE	Classes:12

CORTEX M0 and M4 cores, Harvard and Von Neumann architectures, CPU Registers, CPU Operating Modes, Thumb-2 Instruction Set, Memory Map, Bus Interface, bit bending , interrupt handling ,NVIC(Nested Vectored Interrupt Controller), system tick timer, Debug system

UNIT-III	INTRODUCTION TO STM32F4XX ARCHITECTURE	Classes:12
Features of STM32F4XXDSC, Memory and bus architecture, Multilevel AHB bus matrix, Memory organization, Memory map, NVIC Operation Exception Entry And Exit , Reset and Clock Circuit		
UNIT-IV	**ADVANCED CONCEPTS IN EMBEDDED 'C' PROGRAMMING**	**Classes:12**
Pointers, structures, unions, pointers to structures, pointers to functions, addressing mechanism for memory mapped registers, enumerators, Interrupt Handlers **Embedded software architecture:** Round robin architecture, Round robin with interrupt architecture		
UNIT-V	**STM32F4 PERIPHERALS & PROGRAMING**	**Classes: 12**
GPIO, General Purpose Timers, GPIO :Introduction, Main Features , Function Description, Registers, Basic timers (TIM6&TIM7): introduction, main features, functional description, registers Embedded C Programming for GPIO and Timers		

TEXT BOOKS

1. Datasheet of 89V51RD2 (www.nxp.com, www.atmel.com)
2. Datasheet MCP3304/MCP4822 (www.microchip.com)
3. The 8051 Microcontroller and Embedded Systems Using Assembly and C, By Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay

REFERENCE BOOKS

1. David E. Simon. "An Embedded Software Primer" Addision Wesley Pearson Education, 1999.
2. "The Definitive Guide to ARM® CORTEX®-M3 and CORTEX®-M4 Processors (Third Edition)",
3. By Joseph Yiu, Newnes, Elsevier
4. . "The insider's guide to the STM32 ARM based Microcontroller", (www.hitex.com)
5. . Datasheet, programming and user reference manual of STM32F4xx (www.st.com)
6. "The Designer's Guide to the Cortex-M Processor Family: A Tutorial Approach", By TrevorMartin, Newnes, Elsevier

WEB REFERENCES

1. https://www.pyimagesearch.com/Programme/image-processing/
2. https://www.mygreatlearning.com/blog/tag/image-processing/
3. https://blogs.mathworks.com/steve
4. https://www.ipol.im/

E -TEXT BOOKS

1. www.libgen.is
2. http://sdeuoc.ac.in/sites/default/files/sde_videos/Digital%20Image%20Processing

%203rd%20ed.%20-%20R.%20Gonzalez%2C%20R.%20Woods-ilovepdf-compressed.pdf

MOOCS COURSE

1. https://nptel.ac.in/courses/117/104/117104072/
2. https://nptel.ac.in/courses/117/104/117104077/

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

ARTIFICIAL NEURAL NETWORKS

(Professional Elective-III)

IV B. TECH- I SEMESTER (R 20)								
Course Code	**Programme**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
EC711PE	**B.Tech**	**3**	**0**	**0**	**3**	**30**	**70**	**100**

COURSE OBJECTIVES

To learn

1. To understand the biological neural network and to model equivalent neuron models.
2. To understand the architecture, learning algorithms
3. To know the issues of various feed forward and feedback neural networks.
4. To explore the Neuro dynamic models for various problems.

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

1. Understand the similarity of Biological networks and Neural networks
2. Perform the training of neural networks using various learning rules.
3. Understanding the concepts of forward and backward propagations.
4. Understand and Construct the Hopfield models.
5. Understand and implement the Neuro Dynamics.

UNIT-I	INTRODUCTION	Classes: 12

Introduction: A Neural Network, Human Brain, Models of a Neuron, Neural Networks viewed as Directed Graphs, Network Architectures, Knowledge Representation, Artificial Intelligence and Neural Networks

Learning Process: Error Correction Learning, Memory Based Learning, Hebbian Learning,

Competitive, Boltzmann Learning, Credit Assignment Problem, Memory, Adaption, Statistical Nature of the Learning Process

UNIT-II	SINGLE LAYER PERCEPTRONS	Classes:13

Single Layer Perceptrons: Adaptive Filtering Problem, Unconstrained Organization Techniques,Linear Least Square Filters, Least Mean Square Algorithm, Learning Curves, Learning Rate Annealing Techniques, Perceptron –Convergence Theorem, Relation Between Perceptron and Bayes Classifier for a Gaussian Environment

Multilayer Perceptron: Back Propagation Algorithm XOR Problem, Heuristics, Output Representation and Decision Rule, Computer Experiment, Feature Detection

UNIT-III	BACK PROPAGATION	Classes:10

Back Propagation: Back Propagation and Differentiation, Hessian Matrix, Generalization, Cross Validation, Network Pruning Techniques, Virtues and Limitations of Back Propagation Learning, Accelerated Convergence, Supervised Learning

UNIT-IV	SELF-ORGANIZATION MAPS (SOM)	Classes:12

Self-Organization Maps (SOM): Two Basic Feature Mapping Models, Self-Organization Map, SOM Algorithm, Properties of Feature Map, Computer Simulations, Learning Vector Quantization, Adaptive Patter Classification

UNIT-V	NEURO DYNAMICS	Classes: 12

Neuro Dynamics: Dynamical Systems, Stability of Equilibrium States, Attractors, Neuro Dynamical Models, Manipulation of Attractors as a Recurrent Network Paradigm

Hopfield Models – Hopfield Models, restricted boltzmen machine.

TEXT BOOKS

1. Neural Networks a Comprehensive Foundations, Simon S Haykin, PHI Ed.,.
2. Introduction to Artificial Neural Systems Jacek M. Zurada, JAICO Publishing House Ed. 2006.

REFERENCE BOOKS

1. Neural Networks in Computer Inteligance, Li Min Fu TMH 2003
2. Neural Networks -James A Freeman David M S Kapura Pearson Ed., 2004.
3. Artificial Neural Networks - B. Vegnanarayana Prentice Hall of India P Ltd 2005

WEB REFERENCES

1. https://www.researchgate.net/publication/226213344_Semantic_Web_Technologies_and_Artificial_Neural_Networks_for_Intelligent_Web_Knowledge_Source_Discovery
2. https://ieeexplore.ieee.org/document/485891
3. https://www.sciencedirect.com/science/article/pii/S2405844018332067

E -TEXT BOOKS

1. https://www.intechopen.com/books/6187
2. https://books.google.co.in/books/about/Artificial_Neural_Networks.html?id=tJokAQAAIAAJ&redir_esc=y

MOOCS COURSES

1. https://www.coursera.org/courses?query=neural%20networks
2. https://www.mooc-list.com/tags/neural-networks
3. https://www.mooc-list.com/tags/artificial-neural-networks

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

SCRIPTING LANGUAGES

(Professional Elective-III)

IV B. TECH- I SEMESTER (R 20)								
Course Code	**Programme**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
EC712PE	**B.Tech**	**3**	**0**	**0**	**3**	**30**	**70**	**100**

COURSE OBJECTIVES

To learn

1. Able to differentiate scripting and non- scripting languages.
2. To learn Scripting languages such as PERL, TCL/TK, python and BASH.
3. Expertise to program in the Linux environment.
4. Usage of scripting languages in IC design flow.

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

1. Known about basics of Linux and Linux Networking
2. Use Linux environment and write programs for automation
3. Understand the concepts of Scripting languages
4. Create and run scripts using PERL/TCl/Python.
5. Knowing about the Python Scripting

UNIT-I	**LINUX BASICS**	**Classes: 12**

Introduction to Linux, File System of the Linux, General usage of Linux kernel & basic commands, Linux users and group, Permissions for file, directory and users, searching a file & directory, zipping and unzipping concepts.

UNIT-II	**LINUX NETWORKING**	**Classes:13**

Introduction to Networking in Linux, Network basics & Tools, File Transfer Protocol in Linux, Network file system, Domain Naming Services, Dynamic hosting configuration Protocol & Network information

UNIT-III	**PERL SCRIPTING**	**Classes:10**

Introduction to Perl Scripting, working with simple values, Lists and Hashes, Loops and Decisions, Regular Expressions, Files and Data in Perl Scripting, References & Subroutines, Running and Debugging Perl, Modules, Object – Oriented Perl.

