

SCHOOL OF INFORMATION AND COMMUNICATION TECHNOLOGY

COURSE STURCTURE

5 YEARS DUAL DEGREE B.TECH. (ECE) + M. TECH. / MBA

SPECIALIZATION:

WIRELESS COMMUNICATION AND NETWORKS



**GAUTAM BUDDHA UNIVERSITY
GAUTAM BUDH NAGAR, GREATER NOIDA
2014-2015**

**5 Year Dual Degree B. Tech. (Electronics & Communication Engineering)+ M.Tech./MBA
2014-2015**

SEMESTER –I

Sr.No.	Course Code	Courses	L-T-P	Credits
		<u>THEORY</u>		
1	CY101/PH102	Engineering Chemistry/Engineering Physics	3-1-0	4
2	MA101	Engineering Mathematics – I	3-1-0	4
3	CE 101	Engineering Mechanics	2-1-0	3
4	CS 101	Computer Programming – I	2-0-0	2
5	EC101/EE102	Basic Electronics / Electrical Technology	2-0-0	2
6	HU 101	English Proficiency	2-0-0	2
7	SS101	Human Values & Buddhist Ethics	2-0-0	2
		<u>PRACTICALS</u>		
8	CY103/PH104	Engineering Chemistry Lab/Engineering Physics Lab	0-0-2	1
9	CS183	Cyber Security Lab	0-0-3	2
10	CS181	Computer Programming Lab –I	0-0-3	2
11	EC181/EE104	Basic Electronics Lab/ Electrical Technology Lab	0-0-2	1
12	GP101	General Proficiency	-	1
		Total	16-3-10	26
		Total Contact Hours	29	

SEMESTER- II

Sr. No.	Course Code	Courses	L-T-P	Credits
		<u>THEORY</u>		
1	PH102/CY101	Engineering Physics/ Engineering Chemistry	3-1-0	4
2	MA102	Engineering Mathematics – II	3-1-0	4
3	CE106	Ecology and Environment	2-1-0	3
4	CS102	Computer Programming – II	2-0-0	2
5	EE102/EC101	Electrical Technology/ Basic Electronics	2-0-0	2
6	HU102	Professional Communication	2-0-0	2
7	SS102	History of Science & Technology	2-0-0	2
		<u>PRACTICALS</u>		
8	PH104/CY103	Engineering Physics Lab/ Engineering Chemistry Lab	0-0-2	1
9	CS182	Computer Programming Lab II	0-0-3	2
10	EE104/EC181	Electrical Technology Lab/ Basic Electronics Lab	0-0-2	1
11	ME102	Engineering Workshop	0-0-3	2
12	GP102	General Proficiency	-	1
		Total	16-3-10	26
		Total Contact Hours	29	

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SEMESTER – III

Sr. No.	Course Code	Courses	L-T-P	Credits
		<u>THEORY</u>		
1	MA201	Engineering Mathematics-III	3-1-0	4
2	EC201	Digital Electronics	3-0-0	3
3	EC203	Network Analysis and Synthesis	3-0-0	3
4	EC205	Signal and Systems	2-1-0	3
5	CS205	Data Structures and Algorithms	2-1-0	3
6	EC207	Electronic Devices and Circuits	3-0-0	3
		<u>PRACTICALS</u>		
7	EC281	Digital Electronics Lab	0-0-3	2
8	CS283	Data Structures and Algorithms Lab	0-0-3	2
9	EC283	Electronic Circuits Lab	0-0-3	2
10	GP201	General Proficiency		1
		Total	17-2-9	26
		Total Contact Hours	28	

SEMESTER – IV

Sr. No.	Course Code	Courses	L-T-P	Credits
		<u>THEORY</u>		
1	MA202	Quantitative Techniques	3-1-0	4
2	EE202	Measurements and Instrumentation	2-0-0	2
3	EC202	Analog Communication	3-1-0	4
4	EC204	Linear IC Applications	3-0-0	3
5	EC206	Digital Signal Processing	3-0-0	3
6	EC208	Electromagnetic Theory	3-0-0	3
		<u>PRACTICALS</u>		
7	EE216	Measurements and Instrumentation Lab	0-0-3	2
8	EC282	Analog Communication Lab	0-0-3	2
9	EC284	Digital Signal Processing Lab	0-0-3	2
10	GP202	General Proficiency		1
		Total	17-2-9	26
		Total Contact Hours	28	

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SEMESTER – V

Sr. No.	Course Code	Courses	L-T-P	Credits
		<u>THEORY</u>		
1	EC301	Digital Logic Design	3-0-0	3
2	EC303	Digital Communication Systems	3-0-0	3
3	EC305	Antenna and Wave Propagation	3-1-0	4
4	EC307	Introduction to Control Theory	3-1-0	4
5	CS309	Computer Organization and Architecture	3-0-0	3
6	CS311	E-Commerce	2-0-0	2
		<u>PRACTICALS</u>		
7	EC381	Logic Design Lab	0-0-3	2
8	EC383	Digital Communication Lab	0-0-3	2
9	EC385	Antenna and Wave Propagation Lab	0-0-3	2
10	GP301	General Proficiency		1
		Total	17-2-9	26
		Total Contact Hours	28	

SEMESTER – VI

Sr. No.	Course Code	Courses	L-T-P	Credits
		<u>THEORY</u>		
1	EC302	Microwave Engineering	3-1-0	4
2	EC304	Microprocessors & Interfacing	3-0-0	3
3	EC306	Microelectronics Engineering	3-0-0	3
4	EC308	Information Theory & Coding	3-1-0	4
5	CS310	Data Networks	3-0-0	3
6	CS312	Management Information System	2-0-0	2
		<u>PRACTICALS</u>		
7	EC382	Microwave Engineering Lab	0-0-3	2
8	EC384	Microprocessor and Interfacing Lab	0-0-3	2
9	CS382	Computer Networks Lab	0-0-3	2
10	GP302	General Proficiency		1
		Total	17-2-9	26
		Total Contact Hours	28	

**5 Year Dual Degree B. Tech. (Electronics & Communication Engineering)+ M.Tech./MBA
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SEMESTER – VII

Sr. No.	Course Code	Courses	L-T-P	Credits
		<u>THEORY</u>		
1	SS401	Social Aspects of Engineering	2-1-0	3
2	EC401	Optical Communication	3-0-0	3
3	EC403	Semiconductor Device Modeling and Technology	3-1-0	4
4	EC405	Wireless Mobile Communication	3-1-0	4
5		Elective	3-0-0	3
		<u>PRACTICALS</u>		
6	EC481	Optical Communication Lab	0-0-3	2
7	EC491	Seminar	0-0-3	2
8	EC493	Minor Project	0-0-8	4
9	GP401	General Proficiency	-	1
		Total	14-3-14	26
		Total Contact Hours	31	

Elective

Sr.No	Course Code	Courses
1	EC441	Design with Microcontrollers
2	EC443	Telecommunication Switching and Networks
3	EC445	Satellite Communication
4	EC447	Digital Image Processing
5	EC449	Communication Networks and Transmission Lines
6	EC465	Principles of VLSI Design
7	EC467	RADAR and TV Engineering

SEMESTER-VIII

Sr. No.	Course Code	Courses	L-T-P	Credits
		<u>THEORY</u>		
1	MA402	Modeling and Simulation	3-1-0	4
2	EC540	Wireless Networks	3-0-0	3
3	EC534	Wireless System Design	3-0-0	3
4	EC546	Ad-hoc Wireless Networks	3-0-0	3
5		Elective-1	3-0-0	3
		<u>PRACTICALS</u>		
6	EC584	Design Lab-I	0-0-3	2
7	EC592	Major Project	0-0-10	5
8	GP532	General Proficiency	---	1
		Total	15-1-13	24
		Total Contact Hours	29	

**5 Year Dual Degree B. Tech. (Electronics & Communication Engineering)+ M.Tech./MBA
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Electives (1)

Sr.No	Course Code	Courses
1	EC562	Optical Networks
2	EC544	Advanced RF Engineering
3	EC550	Advanced Microwave Communication
4	EC542	Advanced Computer Networks
5	EC532	Advanced Communication Networks

Summer Semester (After 8th Semester)

Sr. No.	Courses Code	Courses	L-T-P	Credits
1	EC490	Project	0-0-20	10
Total Credits				10
Total Contact Hours			0-0-20 =	20

SEMESTER – IX

Sr. No.	Course Code	Courses	L-T-P	Credits
		<u>THEORY</u>		
1	EC631	Security in Wireless Networks	3-0-0	3
2	EC635	Mobile Computing	3-0-0	3
3		Elective-2	3-0-0	3
4		Elective-3	3-0-0	3
		<u>PRACTICALS</u>		
5	EC681	Design Lab-II	0-0-3	2
7	EC691	Dissertation Part-I	0-0-14	7
8	GP631	General Proficiency	---	1
		Total	12-0-17	22
		Total Contact Hours	29	

Electives (2 & 3)

Sr.No	Course Code	Courses
1	EC641	Network Reliability
2	EC643	Smart Antenna Systems
3	EC645	Broadband Wireless Networks
4	EC647	Sensor Networks
5	EC639	Discrete Signal Transformations
6	EC651	Multicast Communication

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SEMESTER-X

Sr. No	Course Code	Courses	L-T-P	Credits
1	EC690	Dissertation Part-II	---	21
2	GP632	General Proficiency	---	1
		Total	---	22

Grand Total Credits = 260

5 Year Dual Degree B. Tech. (Electronics & Communication Engineering)+ M.Tech./MBA 2014-2015

Part I

B.Tech.+M.Tech./MBA

(Engineering/ICT/Biotechnology/Food Processing and Technology)

MA 101 (Engineering Mathematics-I)

Credits (L-T-P) : 4 (3- 1- 0)

Unit I

BASIC ANALYSIS

Real number system: Completeness axiom, Density of rational numbers in \mathbb{R} . Sequence and series, Limit, Continuity and differentiability of a function of single variable, Successive differentiation, Leibnitz theorem. Rolle's Theorem, Mean value theorems, Taylor and Maclaurin's series.

Unit II

MULTIVARIABLE CALCULUS

Limits, Continuity and differentiability in higher dimensions, Partial differentiation, Chain rule, Jacobian, Directional Derivatives and Gradient Vectors, Extreme values and Saddle points, Lagrange's multiplier method. Taylor's series for a function of several variables.

Unit III

CURVE TRACING

Curve Tracing in Cartesian Coordinates and Polar Coordinate systems, Area and Length in Polar Coordinates.

Unit IV

MULTIPLE INTEGRAL

Double Integral, triple integral, Fubini's Theorem, Change of order for double integral, Change of variables (*double integral: polar form, triple integral: Cylindrical and Spherical form*).

Unit V

FUNDAMENTAL THEOREMS OF VECTOR CALCULUS

Line integral, surface area and surface integral, Green's Theorem, Vector fields, Divergence and curl of vector fields. Stokes' Theorem and Gauss divergence theorems.

Textbook Thomas Calculus , 11th Edition, Pearson Education Asia, 2009.

Books

- [1] R. K. Jain and S.R.K Iyengar, *Advanced Engineering Mathematics*, Narosa Publications.
- [2] E. Kreyszig, *Advanced Engineering Mathematics*, John Wiley and Sons, 2005.
- [3] P. V. O'Neil, *Advanced Engineering Mathematics*, Thomson (Cengage) Learning, 2007.
- [4] J. Stewart, *Calculus*, Cengage Learning, Sixth Edition.

MA 102 (Engineering Mathematics-II)

Credits (L-T-P) : 4 (3- 1- 0)

Unit I

Matrices, Algebra of Matrices, Elementary row and column operations and reduced echelon forms, Normal Form, Rank of a matrix, Consistency of linear system of equations and their solutions.

Unit II

Finite dimensional vector spaces over reals, Subspace, Linear Dependence and Independence of vectors, Basis, Dimension. Characteristic equation and characteristic polynomial, eigenvalues and eigenvectors, Cayley-Hamilton theorem, diagonalisation.

Unit III

Algebra of Complex numbers, Polar form of complex numbers, Functions of complex variables, Limit, Continuity and Differentiability of Complex functions.

Unit IV

Analytic function, C-R equation, Harmonic functions, Line Integral in complex form, Cauchy's integral theorem, Morera's Theorem, Cauchy's integral formula: Cauchy's Integral formula for derivatives of analytic functions, Liouville's theorem, Fundamental Theorem of algebra.

Unit V

Taylor's and Laurent's Series, Singularities, Zeros and Poles, Residue, Residue theorem, Evaluation of real integrals, Conformal mapping.

Textbook E. Kreyszig, *Advanced Engineering Mathematics*. John Wiley and Sons, 2005.

Books

- [1] R. K. Jain and S.R.K Iyengar, *Advanced Engineering Mathematics*, Narosa Publications.
- [2] J. W. Brown, R. V. Churchill, *Complex Variables and Applications*, McGraw-Hill Higher Education; 8 edition, 2008.

**5 Year Dual Degree B. Tech. (Electronics & Communication Engineering)+ M.Tech./MBA
2014-2015**

COMPUTER PROGRAMMING – I			
Course Code:	CS101	Credits:	2
No. of Lectures (Hrs/Week):	2	Mid Sem Exam Hours:	2
Total No. of Lectures:	30	End Sem Exam Hours:	3

UNIT I INTRODUCTION TO COMPUTER

Definition, characteristic, generation of computers, basic components of a computer system, memory, input, output and storage units, hard copy devices, high level language and low level language, software, system software, application software, hardware, firmware, compiler, interpreter and assembler.

UNIT II INTRODUCTION TO PROGRAMMING CONCEPT

Introduction to algorithm and flow chart; representation of algorithm using flow chart symbol, pseudo code, basic algorithm design, characteristics of good algorithm, development of algorithm.

UNIT III INTRODUCTION TO C PROGRAMMING LANGUAGE

declaring variables, preprocessor statements, arithmetic operators, programming style, keyboard input , relational operators, introduction, feature of C language, concepts, uses, basic program structure, simple data types, variables, constants, operators, comments, control flow statement :if, while, for, do-while, switch .

UNIT IV

User defined data types, arrays, declaration and operations on arrays, structure, member accessing, structure and union, array of structures, functions, declaration and use of functions, parameter passing, dynamic memory allocation.

UNIT V FUNDAMENTALS OF POINTERS

Declaration and usages of pointers, operations that can be performed on computers, use of pointers in programming exercises, parameter passing in pointers, call by value, call by references, Introduction to LINUX: LINUX structure, directory, LINUX commands.

Text Books:

1. C Programming, Herbert Shield
2. Programming in ANSI C by E. Balagurusamy, Tata McGraw Hill,

Reference Books:

3. C Programming Language 2nd Edition by Brian, W Kernighan Pearson Education.
4. C. Puzzle Book: Puzzles For The C. Programming Language by Alan R Feuer Prentice Hall- Gale
5. Expert C Programming: Deep C Secrets (s) by Peter Van Der Linden Dorling Kindersley India.
6. Introduction To UNIX System by Morgan Rachel Tata McGraw Hill Education.
7. C: A Reference Manual (5th Edition) by Samuel P. Harbison & Samuel P. Harbison.
8. Programming Using the C Language by Hutchison, R.C, McGraw Hill Book Company, New York

**5 Year Dual Degree B. Tech. (Electronics & Communication Engineering)+ M.Tech./MBA
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BASIC ELECTRONICS			
Course Code:	EC101	Credits:	2
No. of Lectures (Hrs/Week):	2	Mid Sem Exam Hours:	2
Total No. of Lectures:	30	End Sem Exam Hours:	3

Unit I:**Passive Components**

Resistances, Capacitors and Inductors, Component Specifications, Applications, Response to dc and sinusoidal voltage/current excitations

Semiconductor Theory

Metals, Insulators and Semiconductor materials, energy band diagram, Intrinsic and Extrinsic Semiconductors, Doping, Fermi level, Fermi level of P-type and N-type materials, Mobility, Drift Current and Diffusion Current. Current conduction in Semiconductors, Generation and Recombination of Charges

Unit II: Semiconductor Diodes

Theory of P-N Junction, Ideal & Practical diode, Concept of AC and DC Resistances, V-I Characteristics, Diode Equivalent Circuits, Transition and Diffusion Capacitance, Reverse Recovery Time, Zener and Avalanche breakdown, Tunnel Diodes, Varactor Diode, Light Emitting Diode

Unit III: Diode Applications and Wave Shaping Circuits

Load line analysis, series and parallel combinations, Half wave & Full wave Rectifiers, Clippers & Clampers.