UNIT-IV	TCL / TK SCRIPTING	Classes:12

Tcl Fundamentals, String and Pattern Matching, Tcl Data Structures, Control Flow Commands, Procedures and Scope, Evel, Working with Unix, Reflection and Debugging, Script Libraries, Tk Fundamentals, Tk by examples, The Pack Geometry Manager, Binding Commands to X Events, Buttons and Menus, Simple Tk Widgets, Entry and List box Widgets Focus, Grabs and Dialogs.

UNIT-V	PYTHON SCRIPTING	Classes: 12

Introduction to Python, using the Python Interpreter, More Control Flow Tools, Data Structures, Modules, Input and Output, Errors and Exceptions, Classes, Brief Tour of the Standard Library.

TEXT BOOKS

1. Practical Programming in Tcl and Tk by Brent Welch, Updated for Tcl 7.4 and Tk 4.0.
2. Red Hat Enterprise Linux 4 : System Administration Guide Copyright, Red Hat Inc, 2005.

REFERENCE BOOKS

1. Learning Python – Mark Lutz and David Ascher, 2nd Ed. , O'Reilly, 2003.
2. Learning Perl – 4th Ed. Randal Schwartz, Tom Phoenix and Brain d foy. 2005.
3. Python Essentials – Samuele Pedroni and Noel Pappin. O'Reilly, 2002.
4. Programming Perl – Larry Wall, Tom Christiansen and John Orwant, 3rd Edition, O'Reilly, 2000.(ISBN 0596000278)

WEB REFERENCES

1. https://link.springer.com/referenceworkentry/10.1007%2F978-1-4939-7131-2_363
2. https://docs.microsoft.com/en-us/previous-versions/iis/6.0-sdk/ms525153(v=vs.90)
3. https://eager.io/blog/a-brief-history-of-weird-scripting-languages/
4. https://www.w3.org/TR/REC-html40/interact/scripts.html

E -TEXT BOOKS

1. http://www.faadooengineers.com/threads/403-PRINCIPLES-OF-PROGRAMMING-LANGUAGES-E-book-presentation-and-lecture-notes-covering-full-semester-syllabus
2. https://www.e-booksdirectory.com/details.php?ebook=1139
3. http://202.62.11.199/Ebook/?d=E-Books%20Programming%20Languages%20Concepts

MOOCS COURSES

1. https://www.coursera.org/learn/programming-languages
2. https://www.my-mooc.com/en/categorie/programming
3. https://www.edx.org/course/programming-for-everyone-an-introduction-to-visual

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

DIGITAL IMAGE PROCESSING

(Professional Elective-III)

IV B. TECH- I SEMESTER (R 20)								
Course Code	**Programme**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
EC713PE	**B.Tech**	**3**	**0**	**0**	**3**	**30**	**70**	**100**

COURSE OBJECTIVES

To learn

1. To provide a approach towards image processing and introduction about 2D transforms
2. To expertise about enhancement methods in time and frequency domain
3. To expertise about segmentation and compression techniques
4. To understand the Morphological operations on an image
5. To study image restoration procedures.

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

1. Explore the fundamental relations between pixels and utility of 2-D .Transforms in image processer.
2. Understand the enhancement, segmentation and restoration processes on an image.
3. Implement the various Morphological operations on an image
4. Understand the need of compression and evaluation of basic compression Algorithms.
5. Understand the Image Compression techniques.

UNIT-I	**DIGITAL IMAGE FUNDAMENTALS & IMAGE TRANSFORMS**	**Classes: 12**

Digital Image Fundamentals & Image Transforms: Digital Image Fundamentals, Sampling and Quantization, Relationship between Pixels. Image Transforms: 2-D FFT, Properties, Walsh Transform, Hadamard Transform, Discrete Cosine Transform, Haar Transform, Slant Transform, Hotelling Transform. Singular Value Decomposition.

UNIT-II	**IMAGE ENHANCEMENT**	**Classes:13**

Image Enhancement (Spatial Domain): Introduction, Image Enhancement in Spatial Domain, Enhancement through Point Processing, Types of Point Processing, Histogram Manipulation, Linear and Non – Linear Gray Level Transformation, Local or Neighborhood criterion, Median Filter, Spatial Domain High-Pass Filtering.

Image Enhancement (Frequency Domain): Filtering in Frequency Domain, Low Pass (Smoothing) and High Pass (Sharpening) Filters in Frequency Domain.

UNIT-III	IMAGE RESTORATION	Classes:10

Image Restoration: Degradation Model, Algebraic Approach to Restoration, Inverse Filtering, Least Mean Square Filters, Constrained Least Squares Restoration, Interactive Restoration. Image Denoising.

UNIT-IV	IMAGE SEGMENTATION	Classes:12

Image Segmentation: Detection of Discontinuities, Edge Linking And Boundary Detection, thresholding, Region Oriented Segmentation. Morphological Image Processing: Dilation and Erosion: Dilation, Structuring Element Decomposition, Erosion, Combining Dilation and Erosion, Opening and Closing, Hit or Miss Transformation.

UNIT-V	IMAGE COMPRESSION	Classes: 12

Image Compression: Redundancies and their Removal Methods, Fidelity Criteria, Image Compression Models, Huffman and Arithmetic Coding, Error Free Compression, Lossy Compression, Lossy and Lossless Predictive Coding, Transform Based Compression, JPEG 2000 Standards.

TEXT BOOKS

1. Digital Image Processing - Rafael C. Gonzalez, Richard E. Woods, 3 rd Edition, Pearson, 2008
2. Digital Image Processing- S Jayaraman, S Esakkirajan, T Veerakumar- TMH, 2010.

REFERENCE BOOKS

1. Digital Image Processing and Analysis-Human and Computer Vision Application with using CVIP Tools - Scotte Umbaugh, 2 nd Ed, CRC Press,2011
2. Digital Image Processing using MATLAB – Rafael C. Gonzalez, Richard E Woods and Steven L. Eddings, 2 nd Edition, TMH, 2010.
3. Digital Image Processing and Computer Vision – Somka, Hlavac, Boyle- Cengage Learning (Indian edition) 2008.
4. Introductory Computer Vision Imaging Techniques and Solutions- Adrian low, 2 nd Edition, BS Publication, 2008.

WEB REFERENCES

1. https://www.nature.com/subjects/image-processing
2. http://image-sensors-world.blogspot.com/
3. https://www.pyimagesearch.com/Programme/image-processing/

4. https://www.mygreatlearning.com/blog/tag/image-processing/
5. https://blogs.mathworks.com/steve
6. https://www.ipol.im/

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1. www.libgen.is
2. http://sdeuoc.ac.in/sites/default/files/sde_videos/Digital%20Image%20Processing%203rd%20ed.%20-%20R.%20Gonzalez%2C%20R.%20Woods-ilovepdf-compressed.pdf

MOOCS COURSES

1. https://www.mooc-list.com/course/fundamentals-digital-image-and-video-processing-coursera
2. https://classroom.udacity.com/courses/ud810
3. https://www.my-mooc.com/en/mooc/digital/
4. https://www.coursera.org/courses?languages=en&query=digital+image+processing
5. https://onlinecourses.nptel.ac.in/noc16_ec14/preview

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

ADVANCED DIGITAL SIGNAL PROCESSING

(Professional Elective-III)

IV B. TECH- I SEMESTER (R 20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EC714PE	B.Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

To learn

1. To understand the basic principles of discrete random signal processing
2. To understand the principles of spectral estimation
3. To learn about the weiner and adaptive filters
4. To understand the different signal detection and estimation methods
5. To acquire skills to design synchronization methods for proper functioning of the system

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

1. Analyze the basic principles of discrete random signal processing To realize the need for solid state microwave sources and understand the principles of solid State devices.
2. Analyze the principles of spectral estimation
3. Analyze the weiner and adaptive filters
4. Analyze the different signal detection and estimation methods.
5. Design the synchronization methods for proper functioning of the system

UNIT-I	DISCRETE RANDOM SIGNAL PROCESSING	Classes:10

Discrete Random Processes, Random variables, Parseval's theorem, Wiener-Khintchine relation, Power Spectral Density, Spectral factorization, Filtering Random Processes, Special types of Random Processes.