Unit IV: Transistors

Bipolar Junction Transistor- Construction, Operation, Transistor Configurations, Input and Output Characteristics, AC and DC Load line, operating point, Effect of shifting the operating point. Biasing, Thermal Runaway, Effect of temperature on the characteristics, Early effect, introduction to JFET and MOSFET

Unit V: Logic Gates and Operational Amplifiers

Binary number, Digital systems, Boolean algebra, logic gates, logic functions, realization of logic gates by electronic devices, Positive and negative logic, representation of binary numbers, half adder, full adder, flip-flops, Op-Amp, Practical Op-Amp, Open loop and closed loop configurations, Applications of Op-Amps as inverting and non-inverting amplifier

Text Books:

- [1] Boyelasted an Nashlsky: Electronics Devices and circuit Theory, TMH.
- [2] Gayakwad :Op-Amps and Linear Inegrated Circuits , PHI.

References:

- [1] Millman & Halkias :Integrated Electronics ,TMH.
- [2] Morris Mano: Digital Design ,PHI.
- [3] Malvino :Electronics Principles,TMH.

EE102: Electrical Technology

L-T-P: 2-0-0

Credits: 02

Module I: Elements and Circuits

Types of electrical elements & sources, Kirchhoff's laws, Node voltage and mesh current methods, De star and star-delta conversion and Network theorems.

Module II: Single-phase AC Circuits

Average and effective values of sinusoidal quantities, form, crest and ripple factor, solution of R.I series circuits, the j operator, complex representation of impedances, phasor diagram, power factor, $\cos \phi$ in complex notation, solution of parallel and series circuits.

Module III: Three-phase AC Circuits

Three phase voltages, line and phase quantities, balanced supply voltage and balanced load, problem low power factor and methods for improvement.

Module IV: Magnetic Circuits and Transformer

Magnetic Circuits: B-H curve, solution of magnetic circuits, hysteresis and eddy current loss
Transformers: Construction, EMF equation, ratings, equivalent circuit, phasor diagram, regulation and efficiency calculations, open and short circuit tests.

Module V: Electrical Machines

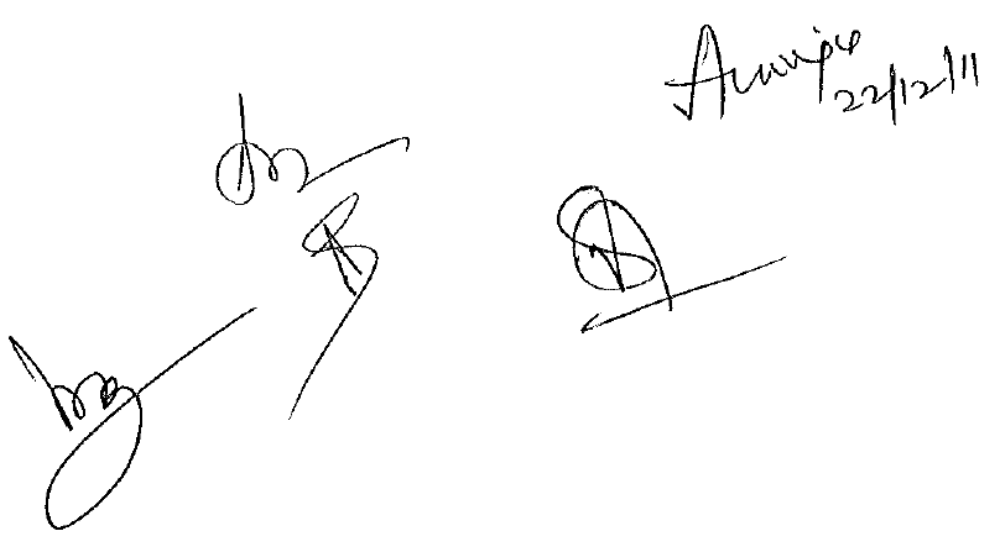
Construction, principle, characteristics of DC machines, applications of DC machines.

Text Books:

1. Basic Electrical Engineering, D.P Kothari & I.J Nagrath, TMH, Second Edition.
2. Basic Electrical Engineering, T. K. Nagsarkar & M.S. Sukhija, Oxford Publication.
3. Basic Electrical Engineering, V.N. Mittle and A. Mittal, TMH, Second Edition

Reference Books:

1. Electrical Engineering Fundamental, Vincent.D.Toro, Pearson Education, Second Edition.
2. Electrical & Electronics Technology, 8/e, Hughes, Pearson Education.
3. Introduction to Electrical Engineering, M.S. Naidu & S. Kamakshaiah, TMH.
4. Basic Electrical Engineering, J.J. Cathey & S.A Nasar, TMH, Second Edition.

The block contains three handwritten signatures in black ink. The signature on the left is a stylized 'B' with a horizontal line extending to the right. The signature in the middle is a cursive 'A' with a horizontal line extending to the right. The signature on the right is a cursive 'A' with a horizontal line extending to the right. Above the middle signature, the date '22/12/11' is written in a cursive script.

**5 Year Dual Degree B. Tech. (Electronics & Communication Engineering)+ M.Tech./MBA
2014-2015**

BASIC ELECTRONICS LAB			
Course Code:	EC181	Credits:	1
No. of Lab (Hrs/Week):	2		
Total No. of Lab Sessions:	10	End Sem Exam Hours:	2

List of Experiments

1. Study of Multimeter and Function Generator /Counter.
2. Study of Cathode-Ray Oscilloscope.
3. To calculate the Equivalent Resistance of the Series and parallel resistive network.
4. To calculate the Equivalent Capacitance of the Series and parallel capacitive network.
5. To Plot the V-I Characteristics of P-N Junction Diode in forward bias and reverse bias.
6. To study the working of a P-N Junction Diode as a switch.
7. To plot the V-I Characteristics of a Zener Diode.
8. To plot the input and output waveforms of clipper circuits.
9. Study the Half wave rectifier.
10. Study of Full wave Bridge Rectifier.
11. Study of Centre Tapped Full Wave Rectifier.
12. To plot the input and output characteristic of transistor's Common Base configuration.
13. To plot the input and output characteristic of transistor's Common Emitter configuration.
14. To plot the input and output characteristic of transistor's Common Collector configuration.
15. To verify the truth table of various logic gates.

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COMPUTER PROGRAMMING LAB – I			
Course Code:	CS181	Credits:	2
No. of Lectures (Hrs/Week):	3		
Total No. of Lab Sessions:	10	End Sem Exam Hours:	3

EXPERIMENTS:

1. Write a C program to reverse a given number, find the sum of digits of the number.
2. Write a C program to concatenate two strings.
3. Write a C program to take marks of a student as input and print the his/her grade bases on following criteria using if – else statements

Marks <40	FAIL
40<= Marks <59	GOOD
59 <= Marks < 80	Excellent
80 <= Marks	Outstanding
4. Perform experiment 3 using switch case statement.
5. Write a C program to compute the length of a string using while loop.
6. Write a C program to convert all the lowercase letter to uppercase letter and all uppercase letters to lower case letter given a string as input.
7. Write a C program to compute the roots of a quadratic equation.
8. Write a C program to check whether a given number is prime or not, also check whether it is divisible by a number k or not.
9. Write a C program to check whether a given year is leap year or not.
10. Write a C program to take two matrixes as input and print the sum of two matrixes.
11. Write a C program to display the address of a variable using pointer.
12. Write a C program to compute the length of a string using pointer.
13. Create a structure called STUDENT having name, registration number, class, session as its field. Compute the size of structure STUDENT.
14. Write a C program to check weather a given string is palindrome or not.
15. Write a C program to generate following patterns.

```

      1
    2  2
  3   3   3
  
```

**5 Year Dual Degree B. Tech. (Electronics & Communication Engineering)+ M.Tech./MBA
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4 4 4 4

A

B B

C C C

D D D D

(SEMESTER - II)

**5 Year Dual Degree B. Tech. (Electronics & Communication Engineering)+ M.Tech./MBA
2014-2015**

COMPUTER PROGRAMMING – II			
Course Code:	CS102	Credits:	2
No. of Lectures (Hrs/Week):	2	Mid Sem Exam Hours:	2
Total No. of Lectures:	30	End Sem Exam Hours:	3

UNIT I OBJECT-ORIENTED PROGRAMMING

Concept of object-oriented programming (OOP), benefits of OOP, application of OOP, Java history, Java features, Java streaming, Java and Internet, Java contribution to Internet: Java applets, security, portability; Java environment, Java library, Java program structure, Java program, Java Virtual Machine (JVM) architecture, Just In Time compiler (JIT), data type, variables and arrays, operators, control statements, object-oriented paradigms; abstraction, encapsulation, inheritance, polymorphism, Java class and OOP implementation

UNIT II DATA TYPE, OPERATORS AND CONTROL STATEMENT

Data types, Java key words, identifiers, constants, variables, declaration and scope of the variable, symbolic constant, type casting, arithmetic operator, relational operator, logical operator, assignment operator, increment and decrement operator, conditional operator, bitwise operator, ?: operator, arithmetic expressions, expressions, type conversions in expressions, mathematical functions, more data types: arrays, strings, vectors, wrappers classes, program control statements: decision making and branching: if, if....else, else....if, else if ladder, switch, decision making and looping: while, do....while, for.

UNIT III CLASSES, OBJECTS AND METHODS

Java class libraries, class fundamentals, object, methods, adding variables, add methods, creating objects, accessing class members, constructors, methods overloading, static members, nesting of methods, inheritance: extending a class, overriding methods, final variables and methods, final classes, finalizer methods, abstract methods and classes, visibility control, exception handling fundamental.

UNIT IV INTERFACES AND PACKAGES

Interfaces, extending interfaces, implementing interfaces, interfaces references, accessing interface variable, creating queue interface, variable in interfaces, packages, finding a packages and classpath, package and member access, Java API package, system package, naming conventions, creating package, accessing a package, adding a class to a package, hiding classes,

UNIT V MULTITHREADING AND APPLET PROGRAMMING

Multithreading programming: creating threads, thread class and runnable interface extending the thread class, stopping and blocking a thread, life cycle of a thread, thread methods, thread exceptions, thread priority, synchronization, thread communication using notify(), wait(), and notify all(), applet programming : applet basic, applets architecture, a complete applet skeleton, building applets code, applets life cycle, creating a executable applet, designing a web page, applets tag, passing parameters to applets, applets and HTML.

Reference Books:

1. Programming with JAVA, E. Balagurusawamy, Tata McGraw Hill, 1998.
2. JAVA Beginner's guide, Herbert Schildt, Tata McGraw Hill, 2007.
3. Java How to Program, Deitel & Deitel, Prentice-Hall, 1999.
4. The Complete Reference JAVA 2, Herbert Schildt, 5th Edition, Tata McGraw Hill, 2002.
5. The Complete Reference JAVA 2, Herbert Schildt, 7th Edition, Tata McGraw Hill, 2009.
6. The Java Programming Language, Ken Arnold, James Gosling, Addison-Wesley, 1996.
7. How to Program Java, Peter Coffee, Ziff-Davis Press, 1996.

5 Year Dual Degree B. Tech. (Electronics & Communication Engineering)+ M.Tech./MBA 2014-2015

Part I

B.Tech.+M.Tech./MBA

(Engineering/ICT/Biotechnology/Food Processing and Technology)

MA 101 (Engineering Mathematics-I)

Credits (L-T-P) : 4 (3- 1- 0)

Unit I

BASIC ANALYSIS

Real number system: Completeness axiom, Density of rational numbers in \mathbb{R} . Sequence and series, Limit, Continuity and differentiability of a function of single variable, Successive differentiation, Leibnitz theorem. Rolle's Theorem, Mean value theorems, Taylor and Maclaurin's series.

Unit II

MULTIVARIABLE CALCULUS

Limits, Continuity and differentiability in higher dimensions, Partial differentiation, Chain rule, Jacobian, Directional Derivatives and Gradient Vectors, Extreme values and Saddle points, Lagrange's multiplier method. Taylor's series for a function of several variables.

Unit III

CURVE TRACING

Curve Tracing in Cartesian Coordinates and Polar Coordinate systems, Area and Length in Polar Coordinates.

Unit IV

MULTIPLE INTEGRAL

Double Integral, triple integral, Fubini's Theorem, Change of order for double integral, Change of variables (*double integral: polar form, triple integral: Cylindrical and Spherical form*).

Unit V

FUNDAMENTAL THEOREMS OF VECTOR CALCULUS

Line integral, surface area and surface integral, Green's Theorem, Vector fields, Divergence and curl of vector fields. Stokes' Theorem and Gauss divergence theorems.

Textbook Thomas Calculus , 11th Edition, Pearson Education Asia, 2009.

Books

- [1] R. K. Jain and S.R.K Iyengar, *Advanced Engineering Mathematics*, Narosa Publications.
- [2] E. Kreyszig, *Advanced Engineering Mathematics*, John Wiley and Sons, 2005.
- [3] P. V. O'Neil, *Advanced Engineering Mathematics*, Thomson (Cengage) Learning, 2007.
- [4] J. Stewart, *Calculus*, Cengage Learning, Sixth Edition.

MA 102 (Engineering Mathematics-II)

Credits (L-T-P) : 4 (3- 1- 0)

Unit I

Matrices, Algebra of Matrices, Elementary row and column operations and reduced echelon forms, Normal Form, Rank of a matrix, Consistency of linear system of equations and their solutions.

Unit II

Finite dimensional vector spaces over reals, Subspace, Linear Dependence and Independence of vectors, Basis, Dimension. Characteristic equation and characteristic polynomial, eigenvalues and eigenvectors, Cayley-Hamilton theorem, diagonalisation.

Unit III

Algebra of Complex numbers, Polar form of complex numbers, Functions of complex variables, Limit, Continuity and Differentiability of Complex functions.

Unit IV

Analytic function, C-R equation, Harmonic functions, Line Integral in complex form, Cauchy's integral theorem, Morera's Theorem, Cauchy's integral formula: Cauchy's Integral formula for derivatives of analytic functions, Liouville's theorem, Fundamental Theorem of algebra.

Unit V

Taylor's and Laurent's Series, Singularities, Zeros and Poles, Residue, Residue theorem, Evaluation of real integrals, Conformal mapping.

Textbook E. Kreyszig, *Advanced Engineering Mathematics*. John Wiley and Sons, 2005.

Books

- [1] R. K. Jain and S.R.K Iyengar, *Advanced Engineering Mathematics*, Narosa Publications.
- [2] J. W. Brown, R. V. Churchill, *Complex Variables and Applications*, McGraw-Hill Higher Education; 8 edition, 2008.

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CE106: Ecology and Environment

L-T-P: (2-1-0) Credit: 03

Module I

Definition, scope, importance and need for public awareness.

Module II

Natural Resources: Renewable and non-renewable resources, Different type of resources and related problems and issues, Resource conservation and sustainable life cycle.

Module III

Ecosystem: Definition and relevance, structure and function of ecosystem, producers, consumers and decomposers, Energy cycle in ecosystem, Ecological succession, Classification and characteristics of ecosystems.

Module IV

Biodiversity and its conservation: Definition and classification of ecological diversity, Hot spots of bio-diversity, Threats and conservation of bio-diversity.

Module V

Environmental Threats: Pollution, Global warming, Climate change, Solid waste and its management, Environmental disasters.

Module VI

Social Issues and Environment: Sustainable development, Urban environment problems, Water and energy conservation, Resettlement and rehabilitation of peoples, Environmental ethics.

Text Books:

1. Environmental Studies by R. Rajagopalan, Oxford University Press.
2. A textbook in Environmental Science by Arvind Kumar, A P H Publication Corporation.
3. Textbook of Environmental Studies for Undergraduate Courses By Erach Bharucha, University Press India.
4. A textbook in Environmental Science by V. Subramanian, CRC Press, 2002.
5. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha, Prenticehall of India Pvt Ltd.
6. Essentials of Ecology and Environmental Science, 4th ed., by Rana, PHI.
7. Environmental Science and Engineering, 2nd ed., Henry & Heinke.