UNIT-II	SPECTRAL ESTIMATION	Classes:

Introduction, Nonparametric methods – Periodogram, Modified periodogram, Bartlett, Welch and Blackman-Tukey methods, Parametric methods – ARMA, AR and MA model based spectral estimation, Solution using Levinson-Durbin algorithm.

UNIT-III	WEINER AND ADAPTIVE FILTERS	Classes:

Weiner Filter: FIR wiener filter, IIR wiener filter, Adaptive Filter: FIR adaptive filters – Steepest descent method- LMS algorithm, RLS adaptive algorithm, Applications.

UNIT-IV	DETECTION AND ESTIMATION	Classes: 12

Bayes detection techniques, MAP, ML,– detection of M-ary signals, Neyman Peason, minimax decision criteria. kalman filter- Discrete kalman filter, The Extended kalman filter, Application.

UNIT-V	SYNCHRONIZATION	Classes: 12

Signal parameter estimation, carrier phase estimation, symbol timing estimator, joint estimation of carrier phase and symbol timing

TEXT BOOKS

1. Monson H. Hayes, "Statistical Digital Signal Processing and Modeling", John Wiley and Sons, Inc, Singapore, 2009.
2. John G. Proakis., "Digital Communication", 4 th edition, McGraw Hill Publication, 2001.

Simon Haykin, "Adaptive Filter Theory", Pearson Education, Fourth Edition, 2003.

REFERENCE BOOKS

1. Bernard Sklar and Pabitra Kumar Roy, "Digital Communications: Fundamentals and
2. Applications", 2/E, Pearson Education India, 2009

Paulo S. R. Diniz, "Adaptive Filtering Algorithms and Practical Implementation", Springer,2011

WEB REFERENCES

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2. http://adsp-filters-world.blogspot.com/
3. https://www.pyimagesearch.com/Programme/image-processing/
4. https://www.mygreatlearning.com/blog/tag/image-processing/
5. https://blogs.mathworks.com/steve
6. https://www.ipol.im/

E -TEXT BOOKS

1. www.libgen.is
2. http://sdeuoc.ac.in/sites/default/files/sde_videos/Digital%20Image%20Processing%203rd%20ed.%20-%20R.%20Gonzalez%2C%20R.%20Woods-ilovepdf-compressed.pdf

MOOCS COURSE

1. https://nptel.ac.in/courses/117/101/117101001/
2. https://nptel.ac.in/courses/117/105/117105075/
3. https://nptel.ac.in/courses/117/105/117105075/

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

BIOMEDICAL INSTRUMENTATION

(Professional Elective-IV)

IV B. TECH- I SEMESTER (R 20)								
Course Code	**Programme**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
EC721PE	**B.Tech**	**3**	**0**	**0**	**3**	**30**	**70**	**100**

COURSE OBJECTIVES

To learn

1. **Identify** significant biological variables at cellular level and ways to acquire different bio-signals.
2. **Elucidate** the methods to monitor the activity of the heart, brain, eyes and muscles.
3. **Introduce** the rapeutic equipment for intensive and critical care.
4. **Outline** medical imaging techniques and equipment for certain diagnosis and therapies.

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

1. **Understand** bio systems and medical systems from an engineering perspective.
2. **Identify** the techniques to acquire record and primarily understand physiological activity of the human body through cellpotential, ECG, EEG, BP and blood flow measurement and EMG.
3. **Understand** the working of various medical instruments and critical care equipment.
4. **Know** the imaging techniques including CT, PET, SPECT and MRI used in diagnosis of various medical conditions.
5. **Understand** the Principles in Medical Imaging.

UNIT-I	BIO-POTENTIAL SIGNALS AND ELECTRODES	Classes: 12

Bio-signals and their characteristics, Organization of cell, Nernst equation of membrane, Resting and Action potentials. Bio-amplifiers, characteristics of medical instruments, problems encountered with measurements from living systems. Bio-potential electrodes – Body surface recording electrodes, Internal electrodes, micro electrodes. Bio-chemical transducers – reference electrode, the pH electrodes, Blood gas electrodes

UNIT-II	CARDIOVASCULAR INSTRUMENTATION	Classes:13

Heart and cardiovascular system Heart electrical activity, blood pressure and heart sounds. Cardiovascular measurements electro cardiography – electrocardiogram, ECG Amplifier, Electrodes and leads, ECG recorder principles. Types of ECG recorders. Principles of blood pressure and blood flow measurement

UNIT-III	NEUROLOGICAL INSTRUMENTATION	Classes:10
Neuronal communication, electro encephalogram (EEG), EEG Measurements EEG electrode-placement system, interpretation of EEG, EEG system Block diagram, preamplifiers and amplifiers. EMG block diagram and Stimulators		
UNIT-IV	**EQUIPMENT FOR CRITICAL CARE**	**Classes:12**
Therapeutic equipment - Pacemaker, Defibrillator, Shortwave diathermy, Hemodialysis machine. Respiratory Instrumentation - Mechanism of respiration, Spirometry, Pneumotachograph, Ventilators.		
UNIT-V	**PRINCIPLES OF MEDICAL IMAGING**	**Classes: 12**
Radiography, computed Radiography, Computed Tomography (CT), Magnetic Resonance Imaging (MRI), Nuclear Medicine, Single Photon Emission Computed Tomography (SPECT), Positron Emission Tomography (PET), Ultrasonography, Introduction to Telemedicine.		

TEXT BOOKS

1. Hand-book of Biomedical Instrumentation–by R.S.Khandpur, McGraw-Hill, 2003.
2. Medical Instrumentation, Application and Design –by John G. Webster, John Wiley

REFERENCE BOOKS

1. Biomedical Instrumentation and Measurements– by Leslie Cromwell, F.J. Weibell, E.A. Pfeiffer, PHI.
2. Principles of Applied Biomedical Instrumentation–by L.A. Geoddes and L.E. Baker, John Wiley and Sons.
3. Introduction to Biomedical equipmen ttechnology- by Joseph Carr and Brown.

WEB REFERENCES

1. https://biomedical-engineering-online.biomedcentral.com/
2. https://www.sanfoundry.com/best-reference-books-biomedical-instrumentation/
3. https://www.springer.com/journal/42600

E -TEXT BOOKS

1. https://books.google.co.in/books/about/Handbook_of_Biomedical_Instrumentation.html?id=bYsiBAAAQBAJ&redir_esc=y

MOOCS COURSES

1. https://www.mooc-list.com/tags/biomedical-engineering
2. https://www.coursera.org/courses?query=biomedical/

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

DATABASE MANAGEMENT SYSTEMS

(Professional Elective-IV)

IV B. TECH- I SEMESTER (R 20)								
Course Code	**Programme**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
EC722PE	**B.Tech**	**3**	**0**	**0**	**3**	**30**	**70**	**100**

COURSE OBJECTIVES

To learn

1. To understand the basic concepts and the applications of data base systems.
2. To master the basics of SQL and construct queries using SQL.
3. Topics include data models, data base design, relational model, relational algebra, transaction control, concurrency control, storage structures and access techniques.
4. Database System Applications

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

1. Gain knowledge of fundamentals of DBMS, database design and normal forms
2. Master the basics of SQL for retrieval and management of data.
3. Be acquainted with the basics of transaction processing and concurrency control.
4. Familiarity with database storage structures and access techniques
5. Knowing about the Data Storage

UNIT-I	DATABASE SYSTEM APPLICATIONS	Classes: 12

Database System Applications: A Historical Perspective, File Systems versus a DBMS, the Data Model, Levels of Abstraction in a DBMS, Data Independence, Structure of a DBMS

Introduction to Database Design: Database Design and ER Diagrams, Entities, Attributes, and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design With the ER Model

UNIT-II	INTRODUCTION TO THE RELATIONAL MODEL	Classes:13

Introduction to the Relational Model: Integrity constraint over relations, enforcing integrity constraints, querying relational data, logical data base design, introduction to views, destroying/altering tables and views.
Relational Algebra, Tuple relational Calculus, Domain relational calculus.

UNIT-III	SQL: Queries, Constraints, Triggers	Classes:10

SQL: Queries, Constraints, Triggers: form of basic SQL query, UNION, INTERSECT, and EXCEPT, Nested Queries, aggregation operators, NULL values, complex integrity constraints in SQL, triggers and active data bases.
Schema Refinement: Problems caused by redundancy, decompositions, problems related to decomposition, reasoning about functional dependencies, FIRST, SECOND, THIRD normal forms, BCNF, lossless join decomposition, multi-valued dependencies, FOURTH normal form, FIFTH normal form.

UNIT-IV	TRANSACTION CONCEPT	Classes:12

Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for serializability, Lock Based Protocols, Timestamp Based Protocols, Validation- Based Protocols, Multiple Granularity, Recovery and Atomicity, Log–Based Recovery, Recovery with Concurrent Transactions.

UNIT-V	DATA ON EXTERNAL STORAGE	Classes: 12

Data on External Storage, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes, Index data Structures, Hash Based Indexing, Tree base Indexing, Comparison of File Organizations, Indexes and Performance Tuning, Intuitions for tree Indexes, Indexed Sequential Access Methods (ISAM), B+ Trees: A Dynamic Index Structure.

TEXT BOOKS

1. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata Mc Graw Hill 3rd Edition
2. Database System Concepts, Silberschatz, Korth, Mc Graw hill, V edition.

REFERENCE BOOKS

1. Database Systems design, Implementation, and Management, PeterRob & Carlos Coronel 7th Edition.
2. Fundamentals of Database Systems, Elmasri Navrate, *Pearson Education*
3. Introduction to Database Systems, C.J. Date, *Pearson Education*
4. Oracle for Professionals, The XTeam, S.Shah and V.Shah,*SPD*.
5. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL, Shah,*PHI*.
6. Fundamentals of Database Management Systems, M.L. Gillenson,*Wiley Student* Edition

WEB REFERENCES

1. https://www.oreilly.com/library/view/concepts-of-database/9789332537422/xhtml/bibliography.xhtml
2. https://www.ddegjust.ac.in/studymaterial/mca-3/ms-11.pdf

E -TEXT BOOKS
1. http://www.ebooks-for-all.com/bookmarks/detail/Database-Management-Systems/onecat/0.html 2. https://www.textbooks.com/Catalog/DF2/Database-Management.php
MOOCS COURSE
1. https://www.mooc-list.com/tags/database-management 2. https://www.coursera.org/courses?query=database%20management

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

NETWORK SECURITY AND CRYPTOGRAPHY

(Professional Elective-IV)

IV B. TECH- I SEMESTER (R 20)								
Course Code	**Programme**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
EC723PE	**B.Tech**	**3**	**0**	**0**	**3**	**30**	**70**	**100**

COURSE OBJECTIVES

To learn

1. Understand the basic concept of Cryptography and Network Security, their mathematical models
2. To understand the necessity of network security, threats/vulnerabilities to networks and countermeasures
3. To understand Authentication functions with Message Authentication Codes and Hash Functions.
4. To provide familiarity in Intrusion detection and Firewall Design Principles

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

1. Describe network security fundamental concepts and principles
2. Encrypt and decrypt messages using block ciphers and network security technology and protocols
3. Analyze key agreement algorithms to identify their weaknesses
4. Identify and assess different types of threats, malware, spyware, viruses, vulnerabilities
5. Understand thetechniques for keeping the information secure.

UNIT-I	**SECURITY SERVICES AND MODERN TECHNIQUES**	**Classes: 12**

Security Services, Mechanisms and Attacks, A Model for Internetwork security, Classical Techniques: Conventional Encryption model, Steganography, Classical Encryption Techniques.
Modern Techniques: Simplified DES, Block Cipher Principles, Data Encryption standard, Strength of DES, Block Cipher Design Principles.

UNIT-II	**ENCRYPTION**	**Classes:13**

Triple DES, International Data Encryption algorithm, Blowfish, RC5, Characteristics of Advanced Symmetric block Ciphers. Placement of Encryption function, Traffic confidentiality, Key distribution, Random Number Generation

UNIT-III	PUBLIC KEY CRYPTOGRAPHY	Classes:10

Public Key Cryptography: Principles, RSA Algorithm, Key Management, Diffie-Hellman Key exchange, Elliptic Curve Cryptograpy. Number Theory: Prime and Relatively prime numbers, Modular arithmetic, Fermat's and Euler's theorems, Testing for primality, Euclid's Algorithm, the Chinese remainder theorem, Discrete logarithms.

UNIT-IV	MESSAGE AUTHENTICATION AND HASH FUNCTIONS	Classes:12

Message Authentication and Hash Functions: Authentication requirements and functions, Message Authentication, Hash functions, Security of Hash functions and MACs. Hash and Mac Algorithms: MD-5, Message digest Algorithm, Secure Hash Algorithm. **Digital signatures and Authentication protocols**: Digital signatures, Authentication Protocols, Digital signature standards. Authentication Applications: Kerberos, Electronic Mail Security: Pretty Good Privacy, SIME/MIME.

UNIT-V	IP SECURITY	Classes: 12

IP Security: Overview, Architecture, Authentication, Encapsulating Security Payload, Key Management. Web Security: Web Security requirements, Secure sockets layer and Transport layer security, Secure Electronic Transaction.
Intruders, Viruses and Worms: Intruders, Viruses and Related threats.
Fire Walls: Fire wall Design Principles, Trusted systems.

TEXT BOOKS

1. Cryptography and Network Security: Principles and Practice- William Stallings, Pearson Education.
2. Network Security: The complete reference, Robert Bragg, Mark Rhodes, TMH, 2004.

REFERENCE BOOKS

1. Network Security Essentials (Applications and Standards) by William Stallings Pearson Education.
2. Fundamentals of Network Security by Eric Maiwald (Dreamtech press)
3. Principles of Information Security, Whitman, Thomson.
4. Introduction to Cryptography, Buchmann, Springer.

WEB REFERENCES

1. https://www.sanfoundry.com/best-reference-books-cryptography-network-security/
2. https://www.google.com/search?q=network+security+and+crytography+e+references&ei=_X-wYcuwAaSd4-EP7va-iAo&ved=0ahUKEwiLo8rn9tP0AhWkzjgGHW67D6EQ4dUDCA4&uact=

E -TEXT BOOKS

1. https://www.sanfoundry.com/best-reference-books-cryptography-network-security/
2. https://books.google.co.in/books/about/Cryptography_and_Network_Security.html?id=jdo6eUKdrVkC&redir_esc=y

MOOCS COURSES
1. https://www.coursera.org/lecture/managing-network-cybersecurity/cryptography-and-network-security-w9SuJ 2. https://www.classcentral.com/course/swayam-cryptography-and-network-security-9896

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

SATELLITE COMMUNICATION

(Professional Elective-V)

IV B. TECH- II SEMESTER (R 20)								
Course Code	**Programme**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
EC811PE	**B.Tech**	**3**	**0**	**0**	**3**	**30**	**70**	**100**

COURSE OBJECTIVES

To learn

1. To acquired foundation in orbital mechanics and launch vehicles for the satellites.
2. To provide basic knowledge of link design of satellite.
3. To understand multiple access systems and earth station technology
4. To understand the concepts of satellite navigation and GPS.

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

1. Understand basic concepts and frequency allocations for satellite communication, orbital mechanics and launch vehicles.
2. Envision the satellite sub systems and design satellite links for specified C/N.
3. Understand the various multiple access techniques for satellite communication systems and earth station technologies.
4. Known the concepts of LEO, GEO Stationary Satellite Systems and satellite navigation.
5. To Understand the Geo-Stationary Satellite Systems.

UNIT-I	**INTRODUCTION, ORBITAL MECHANICS AND LAUNCHERS**	**Classes: 12**

Introduction: Origin of Satellite Communications, Historical Back-ground, Basic Concepts of Satellite Communications, Frequency Allocations for Satellite Services, Applications, Future Trends of Satellite Communications.

Orbital Mechanics and Launchers: Orbital Mechanics, Look Angle determination, Orbital Perturbations, Orbit determination, Launches and Launch vehicles, Orbital Effects in Communication Systems Performance.

UNIT-II	**SATELLITE SUBSYSTEMS**	**Classes:13**

Attitude and Orbit Control System, Telemetry, Tracking, Command And Monitoring, Power Systems, Communication Subsystems, Satellite Antennas, Equipment Reliability and Space Qualification. Pass (Smoothing) and High Pass (Sharpening) Filters in Frequency Domain.

UNIT-III	**SATELLITE LINK DESIGN, MULTIPLE ACCESS**	**Classes:10**

Satellite Link Design: Basic Transmission Theory, System Noise Temperature and G/T Ratio, Design of Down Links, Up Link Design, Design Of Satellite Links For Specified C/N, System Design Examples.