Reference Books:

1. Principles of Environmental Sciences by Jan J. Boersema, Lucas Reijnders, Springer.
2. Environmental Science by Daniel D. Chiras, Jones and Bartletts Publishers.

Professional Communication (HU102) course contents:

Unit 1:

- (i) Communication : Definitions, Nature and Scope.
- (ii) Types: verbal and Non verbal Communication
- (iii) Barriers to Effective Communication
- (iv) Attributes to Effective Communication
- (v) Communication in Professional Domain

Unit 2:

- (i) Dissertation and Report Writing, Research Articles
- (ii) Business proposals
- (iii) Writing Resume, Job Applications
- (iv) Letters: Order letter, Enquiry letter, Enquiry-Response letter, Complaint letter, Apology letter, Persuasive letter.
- (v) Other modes of correspondences: Notice, Circular, Memos, Tender Notices, e-mails

Unit 3:

- (i) Oral presentations
- (ii) Group discussions
- (iii) Job interviews
- (iv) Conducting meetings/seminars: agenda setting, Minutes, Follow up

Unit 4:

Learning through thematic texts (Short stories & Poems)

- (i) "Hamida" by Amrita Pritam
- (ii) "Confession" by Guy de Maupassant
- (iii) "A Model Millionaire" by Oscar Wilde
- (iv) "Lines composed A Few Miles Above Tintern Abbey" by William Wordsworth
- (v) "On His Blindness" by John Milton
- (vi) "Captain! My Captain" by Walt Whitman

References:

1. Basic Correspondence and Report Writing , Sharma and Mohan, TMH
2. Basic Business Communication Skills for Empowering the Internet Generation, Lasikar, Flatly, TMH
3. Business Communication, Meenakshi Raman, Prakash Singh, Oxford Higher Education
4. An English Pronouncing Dictionary, London: Dent, rpt in facsimile in Jones(2002).
17th edition, P. Roach, J. Hartman and J. Setter(eds), Cambridge: CUP, 2006.

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Paper: History of Science and Technology Code: SS102 Credit: 2 Number of class: 30.

Objective:

1. Facilitating historical understanding among the students about the developmental of ancient to modern science and technology.
2. Providing knowledge about the science policy of Government of India.
3. Ensuring a vision about the desirable development of science and technology based on historical past.

Unit-I (Introduction)
<ul style="list-style-type: none"> • Science and technology: Definition and concepts, Scientific methods. • Science and technology in ancient civilization (Egypt, Greece, Rome, China) • Technology in the ancient India.
Unit-II (Medieval period)
<ul style="list-style-type: none"> • Dark ages in Europe, Church and science: the conflict and development • Renaissance as the new thought. • Science and technology in Medieval India and impact of the neighboring countries on Indian technology. • The technological marvel and construction of Indian temples and structures.
Unit-III (Modern Science)
<ul style="list-style-type: none"> • Birth of modern Science and the change in the society. • Galilean revolution and Newton's contribution in the development of modern science • Industrial revolution, the growth of technology and its impact on the society. • Impact of science and technology: Intellectual, social and economic
Unit-IV (Science and policies in India)
<ul style="list-style-type: none"> • Science policy of Independent India • Government programme and institutions in development of science and technology. • Indian Science and technology: recent development and future prospect

Reference book

- Tyler J. Veak – 2006, Democratizing technology: Andrew Feenberg's critical theory of technology, State University of New York Press
- Helaine Selin – 1997, Encyclopaedia of the history of science, technology, and medicine, Kluwer Academic publisher.
- Lourdasamy John Bosco (2004). Science and national consciousness in Bengal, Orient Longman
- Robert C. Scharff, Val Dusek (2003), Philosophy of technology: the technological condition: an anthology, Blackwell publication
- David M. Kaplan (2004). Readings in the philosophy of technology, Rawman & Littlefield Publishers, INC
- Carl Mitcham, 1994, Thinking through technology: the path between engineering and philosophy, the University of Chicago Press.
- Debiprasad Chattopadhyaya - 1996 , History of science and technology in ancient India, Volume 1, Firma KLM

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COMPUTER PROGRAMMING-II LAB			
Course Code:	CS182	Credits:	2
No. of Practical (Hrs/Week):	3		
Total No. of Lab Sessions:	10	End Sem. Exam Hours:	2

Programs/Experiments List:

- Write a separate Java Code to implement each of the following:
Class, Command Line Argument, how to enter value through keyboard
- Write a separate Java Code to implement each of the following data types:
Variable, Constant, Arrays, Strings, Vectors, Wrappers Classes, Type Casting
- Write a separate Java Code to implement each of the following operators:
Arithmetic operator, Relational operator, Logical operator, Assignment operator, Increment & Decrement operator, Conditional operator, Bitwise operator, ?: operator
- Write a separate Java Code to implement each of the following control statements:
Decision statement, Loops statement and Branch statements
- Write a separate Java Code to implement each of the following sorting:
Bubble Sort, Selection Sort, Insertion Sort, Merge Sort
- Write a separate Java Code to implement each of the following:
Class, Object, Constructors, Method, Method Overloading and Method Overriding
- Write a separate Java Code to implement each of the following:
Final variable, final class, final method, abstract class, abstract method and concrete method
- Write a separate Java Code to implement each of the following OOPs concepts:
Abstraction, Polymorphism, Encapsulation, Inheritance
- Write a separate Java Code to implement each of the following:
Exception handling with Try, Catch, Throw, Throws, Finally
Multiple catch statement with the following exceptions :
ArithmeticException, ArrayOutOfBoundsException and ArrayStoreException
- Write a separate Java Code to implement each of the following:
Visibility Controls: Private, Public and Protected
- Write a separate Java Code to implement each of the following:
Interface, extending and implementing interface
- Write a separate Java Code to implement each of the following:
Multithreading: Create thread with thread class and runnable interface, thread priorities, synchronization
- Write a separate Java Code to implement each of the following:
Packages : Create package A with following methods and import this package A into another Java program to show the result of methods of package A.
 - First method: Factorial number with the help of recursion.
 - Second method: Fibonacci Series

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- iii) Third Method: Generate first 10 prime numbers and show the sum of first 10 prime numbers.

14. Write Java Code to generate the following output on applet with the help of two dimensional array and show the result with the help of HTML file.

7	14	21	28	35	42	49	56	63	70	Sum = 385
5	10	15	20	25	30	35	40	45	50	Sum = 275
3	6	9	12	15	18	21	24	27	30	Sum = 165

15. Write a Java Code to design the following web page with the help of applet and HTML.

**School of Information and Communication Technology
GAUTAM BUDDHA UNIVERSITY
GREATER NOIDA**

- **Student Name:**
- **Enrollment Number:**
- **Programme Name:**
- **Semester:**
- **Course Name:**
- **E-Mail ID:**
- **Mobile Number:**
- **Blood Group:**

(SEMESTER - III)

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MA 201 (Engineering Mathematics-III)

Credits (L-T-P) : 4 (3-1-0)

Unit I

Definition of differential equation (linear/nonlinear) with examples, order and degree of the differential equation, types of solutions of differential equations, methods of solution, variables separable method, exact differential equations, integrating factors of first order differential equation of the type $M(x, y)dx + N(x, y)dy = 0$, Bernoulli equations, Riccati differential equation, Picard's existence and uniqueness theorem for $dy/dx = f(x, y)$ (without proof)

Unit II

Linear differential equations of nth order with constant coefficients, solutions of homogeneous and non-homogeneous linear differential equations, complementary functions and particular integrals, simultaneous linear differential equations, Euler-Cauchy linear differential equations, method of variation of parameters, applications to engineering problems (Motion of a particle in resisting medium, simple harmonic motion, electric circuit problem).

Unit III

Existence theorem for Laplace transform, Laplace transform of derivatives and integrals, Inverse Laplace transform, Unit step function, Dirac delta function, Laplace transform of periodic functions, Convolution theorem, Application to solve linear and simultaneous differential equations.