Multiple Access: Frequency Division Multiple Access (FDMA), Inter modulation, Calculation of C/N, Time Division Multiple Access (TDMA), Frame Structure, Examples, Satellite Switched TDMA Onboard Processing, DAMA, Code Division Multiple Access (CDMA), Spread Spectrum Transmission and Reception.

UNIT-IV	EARTH STATION TECHNOLOGY	Classes:12

Introduction, Transmitters, Receivers, Antennas, Tracking Systems, Terrestrial Interface, Primary Power Test Methods.

UNIT-V	LOW EARTH ORBIT AND GEO-STATIONARY SATELLITE SYSTEMS	Classes: 12

Orbit Considerations, Coverage and Frequency Consideration, Delay & Throughput Considerations, System Considerations, Operational NGSO Constellation Designs. Satellite Navigation & Global Positioning System: Radio and Satellite Navigation, GPS Position Location Principles, GPS Receivers and Codes, Satellite Signal Acquisition, GPS Navigation Message, GPS Signal Levels, GPS Receiver Operation, GPS C/A Code Accuracy, Differential GPS.

TEXT BOOKS

1. Satellite Communications – Timothy Pratt, Charles Bostian and Jeremy Allnutt, WSE, Wiley Publications, 2nd Edition, 2003.

2. Satellite Communications Engineering – Wilbur L. Pritchard, Robert A Nelson and Henri G. Suyderhoud, 2nd Edition, Pearson Publications, 2003.

REFERENCE BOOKS

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1. Satellite Communications: Design Principles – M. Richharia, BS Publications, 2nd Edition, 2003.

2. Satellite Communication - D.C Agarwal, Khanna Publications, 5th Ed.

3. Fundamentals of Satellite Communications – K.N. Raja Rao, PHI, 2004

4. Satellite Communications – Dennis Roddy, McGraw Hill, 4th Edition, 2009.

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4. https://www.mygreatlearning.com/blog/tag/image-processing/
5. https://blogs.mathworks.com/steve
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E -TEXT BOOKS

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2. http://sdeuoc.ac.in/sites/default/files/sde_videos/Digital%20Image%20Processing%203rd%20ed.%20-%20R.%20Gonzalez%2C%20R.%20Woods-ilovepdf-

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1. https://www.mooc-list.com/course/fundamentals-digital-image-and-video-processing-coursera
2. https://classroom.udacity.com/courses/ud810
3. https://www.my-mooc.com/en/mooc/digital/
4. https://www.coursera.org/courses?languages=en&query=digital+image+processing
5. https://onlinecourses.nptel.ac.in/noc16_ec14/preview

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

RADAR SYSTEMS

(Professional Elective-V)

IV B. TECH- II SEMESTER (R 20)								
Course Code	**Programme**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
EC812PE	**B.Tech**	**3**	**0**	**0**	**3**	**30**	**70**	**100**

COURSE OBJECTIVES

To learn

1. To explore the concepts of radar and its frequency bands.
2. To understand Doppler effect and get acquainted with the working principles of CW radar, FMCW radar.
3. To impart the knowledge of functioning of MTI and Tracking Radars.
4. To explain the deigning of a Matched Filter in radar receivers.

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

1. Derive the complete radar range equation.
2. Understand the need and functioning of CW, FM-CW and MTI radars
3. Known various Tracking methods.
4. Derive the matched filter response characteristics for radar receivers.
5. Understand and Analyze the noise in Radar System

UNIT-I	BASICS OF RADAR, RADAR EQUATION	Classes: 12

Basics of Radar: Maximum Unambiguous Range, Simple form of Radar Equation, Radar Block Diagram and Operation, Radar Frequencies and Applications. Prediction of Range Performance, Minimum Detectable Signal, Receiver Noise, Modified Radar Range Equation.

Radar Equation: SNR, Envelope Detector – False Alarm Time and Probability, Integration of Radar Pulses, Radar Cross Section of Targets, Transmitter Power, PRF and Range Ambiguities, System Losses (qualitative treatment).

UNIT-II	CW AND FREQUENCY MODULATED RADAR	Classes:13

CW and Frequency Modulated Radar: Doppler Effect, CW Radar – Block Diagram, Isolation between Transmitter and Receiver, Non-zero IF Receiver, Receiver Bandwidth Requirements, Applications of CW radar.

FM-CW Radar: Range and Doppler Measurement, Block Diagram and Characteristics, FM-CW altimeter.

UNIT-III	MTI AND PULSE DOPPLER RADAR	Classes:10

MTI and Pulse Doppler Radar: Principle, MTI Radar - Power Amplifier Transmitter and Power Oscillator Transmitter, Delay Line Cancellers – Filter Characteristics, Blind Speeds, Double Cancellation, Staggered PRFs. Range Gated Doppler Filters. MTI Radar Parameters, Limitations to MTI Performance, MTI versus Pulse Doppler Radar.

UNIT-IV	TRACKING RADAR	Classes:12

Tracking Radar: Tracking with Radar, Sequential Lobing, Conical Scan, Mono pulse Tracking Radar – Amplitude Comparison Mono pulse (one- and two- coordinates), Phase Comparison Mono pulse, Tracking in Range, Acquisition and Scanning Patterns, Comparison of Trackers.

UNIT-V	DETECTION OF RADAR SIGNALS IN NOISE	Classes: 12

Detection of Radar Signals in Noise Matched Filter Receiver – Response Characteristics and Derivation, Correlation Function and Cross-correlation Receiver, Efficiency of Non-matched Filters, Matched Filter with Non-white Noise.

Radar Receivers – Noise Figure and Noise Temperature, Displays – types. Duplexers – Branch type and Balanced type, Circulators as Duplexers. Introduction to Phased Array Antennas – Basic Concepts, Radiation Pattern, Beam Steering and Beam Width changes, Applications, Advantages and Limitations.

TEXT BOOKS

1. Introduction to Radar Systems – Merrill I. Skolnik, TMH Special Indian Edition, 2ndEd., 2007.

REFERENCE BOOKS

1. Radar: Principles, Technology, Applications – Byron Edde, Pearson Education, 2004.
2. Radar Principles – Peebles, Jr., P.Z., Wiley, New York, 1998.
3. Principles of Modern Radar: Basic Principles – Mark A. Richards, James A. Scheer, William A. Holm, Yesdee, 2013
4. Radar Handbook - Merrill I. Skolnik, 3rd Ed., McGraw Hill Education, 2008.

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3. https://www.pyimagesearch.com/Programme/image-processing/
4. https://www.mygreatlearning.com/blog/tag/image-processing/
5. https://blogs.mathworks.com/steve
6. https://www.ipol.im/

E -TEXT BOOKS

1. www.libgen.is
2. http://sdeuoc.ac.in/sites/default/files/sde_videos/Digital%20Image%20Processing%203rd%20ed.%20-%20R.%20Gonzalez%2C%20R.%20Woods-ilovepdf-compressed.pdf

MOOCS COURSES
1. https://www.mooc-list.com/course/fundamentals-digital-image-and-video-processing-coursera 2. https://classroom.udacity.com/courses/ud810 3. https://www.my-mooc.com/en/mooc/digital/ 4. https://www.coursera.org/courses?languages=en&query=digital+image+processing 5. https://onlinecourses.nptel.ac.in/noc16_ec14/preview

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

WIRELESS SENSOR NETWORKS

(Professional Elective-V)

IV B. TECH- II SEMESTER (R20)								
Course Code	**Programme**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
EC813PE	**B.Tech**	**3**	**0**	**0**	**3**	**30**	**70**	**100**

COURSE OBJECTIVES

To learn

1. To acquire the knowledge about various architectures and applications of Sensor Networks
2. To understand issues, challenges and emerging technologies for wireless sensor networks
3. To learn about various routing protocols and MAC Protocols
4. To understand various data gathering and data dissemination methods
5. To Study about design principals, node architectures, hardware and software required for implementation of wireless sensor networks.

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

1. Analyze and compare various architectures of Wireless Sensor Networks
2. Understand Design issues and challenges in wireless sensor networks
3. Analyze and compare various data gathering and data dissemination methods.
4. Design, Simulate and Compare the performance of various routing and MAC protocol
5. Understand design principles of Wireless Sensor networks.

UNIT-I	**Introduction**	**Classes: 12**

Introduction to Sensor Networks, unique constraints and challenges, Advantage of Sensor Networks, Applications of Sensor Networks, Types of wireless sensor networks

UNIT-II	**MANETs**	**Classes:13**

Mobile Ad-hoc Networks (MANETs) and Wireless Sensor Networks, Enabling technologies for Wireless Sensor Networks. Issues and challenges in wireless sensor networks

UNIT-III	**ROUTING PROTOCOLS**	**Classes:10**

Routing protocols, MAC protocols: Classification of MAC Protocols, S-MAC Protocol, B-MAC protocol, IEEE 802.15.4 standard and ZigBee

UNIT-IV	DISSEMINATION PROTOCOL	Classes:12
Dissemination protocol for large sensor network. Data dissemination, data gathering, and data fusion; Quality of a sensor network; Real-time traffic support and security protocols.		
UNIT-V	**DESIGN PRINCIPLES OF WSN**	**Classes: 12**
Design Principles for WSNs, Gateway Concepts Need for gateway, WSN to Internet Communication, and Internet to WSN Communication. Single-node architecture, Hardware components & design constraints, Operating systems and execution environments, introduction to TinyOS and nesC.		

TEXT BOOKS

1. Ad-Hoc Wireless Sensor Networks- C. Siva Ram Murthy,B. S. Manoj, Pearson
2. Principles of Wireless Networks – Kaveh Pah Laven and P. Krishna Murthy, 2002, PE

REFERENCE BOOKS

1. Wireless Digital Communications – Kamilo Feher, 1999, PHI.
2. Wireless Communications-Andrea Goldsmith, 2005 Cambridge University Press.
3. Mobile Cellular Communication – Gottapu Sasibhushana Rao, Pearson Education, 2012.
4. Wireless Communication and Networking – William Stallings, 2003, PHI.

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2. http://image-sensors-world.blogspot.com/
3. https://www.pyimagesearch.com/Programme/image-processing/
4. https://www.mygreatlearning.com/blog/tag/image-processing/
5. https://blogs.mathworks.com/steve
6. https://www.ipol.im/

E -TEXT BOOKS

1. www.libgen.is
2. http://sdeuoc.ac.in/sites/default/files/sde_videos/Digital%20Image%20Processing%203rd%20ed.%20-%20R.%20Gonzalez%2C%20R.%20Woods-ilovepdf-compressed.pdf

MOOCS COURSES

1. https://www.mooc-list.com/course/fundamentals-digital-image-and-video-processing-coursera
2. https://classroom.udacity.com/courses/ud810
3. https://www.my-mooc.com/en/mooc/digital/
4. https://www.coursera.org/courses?languages=en&query=digital+image+processing
5. https://onlinecourses.nptel.ac.in/noc16_ec14/preview

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

SYSTEM ON CHIP ARCHITECTURE

(Professional Elective-VI)

IV B. TECH- II SEMESTER (R 20)								
Course Code	**Programme**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
EC821PE	**B.Tech**	**3**	**0**	**0**	**3**	**30**	**70**	**100**

COURSE OBJECTIVES

To learn

1. To introduce the architectural features of system on chip.
2. To imbibe the knowledge of customization using case studies.

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

1. Expected to understand SOC Architectural features.
2. To acquire the knowledge on processor selection criteria and limitations
3. To acquires the knowledge of memory architectures on SOC.
4. To understands the interconnection strategies and their customization on SOC.
5. To understand about Processor Configuration.

UNIT-I	**INTRODUCTION TO THE SYSTEM APPROACH**	**Classes: 12**

Introduction to the System Approach: System Architecture, Components of the system, Hardware & Software, Processor Architectures, Memory and Addressing. System level interconnection, An approach for SOC Design, System Architecture and Complexity.

UNIT-II	**PROCESSORS**	**Classes:13**

Processors: Introduction, Processor Selection for SOC, Basic concepts in Processor Architecture, Basic concepts in Processor Micro Architecture, Basic elements in Instruction handling. Buffers: minimizing Pipeline Delays, Branches, More Robust Processors, Vector Processors and Vector Instructions extensions, VLIW Processors, Superscalar Processors.

UNIT-III	**MEMORY DESIGN FOR SOC**	**Classes:10**

Memory Design for SOC: Overview of SOC external memory, Internal Memory, Size, Scratchpads and Cache memory, Cache Organization, Cache data, Write Policies, Strategies for line replacement at miss time, Types of Cache, Split – I , and D – Caches , Multilevel Caches, Virtual to real translation , SOC Memory System , Models of Simple Processor – memory interaction.

UNIT-IV	**INTERCONNECT CUSTOMIZATION**	**Classes:12**

Interconnect Customization: Inter Connect Architectures, Bus: Basic Architectures, SOC Standard Buses, Analytic Bus Models, Using the Bus model, Effects of Bus transactions and contention time. SOC Customization

UNIT-V	CONFIGURATION	Classes: 12

Configuration: An overview, Customizing Instruction Processor, Reconfiguration Technologies, Mapping design onto Reconfigurable devices, Instance- Specific design, Customizable Soft Processor, Reconfiguration - overhead analysis and trade-off analysis on reconfigurable Parallelism

TEXT BOOKS

1. Computer System Design System-on-Chip by Michael J. Flynn and Wayne Luk Wiely India Pvt.Ltd.

2. ARM System on Chip Architecture – Steve Furber –2nd Eed., 2000, Addison Wesley Professional.

REFERENCE BOOKS

REFERENCE BOOKS:

1Design of System on a Chip: Devices and Components – Ricardo Reis, 1st Ed., 2004, Springer

2. Co-Verification of Hardware and Software for ARM System on Chip Design (Embedded Technology) – Jason Andrews – Newnes, BK and CDROM

3. System on Chip Verification – Methodologies and Techniques –Prakash Rashinkar, Peter Paterson and Leena Singh L, 2001, Kluwer Academic Publishers.

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3. https://www.pyimagesearch.com/Programme/image-processing/
4. https://www.mygreatlearning.com/blog/tag/image-processing/
5. https://blogs.mathworks.com/steve
6. https://www.ipol.im/

E -TEXT BOOKS

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3. https://www.my-mooc.com/en/mooc/digital/
4. https://www.coursera.org/courses?languages=en&query=digital+image+processing

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

TEST AND TESTABILITY

(Professional Elective-VI)

IV B. TECH- II SEMESTER (R 20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EC822PE	B.Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

To learn

1. To provide or broad understanding of fault diagnosis.
2. To illustrate the framework of test pattern generation.
3. To understand design for testability in Digital Design

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

1. To acquire the knowledge of fundamental concepts in fault and fault diagnosis
2. Test pattern generation using LFSR and CA
3. Design for testability rules and techniques for combinational circuits
4. Introducing scan architectures
5. Understand the testing of sequential circuits

UNIT-I	NEED FOR TESTING	Classes: 12

Need for testing, the problems in digital Design testing, the problems in Analog Design testing, the problems in mixed analog/digital design testing, design for test, printed-circuit board (PCB) testing, software testing,

Fault in Digital Circuits:General Introduction, Controllability and Observability, Fault Models, stuck at faults, bridging faults,CMOS technology considerations, intermittent faults.

UNIT-II	INTRODUCTION	Classes:13

General Introduction, to test pattern genration, Test Pattern generation for combinational logic circuits,Manual test pattern generation, automatic test pattern generation, boolen difference method, Roth's Dalgoritham, Developments following Roth's D-algoritham, Pseudorandom test pattern generation.

UNIT-III	TEST PATTERN GENERATOR	Classes:10

Pseudorandorn test pattern generators, Design of test pattern generator usingLinear feedback shift registers (LFSRs) and cellular automata(CAs).

UNIT-IV	DESIGN FOR TESTABILITY	Classes:12

Design for Testability for combinational circuits: Basic Concepts of testability, controllability and observability, the Reed Muller's expansion techniques, use of control logic and syndrome testable designs.

UNIT-V	TESTING SEQUENTIAL CIRCUITS	Classes: 12

Making sequential circuits testable, testability insertion, full scan DFT technique-Full scan insertion, flipflop structures, Full scan design and test, scan architectures-full scan design, shadow register DFT, partial scan methods, multiple scan design, other scan designs.