Unit IV

Periodic functions, Trigonometric series, Fourier series of period 2π , Euler's formulae, Functions having arbitrary period, Change of interval, Even and odd functions, Half range sine and cosine Fourier series,

Unit V

PDEs and its Applications: Linear partial differential equations with constant coefficients. Classifications of 2^{nd} order PDE. Method of separation of variables for solving partial differential equations, Its applications to solve Heat conduction equation, Wave equation, steady state heat equation (Laplace equation) through Fourier series.

Textbook R. K. Jain and S.R.K Iyengar, *Advanced Engineering Mathematics*, Narosa Publications.

Books

- [1] G. F. Simmons, *Differential Equations*. Tata Mc Graw-Hill Publishing Company Ltd., 1981.
- [2] E. Kreyszig, *Advanced Engineering Mathematics*. John Wiley and Sons, 2005.
- [3] W. E. Boyce and R.C. DiPrima, *Elementary differential equations and Boundary Value Problems*. John Wiley and Sons, 8th Edition, 2010.

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DIGITAL ELECTRONICS			
Course Code:	EC201	Credits:	3
No. of Lectures (Hrs/Week):	3	Mid Sem Exams Hours:	2
Total No. of Lectures:	45	End Sem Exams Hours:	3

Unit I: Review of Number systems and Binary codes, Binary arithmetic: addition, subtraction, multiplication and division algorithms. Boolean algebra: theorems and functions, Simplification of Boolean functions, minimization techniques, Karnaugh's map method, Quine and McCluskey's method, realization of various binary functions using AND, OR, NOT, XOR logic gates.

Unit II: Universal gates: NAND, NOR, realization of boolean function using universal gates. Half and full adder, half and full subtractor, Series and parallel adder, BCD adders, look-ahead Carry adder. Decoders, Encoders, multiplexers and de-multiplexers. Analysis and design of combination circuits, realization of various Boolean functions using NAND, NOR gates and multiplexers.

Unit III: Flip-Flops: R-S, Clocked R-S, T, D, J-K, race around problem, Master-slave J-K., State and Excitation Tables, Multivibrators- Astable, Monostable and bistable multivibrators, 555 timer chip and its application in multivibrators

Unit IV: Shift registers and counters, synchronous and asynchronous counters, Binary ripple counter, up-down counter, Johnson and ring counter, Analysis and Design of Sequential Circuits, SISO, SIPO, PISO, PIPO soft registers.

Unit V: Logic families: RTL, DTL, TTL, ECL, IIL, PMOS, NMOS and CMOS logic

Text Books:

- [1] M. Mano :Digital Logic and Computer Design, Pearson Education
- [2] William I. Fletcher :An Engineering Approach to Digital Design, Pearson Education
- [3] R.P. Jain: Digital Electronics, TMH

References:

- [1] M. Mano : Digital Design, Pearson Education
- [2] W.H. Gothman : Digital Electronics, PHI.
- [3] Millman and Taub : Pulse, Digital and Switching Waveforms, MGH
- [4] Anand Kumar : Pulse and Digital Circuits , PHI
- [5] Leach and Malvino : Digital Principles and Applications, TMH

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NETWORK ANALYSIS AND SYNTHESIS			
Course Code:	EC203	Credits:	3
No. of Lectures (Hrs/Week):	3	Mid Sem Exam Hours:	2
Total No. of Lectures:	45	End Sem Exam Hours:	3

Unit I: Introduction to Circuits

Voltage, Ideal Voltage Source, Current Ideal Current Sources, Classification of Circuits, Ohm's Law, Resistivity, Temperature Effect, Resistors, Resistor Power Absorption, Nominal Values and Tolerances, Color Codes, Open and Short Circuits, Internal Resistance. Operational Amplifiers, Capacitance, Inductance, Transformers.

Unit II: Network Theorems for DC applications

DC Circuits: Series and Parallel Circuits, Kirchhoff's Voltage and Current Law, Mesh Analysis, Loop Analysis, Nodal Analysis, Thevenin's and Norton's Theorem, Maximum Power Transfer Theorem, Superposition Theorem, Millman's Theorem, Tellegen's Theorem, Star - Delta and Delta -Star Transformation, Bridge Circuits.

Unit III: Network Theorems for AC applications

AC Circuits: Circuits containing Capacitors and Inductors, Transient Response, Alternating Current and Voltages, Phasors, Impedances and Admittance, Mesh Analysis, Loop Analysis, Nodal Analysis, Thevenin's and Norton's Theorem, Star-Delta and Delta-Star Transformation, Bridge Circuits. Resonant Circuits, Complex Frequency and Network Function, Maximum Power Transfer Theorem, Superposition Theorem.

Unit IV: Network Function and Two port Networks

Network function & Two port networks – concept of complex frequency, Network & Transfer functions for one port & two ports, poles and zeros, Necessary condition for driving point & transfer function. Two port parameters – Z,Y, ABCD, Hybrid parameters, their inverse & image parameters, relationship between parameters, Interconnection of two ports networks, Terminated two port network.

Unit V: Network Synthesis

Hurwitz polynomials, positive real functions. Properties of real immittance functions, synthesis of LC driving point immittances, properties of RC driving point impedances, synthesis of RC impedances or RL admittances, properties of RL impedances and RC admittances.

Text Books:

- [1] Decarlo Lin: Linear circuit Analysis; Oxford
- [2] Franklin F. Kuo : Network Analysis and synthesis, 2nd Edition, Wiley India Pvt Ltd.

References:

- [1] M.E. Van Valkenburg :Network Analysis, (PHI).
- [2] Chakraborti :Circuit theory, Dhanpat Rai.
- [3] Sudhakar Shyam Mohan: Network Analysis and Synthesis

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SIGNAL AND SYSTEMS			
Course Code:	EC205	Credits:	3
No. of Lectures (Hrs/Week):	3	Mid Sem Exam Hours:	2
Total No. of Lectures:	45	End Sem Exam Hours:	3

Unit I: LTI Systems

Classification of signals continuous time and discrete time signals, Even and Odd signals, Elementary continuous time and discrete time signals, Classification of systems, causality; stability, time invariance, linearity, Continuous time and Discrete time LTI Systems, convolution Integral and convolution sum, Properties of LTI Systems, Differential and Difference equations. Singularity functions.

Unit II: Analysis of Periodic Signals

Fourier series representation of CTFS, convergence of FS, Properties of CTFS, Fourier series representation of DTFS. Fourier series and LTI Systems, Filtering, RC low pass and high pass filters. Recursive and Non recursive Discrete Time filters, Sampling theorem, sampling of continuous time signal with impulse train and zero order hold Reconstruction, Aliasing, Discrete-time processing of continuous time signals, Digital differentiator, Sampling of discrete time signals, decimation and Interpolation

Unit III: Analysis of Aperiodic Signals

Continuous Time Fourier Transform (CTFT), Convergence of FT. Properties of CTFT, Discrete time Fourier Transform (DTFT), Properties of DTFT. System characterized by linear constant co-efficient differential equations. Magnitude and phase spectrum, group delay, Time domain and frequency domain aspects of ideal Non-ideal filters. First order and second order continuous time and discrete time systems

Unit IV: Laplace Transform

The Laplace transform, Region of convergence, Inverse Laplace transform. Geometric evaluation of Fourier transform from pole zero plot, First order, second order and all pass systems. Properties of Laplace transform Analysis and characterization of LTI systems using the Laplace transform. Causality, stability, Differential equations, Butterworth and Chebychev filters. Unilateral Laplace transform its properties and uses.

Unit V: Convolution and Correlation of Signals

concept of convolution in time domain and frequency domain, graphical representation of convolution, convolution property of Fourier Transform, cross-correlation and auto-correlation of functions, properties of correlation function, energy density spectrum, Parseval's Theorem, power density spectrum, detection of periodic signals in the presence of noise by correlation

Text Books:

- [1] Oppenheim Willsky and Nawab, Signals and Systems, PHI.
- [2] Simon Haykin: Signals and Systems, John Wiley.

Reference Books:

- [1] Taub and Schilling: Principles of Communication Systems, TMH.
- [2] Dungan F R: Electronic Communication Systems, Thomas-Delmar.