TEXT BOOKS

1. Fault Tolerant and Fault Testable Hardware Design-Parag K. Lala, 1984, PHI.
2. VLSI Testing digital and Mixed analogue/digital techniques-Stanley L. Hurst, IEE Circuits, Devices and Systems series 9, 1998.

REFERENCE BOOKS

1. Digital Systems Testing and Testable Design-Miron Abramovici, Melvin A. Breuer and Arthur
2. D. Friedman, Jaico Books Esstentials of Electronic Testing-Bushnell and Vishwani D.Agarwal, Springers.
3. Design for test for Digital IC's and Embedded Core Systems-Alfred L. Crouch, 2008, Pearson Education.

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9. https://www.pyimagesearch.com/Programme/image-processing/
10. https://www.mygreatlearning.com/blog/tag/image-processing/
11. https://blogs.mathworks.com/steve
12. https://www.ipol.im/

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3. https://www.my-mooc.com/en/mooc/digital/
4. https://www.coursera.org/courses?languages=en&query=digital+image+processing
5. https://onlinecourses.nptel.ac.in/noc16_ec14/preview

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

LOW POWER VLSI DESIGN

(Professional Elective-VI)

IV B.TECH- II SEMESTER (R20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EC823PE	B. Tech	2	0	0	2	30	70	100

COURSE OBJECTIVES

To learn

1. To identify the sources of power dissipation in digital IC systems
2. To understand the impact of power on system performance and reliability.
3. To Characterize and model power consumption
4. To understand the basic analysis methods.
5. To understand leakage sources and reduction techniques.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Identify the sources of power dissipation in digital IC systems
2. Understand the impact of power on system performance and reliability.
3. Characterize and model power consumption
4. Understand the basic analysis methods.
5. Understand leakage sources and reduction techniques.

UNIT-I	TECHNOLOGY & CIRCUIT DESIGN LEVELS	Classes: 12

Sources of power dissipation in digital ICs, degree of freedom, recurring themes in low-power, emerging low power approaches, dynamic dissipation in CMOS, effects of V_{dd} & V_t on speed, constraints on V_t reduction, transistor sizing & optimal gate oxide thickness, impact of technology scaling, technology innovations.

UNIT-II	LOW POWER CIRCUIT TECHNIQUES	Classes: 12

Power consumption in circuits, flip-flops & latches, high capacitance nodes, energy recovery, reversible pipelines, high performance approaches .Low Power Clock Distribution: Power dissipation in clock distribution, single driver

UNIT-III	LOGIC SYNTHESIS FOR LOW POWER ESTIMATION TECHNIQUES	Classes: 12

Power minimization techniques, low power arithmetic components- circuit design styles, adders, multipliers.		
UNIT-IV	**LOW POWER MEMORY DESIGN**	**Classes: 12**
Sources & reduction of power dissipation in memory subsystem, sources of power dissipation in DRAM & SRAM, low power DRAM circuits, low power SRAM circuits.		
UNIT-V	**LOW POWER MICROPROCESSOR DESIGN SYSTEM**	**Classes: 12**
Power management support, architectural trade-offs for power, choosing the supply voltage, low-power clocking, implementation problem for low power, comparison of microprocessors for power & performance.		

TEXT BOOKS

1. P. Rashinkar, Paterson and L. Singh, "Low Power Design Methodologies", Kluwer Academic, 2002
2. Kaushik Roy, Sharat Prasad, "Low power CMOS VLSI circuit design", John Wiley sons Inc.,2000

REFERENCE BOOKS

1. J.B.Kulo and J.H Lou, "Low voltage CMOS VLSI Circuits", Wiley, 1999.
2. A.P. Chandrasekaran and R.W. Broadersen, "Low power digital CMOS design", Kluwer, 1995.
3. Gary Yeap, "Practical low power digital VLSI design", Kluwer, 1998.

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2. https://nptel.ac.in/courses/117/106/117106109/
3. https://nptel.ac.in/courses/106/103/106103016/

E -TEXT BOOKS

1. https://books.google.co.in/books/about/Low_Power_VLSI_Design_and_Technology.html?id=l2GtgPvLQJUC
2. https://books.google.co.in/books/about/Low_Power_Design_Methodologies.html?id=9IzuBwAAQBAJ&redir_esc=y

MOOCS COURSES

1. https://moodle.fel.cvut.cz/course/view.php?id=542&lang=en
2. https://www.coursera.org/specializations/fpga-design

List of Open Electives

EC600OE	Fundamentals Of Internet Of Things
EC700OE	Electronic Sensors
EC800OE	Measuring Instruments

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

FUNDAMENTALS OF INTERNET OF THINGS

(Open Elective-I)

III B. TECH- II SEMESTER (R20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EC600OE	B.Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

To learn

1. Understand the concepts of Internet of Things and able to build IoT applications
2. Learn the programming and use of Arduino and Raspberry Pi boards.
3. Known about data handling and analytics in SDN.
4. Understanding the networking concepts.
5. Learn the communication protocols.

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

1. Known basic protocols in sensor networks.
2. Program and configure Arduino boards for various designs.
3. Python programming and interfacing for Raspberry Pi.
4. Design IoT applications in different domains.
5. Having the knowledge of communication protocols.

UNIT-I	INTRODUCTION	Classes: 12

Introduction to Internet of Things, Characteristics of IoT, Physical design of IoT, Functional blocks of IoT, Sensing, Actuation, Basics of Networking, Communication Protocols, Sensor Networks.

UNIT-II	WORKING WITH ARDUINO	Classes:13

Machine-to-Machine Communications, Difference between IoT and M2M, Interoperability in IoT, Introduction to Arduino Programming, Integration of Sensors and Actuators with Arduino.

UNIT-III	PYTHON PROGRAMMING	Classes:10

Introduction to Python programming, Introduction to Raspberry Pi, Interfacing Raspberry Pi with basic peripherals, Implementation of IoT with Raspberry Pi

UNIT-IV	WORKING WITH RASPBERRY PI	Classes:12

Implementation of IoT with Raspberry Pi, Introduction to Software defined Network (SDN), SDN for IoT, Data Handling and Analytics.

UNIT-V	CLOUD COMPUTING	Classes: 12

Cloud Computing, Sensor-Cloud, Smart Cities and Smart Homes, Connected Vehicles, Smart Grid, Industrial IoT.Case Study: Agriculture, Healthcare, Activity Monitoring

TEXT BOOKS

1. "The Internet 'of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman (CRC Press)
2. “Make sensors”: Terokarvinen, kemo, karvinen and villey valtokari, 1st edition, maker media, 2014.
3. "Internet of Things: A Hands-on Approach", by Arshdeep Bahga and Vijay Madisetti

REFERENCE BOOKS

1. Vijay Madisetti, Arshdeep Bahga, “Internet of Things: A Hands-On Approach”
2. WaltenegusDargie,ChristianPoellabauer,"FundamentalsofWirelessSensorNetworks:TheoryandPractice"
3. Beginning Sensor networks withArduinoandRaspberryPi–CharlesBell,Apress,2013

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2. https://en.wikipedia.org/wiki/Internet_of_things
3. https://www.oracle.com/in/internet-of-things/what-is-iot/
4. https://www.internetsociety.org/resources/doc/2015/iot-overview/\

E -TEXT BOOKS

1. https://www.routledge.com/Fundamentals-of-Internet-of-Things/Kumar/p/book/9781032126449
2. https://www.tableau.com/learn/articles/internet-of-things-books
3. https://insights.btoes.com/top-10-internet-of-things-iot-books

MOOCS COURSES

1. https://www.mooc-list.com/tags/iot
2. https://www.my-mooc.com/en/categorie/internet-of-things
3. https://www.coursera.org/specializations/iot
4. https://onlinecourses.nptel.ac.in/noc19_cs65/preview

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

ELECTRONIC SENSORS

(Open Elective-II)

IV B. TECH- I SEMESTER (R20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EC700OE	B.Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

To learn

1. Learn the characterization of sensors.
2. Known the working of Electromechanical, Thermal, Magnetic and radiation sensors
3. Understand the concepts of Electro analytic and smart sensors
4. Able to use sensors in different applications
5. Know about the smart sensors

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

1. Learn about sensor principle, Classification and Characterization.
2. Explore the working of Electromechanical, Thermal, Magnetic, radiation and Electro-analytic sensors.
3. Understand the basic concepts of Smart Sensors
4. Design a system with sensors
5. Learn about the smart sensors