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DATA STRUCTURES AND ALGORITHMS			
Course Code:	CS205	Credits:	3
No. of Lectures (Hrs/Week):	2+1	Mid Sem Exam Hours:	2
Total No. of Lectures:	30	End Sem Exam Hours:	3

Unit I: Introduction: Basic Terminology, Elementary Data Organization, Algorithm, Efficiency of an Algorithm, Time and Space Complexity, Asymptotic notations: Big-Oh, Time-Space trade-off.

Arrays: Definition, Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Application of arrays, Sparse Matrices and their representations.

Linked lists: Array Implementation and Dynamic Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representation and Addition, Generalized Linked List

Unit II: Stacks: Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Recursion, Tower of Hanoi Problem, Simulating Recursion, Principles of recursion, Tail recursion, Removal of recursion

Queues: Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C, Dequeue and Priority Queue.

Unit III: Trees: Basic terminology, Binary Trees, Binary Tree Representation: Array Representation and Dynamic Representation, Complete Binary Tree, Algebraic Expressions, Extended Binary Trees, Array and Linked Representation of Binary trees, Tree Traversal algorithms: Inorder, Preorder and Postorder, Threaded Binary trees, Traversing Threaded Binary trees, Huffman algorithm.

Search Trees: Binary Search Trees(BST), Insertion and Deletion in BST, Complexity of Search Algorithm, AVL trees, Introduction to m-way Search Trees, B Trees & B+ Trees

Unit IV: Graphs: Terminology, Sequential and linked Representations of Graphs: Adjacency Matrices, Adjacency List, Graph Traversal : Depth First Search and Breadth First Search, Connected Component, Spanning Trees, Minimum Cost Spanning Trees: Prims and Kruskal algorithm. Transitive Closure and Shortest Path algorithm: Warshal Algorithm and Dijkstra Algorithm.

Unit V: Searching: Sequential search, Binary Search, Comparison and Analysis Internal Sorting: Insertion Sort, Selection, Bubble Sort, Quick Sort, Two Way Merge Sort, Heap Sort, Radix Sort, Practical consideration for Internal Sorting.

Hashing: Hash Function, Collision Resolution Strategies Storage Management: Garbage Collection and Compaction.

Text books:

- [1] Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J. Augenstein :Data Structures Using C and C++ , PHI
- [2] R. Kruse et al: Data Structures and Program Design in C, Pearson Education
- [3] Lipschutz: Data Structures, Schaum's Outline Series, TMH

References Books:

- [1] Horowitz and Sahani: Fundamentals of Data Structures", Galgotia Publication
- [2] Jean Paul Trembley and Paul G. Sorenson: An Introduction to Data Structures with applications, McGraw Hill

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ELECTRONIC DEVICES AND CIRCUITS			
Course Code:	EC207	Credits:	3
No. of Lectures (Hrs/Week):	3	Mid Sem Exam Hours:	2
Total No. of Lectures:	45	End Sem Exam Hours:	3

Unit I: Review: p-n junction diode, spice model, diode as a switch, BJT-parameters, transistor biasing and stabilization, biasing circuits-analysis and design, equivalent circuits, DC model, h-parameters model, r_e model and hybrid π model, spice model, single stage RC coupled amplifier-load line, gain bandwidth product, emitter follower, BJT as a switch, Power amplifiers

Unit II: JFET: Structure, operating principle, amplifier, biasing analysis, small signal model of JFET, MOSFET-enhancement and depletion type, I-V characteristics, MOSFET amplifiers, introduction to SCR and UJT

Unit III: Multistage BJT amplifiers: classification, distortion, frequency response, RC-coupled amplifier and its low frequency response, high frequency response of an RC-coupled amplifier, multistage CE amplifier cascade at high frequency, Tuned amplifiers-single tuned, double tuned, and staggered tuned amplifiers

Unit IV: Feedback Amplifier: Concept of feedback, classification, transfer gain, general characteristics, effect of feedback on input and output characteristics, analysis of feedback amplifier, voltage series feedback, current series feedback, current shunt feedback, voltage shunt feedback

Unit V: Oscillators: Positive feedback amplifier, Barkhausen Criterion, sinusoidal oscillators, phase shift oscillator, resonant circuit oscillator, general form of oscillator circuit, crystal oscillator, regulated power supplies, series regulators, three terminal IC regulators, switched mode power supplies

Text Books:

- [1] J.Millman, C.C.Halkias, and Satyabratha Jit : Electronic Devices and Circuits ,Tata McGraw Hill, 2nd Ed., 2007.
- [2] R.L. Boylestad and Louis Nashelsky :Electronic Devices and Circuits , Pearson/Prentice Hall,9th Edition,2006.

References:

- [1] T.F. Bogart Jr., J.S.Beasley and G.Rico: Electronic Devices and Circuits, Pearson Education.
- [2] S.G.Burns and P.R.Bond: Principles of Electronic Circuits, Galgotia Publications.
- [3] Millman and Grabel: Microelectronics, Tata McGraw Hill.
- [4] David Bell: Electronic Devices and Circuits, TMH

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DIGITAL ELECTRONICS LAB			
Course Code:	EC281/EC483	Credits:	2
No. of Practical (Hrs/Week):	3		
Total No. of Lab Sessions:	10	End Sem. Exam Hours:	2

Programs/Experiments List:

1. Verify the truth table of AND Gate.
2. Verify the truth table of OR and NOT gates.
3. Verify the truth table of NAND , NOR Gates.
4. Verify the truth table of and EX-OR Gate.
5. Design a combinational circuit to realize the function $f(ABC)=A(B+C)$ using NAND gates.
6. Design a half adder using NOR gates only
7. Design full adder
8. Design a given size of Mux using gates.
9. Verify RS and JK flip flops
10. Verify D and T Flip flops
11. Design a up/down 3-bit counter
12. Design a 3 bit shift register.

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ELECTRONICS CIRCUITS LAB			
Course Code:	EC283	Credits:	2
No. of Lab (Hrs/Week):	3		
Total No. of Lab Sessions:	10	End Sem Exam Hours:	3

List of Experiments

1. To study the switching action of a transistor as a switch.
2. To calculate the h-parameter of transistor in CE mode.
3. To draw the input and output waveforms of power amplifier.
4. To draw the input and output waveforms of single stage R-C coupled amplifier.
5. To draw the input & output characteristics of JFET.
6. To draw the input & output characteristics of MOSFET.
7. To study the transistor as an amplifier in CE mode.
8. To study the transistor as an amplifier in CC mode.
9. To plot the characteristics of SCR.
10. To plot the characteristics of UJT.
11. To study of OP-amp as inverting amplifier.
12. To study of OP-amp as non- inverting amplifier.
13. To study the Hartley oscillator.
14. To study the Phase –Shift oscillator.
15. To study the Wien Bridge oscillator.

(SEMESTER - IV)

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MA 202 (Quantitative Techniques)

Credits (L-T-P) : 4 (3-1-0)

Unit I

Zeroes of transcendental and polynomials, Bisection method, Regular-falsi method and Newton-Raphson method, Secant Method, Rate of convergence of above methods, Error Analysis.

Unit II

Interpolation, Finite differences, difference tables, Newton's forward and backward interpolation, Divided differences, Lagrange's and Newton's divided difference formula for unequal intervals. Numerical differentiation, Numerical integration, Newton-Cote quadrature formula, Trapezoidal, Simpson's one third and three-eighth rules.

Unit III

Solution of system of linear equations, Gauss-Seidal method, Gauss-Jordan Method, Crout method, Jacobi Iteration method. Numerical Solutions of Ordinary Differential Equations and Partial Differential Equations: Picard's Method, Euler's Method, Modified Euler's Method, Runge-Kutta method. Numerical solutions of parabolic and elliptic partial differential equations, Introduction to finite element method

Unit IV

Probability, Conditional Probability, Bayes' Theorem, Random variable, Probability density function, Binomial distributions, Poisson distributions and Normal distributions,

Unit V

Moments, Moment generating functions, Skewness, Kurtosis, Curve fitting, Method of least squares, Fitting of straight lines, Polynomials, Exponential curves, Correlation, Regression analysis: Linear, Nonlinear and multiple. Sampling theory, Tests of significations: Chi-square test, t-test, Analysis of variance (one way), Time series and forecasting, Statistical quality control methods, Control charts, R, p, np, and c charts. Introduction to Stochastic process

Approved by BOS 15 Jul 2014

Textbook E. Kreyszig, *Advanced Engineering Mathematics*, John Wiley and Sons, 2005.