UNIT-I	INTRODUCTION	Classes: 12

Sensors / Transducers: Principles, Classification, Parameters, Characteristics, Environmental Parameters (EP), Characterization

Electromechanical Sensors: Introduction, Resistive Potentiometer, Strain Gauge, Resistance Strain Gauge, Semiconductor Strain Gauges -Inductive Sensors: Sensitivity and Linearity of the Sensor – Types-Capacitive Sensors: Electrostatic Transducer, Force/Stress Sensors Using Quartz Resonators, Ultrasonic Sensors**.**

UNIT-II	THERMAL SENSORS	Classes:13

Thermal Sensors: Introduction ,Gas thermometric Sensors ,Thermal Expansion Type Thermometric Sensors ,Acoustic Temperature Sensor ,Dielectric Constant and Refractive Index thermo sensors, Helium Low Temperature Thermometer ,Nuclear Thermometer ,Magnetic Thermometer ,Resistance Change Type Thermometric Sensors, Thermo emf Sensors, Junction Semiconductor Types, Thermal Radiation Sensors, Quartz Crystal Thermoelectric Sensors, NQR Thermometry, Spectroscopic Thermometry, Noise Thermometry, Heat Flux Sensors

UNIT-III	MAGNETIC SENSORS	Classes:10

Magnetic sensors: Introduction, Sensors and the Principles Behind, Magneto-resistive Sensors, Anisotropic Magneto resistive Sensing, Semiconductor Magneto resistors, Hall Effect and Sensors, Inductance and Eddy Current Sensors, Angular/Rotary Movement Transducers, Synchros.

UNIT-IV	RADIATION SENSORS	Classes:12

Radiation Sensors: Introduction, Basic Characteristics, Types of Photo resistors/ Photo detectors, X- ray and Nuclear Radiation Sensors, Fibre Optic Sensors

Electro analytical Sensors: The Electrochemical Cell, The Cell Potential - Standard Hydrogen Electrode (SHE), Liquid Junction and Other Potentials, Polarization, Concentration Polarization, Reference Electrodes, Sensor Electrodes, Electro ceramics in Gas Media.

UNIT-V	SMART SENSORS	Classes: 12

Smart Sensors: Introduction, Primary Sensors, Excitation, Amplification, Filters, Converters, Compensation, Information Coding/Processing - Data Communication, Standards for Smart Sensor Interface, the Automation

Sensors –Applications: Introduction, On-board Automobile Sensors (Automotive Sensors), Home Appliance Sensors, Aerospace Sensors, Sensors for Manufacturing – Sensors for environmental Monitoring

TEXT BOOKS

1. "Sensors and Transducers - D. Patranabis" –PHI Learning Private Limited., 2003.
2. Introduction to sensors- John veteline, aravind raghu, CRC press, 2011

REFERENCE BOOKS

1. Sensors and Actuators, D. Patranabis, 2nd Ed., PHI, 2013.
2. Make sensors: Terokarvinen, kemo, karvinen and villey valtokari, 1st edition, maker media, 2014.
3. Sensors handbook- Sabrie soloman, 2nd Ed. TMH, 2009

WEB REFERENCES

1. https://www.mdpi.com/journal/sensors
2. https://appmeas.co.uk/resources/sensor-reference-articles/
3. https://www.hindawi.com/journals/js/2019/6514520/
4. https://www.elsevier.com/journals/sensors-and-actuators-a-physical/0924-4247/guide-for-authors

E -TEXT BOOKS

1. https://link.springer.com/book/10.1007/b97321
2. https://www.quora.com/Which-is-the-best-book-for-learning-about-sensors-and-their-signal-conditioning
3. https://www.azosensors.com/book-index.aspx

MOOCS COURSES

1. https://www.mooc-list.com/tags/sensors
2. https://onlinecourses.nptel.ac.in/noc19_ee41/preview
3. https://www.coursera.org/learn/sensors-circuit-interface
4. https://www.my-mooc.com/en/mooc/iot-sensors-and-devices/

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

MEASURING INSTRUMENTS

(Open Elective-III)

IV B. TECH- II SEMESTER (R20)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EC800OE	B.Tech	3	0	0	3	30	70	100

COURSE OBJECTIVES

To learn

1. To provide basic knowledge in transduction principles, sensors and transducer technology and measurement systems.
2. To provide better familiarity with the concepts of Sensors and Measurements
3. To provide the knowledge of various measurement methods of physical parameters like velocity, acceleration, force, pressure and viscosity.
4. To study the measurement techniques.
5. To understand Meterology

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

1. Able to identify suitable sensors and transducers for real time applications.
2. Able to translate theoretical concepts into working models.
3. Able to understand the basic of measuring device and use them in relevant situation.
4. Able to implement measurement techniques.
5. Able to know Meterology.

UNIT-I	INTRODUCTION	Classes: 12

Introduction to measurements. Physical measurement. Forms and methods of measurements. Measurement errors. Statistical analysis of measurement data. Probability of errors. Limiting errors. Standards. Definition of standard units. International standards. Primary standards. Secondary standards. Working standards. Voltage standard. Resistance standard. Current standard. Capacitance standard. Time and frequency standards.

UNIT-II	PASSIVE SENSORS	Classes:13

Passive Sensors. Resistive Sensors: Potentiometers, Strain Gages, Resistive Temperature Detectors (RTDs), Thermistors, Light-dependent Resistors (LDRs), Resistive Hygrometers, Capacitive Sensors: Variable capacitor, Differential capacitor, Inductive Sensors: Reluctance variation sensors, Eddy current sensors

UNIT-III	METROLOGY	Classes:10

Metrology: Measurement of length – Plainness – Area – Diameter – Roughness – Angle – Comparators – Gauge Blocks. Optical Methods for length and distance measurements. Velocity and Acceleration Measurement: Relative velocity – Translational and Rotational

velocity measurements – Revolution counters and Timers - Magnetic and Photoelectric pulse counting stroboscopic methods. Accelerometers- different types, Gyroscopes- applications.

UNIT-IV	MEASUREMENT OF FORCE AND PRESSURE	Classes:12

Force and Pressure Measurement: Gyroscopic Force Measurement – Vibrating wire Force transducer. Basics of Pressure measurement –Manometer types – Force-Balance and Vibrating Cylinder Transducers – High- and Low-Pressure measurement

UNIT-V	VISCOSITY	Classes: 12

Flow, Density and Viscosity Measurements: Flow Meters- Head type, Area type (Rota meter), electromagnetic type, Positive displacement type, Density measurements – Strain Gauge load cell method – Buoyancy method. Units of Viscosity, Two float viscorator – Industrial consistency meter

TEXT BOOKS

1. Measurement Systems – Applications and Design – by Doeblin E.O., 4/e, McGraw Hill International, 1990.
2. Principles of Industrial Instrumentation – Patranabis D. TMH. End edition 1997

REFERENCE BOOKS

1. Sensor Technology Hand Book – Jon Wilson, Newne 2004.
2. Instrument Transducers – An Introduction to their Performance and design – by Herman K.P. Neubrat, Oxford University Press.
3. Measurement system: Applications and Design – by E.O. Doeblin, McGraw Hill Publications.
4. Electronic Instrumentation by H.S. Kalsi.

WEB REFERENCES

1. https://www.osapublishing.org/josa/abstract.cfm?uri=josa-9-3-309
2. https://www.nist.gov/sri
3. https://iopscience.iop.org/journal/0957-0233
4. https://www.researchgate.net/publication/271498593_A_reference_model_of_an_instrument_for_quality_measurement_of_semantic_IS_standards

E -TEXT BOOKS

1. https://www.schandpublishing.com/books/tech-professional/electrical-engineering-electronics/electrical-measurements-measuring-instruments/9788121929639
2. https://www.britannica.com/technology/measurement
3. https://ec.europa.eu/growth/single-market/european-standards/harmonised-standards/measuring-instruments-mid_en

MOOCS COURSE

1. https://www.mooc-list.com/tags/electrical-instruments
2. https://www.classcentral.com/course/swayam-mechanical-measurement-systems-10084
3. https://nptel.ac.in/courses/112/107/112107242/
4. https://www.bcit.ca/free-online-learning/mooc-0371-metrology-the-science-of-measurement/