Books

- [1] R. S. Gupta, *Elements of Numerical Analysis*, Macmillan, 2009
- [2] R. A. Johnson, *Miller & Freund's Probability and Statistics for Engineerings* Prearson, 2001

Measurements and Instrumentation**EE 202****L T P****2 0 1**

Learning Objective of the Subject/Course:- To impart a comprehensive knowledge of instrumentation and its application in various engineering streams. To enable the student to have idea of calibration and measurements of various types of quantities applications. To prepare the students for career in industry and academics and research.

MODULE I

Measurements and Measurement Systems Measurements, Significance of Measurements, Methods of Measurements, Types of Instruments, Classification of Instruments, Applications of Measurement Systems, Elements of Generalized Measurement systems, Input-Output Configurations of Measuring Instruments and Measuring Systems, Methods of Corrections for Interfering and Modifying Inputs.

MODULE II**Characteristics of Instruments**

Measurement System Performance, Static Calibration, Static Characteristics, Accuracy, Precision, Resolution, Reproducibility, Linearity, Sensitivity. Errors in Measurement, Types of Errors: Gross error, Systematic errors, Environmental Errors, Observational and Residual Errors.

MODULE III**Transducers and Sensors**

Introduction, Mechanical Spring Devices, Pressure Sensitive Primary Devices, Flow Rate Sensing Elements, Classification of Transducers on the basis of Principal of Transduction, Characteristics and Choice of Transducers. Inductive Transducer -Linear Variable Differential Transformer, Resistive Transducers; Potentiometers, Strain Gauges, Applications of Strain Gauges, Rosettes, Resistance Thermometers, Capacitive transducers, Piezoelectric Transducers, Photoelectric and Digital Displacement Transducers.

MODULE IV**Measurement of Non- Electrical Quantities**

Displacement Measurement, Measurement of Strain, Pressure Measurement, Vacuum Measurement, Measurement of Velocity, Measurement of Torque, Measurement of Flow, Turbine Flow Meters, Electromagnetic Flow Meter, Measurement of Liquid Level, Measurement of Humidity.

MODULE V**Bridge Theory**

Wheatstone bridge, Low Resistance Measurement-KDB, AC bridge theory, Capacitance bridges, Inductance bridges.

Bio Medical Signals


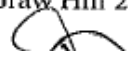
Fundamentals of Medical Instrumentation, Sources of Biomedical Signals, Basic Medical Instrumentation System. Introduction to ECG & EEG signal.

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Text Book:

1. E O Doebelin, Measurement Systems Application & Design. 5th Ed. TMH.
2. A K Sawhney, "A Course in Electrical & Electronics Measurements & Instrumentation", Dhanpat Rai 2000 Reprint.

Reference Books:

1. David A. Bell, "Electronic Instrumentation and Measurements", 2nd Ed., Oxford University Press 2010, 2011 (Previously published by PHI).
 2. Oliver and Cage, "Electronic Measurements and Instrumentation", TMH, 2009.
 3. Helfric & Cooper, "Modern Electronic Instrumentation & Measurement Techniques", PHI.
 4. Golding & Widdies, "Electrical Measurements and Measuring Instruments" Wheeler.
 5. Nakra & Chaudhary, "Instrumentation Measurement & Analysis" Tata Mc Graw Hill.
 6. R S Khandpur, "Bio Medical Instrumentation" Tata Mc Graw Hill 2nd Ed.
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ANALOG COMMUNICATION			
Course Code:	EC202	Credits:	4
No. of Lectures (Hrs/Week):	3+1 T	Mid Sem Exam Hours:	2
Total No. of Lectures:	45	End Sem Exam Hours:	3

Unit I: Spectral Analysis: overview of Fourier Series and Fourier Transform, their Properties, Transform of Gate Signal, Impulse Function and Unit Step Function, Fourier Transform Technique for Periodic Signal, Transform of Train of Pulses and Impulses, Sine and Cosine wave. Signal Energy and Power, Spectral Density of various types of signals, Spectra (Parseval's Theorem), Density Spectra of Periodic Gate. Linear Time Invariant (LTI) Systems, Impulse Response, Convolution, Convolution with Impulse Function, Casual and Non Causal System, Distortion less System, Conditions for Distortion less Transmission. Ideal Filters and Practical Filters

Unit II: Modulation Techniques: Need and types of modulation techniques, Amplitude Modulation, Frequency Spectrum, Power Distribution, AM Modulators, Suppressed Carrier Generation-Balance/Chopper and Square Law Modulation, SSB Generator-Phase and Frequency Discrimination Method, VSB Transmission and Application. Detection of AM signals: Envelope Detector Circuit, RC Time Constant, Synchronous Detection Technique, SSB signal detection, PLL, FDM

Unit III: Angle Modulation: Frequency and Phase Modulation, Frequency spectrum, Bandwidth requirement, Frequency and Phase Deviation, Modulation Index, Narrowband FM, Wide Band FM & their Spectrum . FM Modulators: Direct and Indirect Methods of frequency modulation. FM Detector: Slope Detector, Foster-Seely Discriminator, Ratio Detector, PLL detectors, Pre-Emphasis & De-Emphasis, Capture Effect

Unit IV :AM Transmitter Block Diagram, TRF Receiver & Its Limitations, Necessity of Heterodyning, Super Heterodyne Radio Receivers, IF Amplifiers & Selection of Intermediate Frequency, FM Transmitters, FM Receivers, AGC, AVC, AFC, Dynamic Range of Receivers

Unit V:Classifications of noise, sources of noise, methods of noise calculation in networks, addition of noise due to several sources, noise voltage, noise temperature, noise figure-its calculation and measurement, mathematical representation of random noise, signal to noise ratio, noise bandwidth,

Text Books:

- [1] Lathi B.P.: Analog and Digital Communication systems, 3/E Oxford Press, 2007
- [2] Kennedy Davis "Electronic Communication Systems" Tata McGraw
- [3] Haykin Simon: Communication Systems,4/E John Willey & Sons, 2006.

Reference Books:

- [1] Singh R.P. & Sapre: Communication systems Analog & Digital, 2/E TMH, 2007
- [2] Bruce Carlson: Communication Systems, 5/E McGraw Hill, 2004.
- [3] Proakis and Salehi: Fundamentals of Communication Systems, 1/E Pearson Education, 2005.
- [4] Hwei P Hsu: Analog and Digital Communication Schaum Series TMH, 2 Edition.
- [5] Taub & Schilling: Principles of communication systems, 3/E McGraw Hill, 2000.

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LINEAR IC APPLICATIONS			
Course Code:	EC204	Credits:	3
No. of Lectures (Hrs/Week):	3	Mid Sem Exam Hours:	2
Total No. of Lectures:	45	End Sem Exam Hours:	3

Unit I: Differential and Cascade Amplifier

Balanced, unbalanced output differential amplifiers, FET differential amplifier, current mirrors, level Translators, cascade configuration of amplifier, operational amplifiers, Introduction to ideal OP-AMP, characteristic parameters, Interpretation of data sheets, Practical OP-AMP, its equivalent circuit and op-amp circuit configuration.

Unit II: Op-Amp with Negative Feedback and Frequency Response

Block diagram representation of feedback amplifier, voltage series feedback, voltage shunt feedback differential amplifier, frequency response compensating network, frequency response of internally compensative op-amp and non compensating op-amp. High frequency op-amp equivalent circuit, open loop gain Vs frequency, closed loop frequency response, circuit stability, and slew rate.

Unit III: Op-Amp Applications

DC, AC amplifier, peaking amplifier, summing ,stealing ,averaging and instrumentation amplifier differential input amplifier, voltage to current converter, current to voltage converter, very high input impedance circuit, integration and differential circuit, wave shaping circuit, active filters, oscillators.

UNIT IV: Linear IC Applications

Log–Anti Log Amplifiers, Multiplier and divider. Precision Rectifiers, Peak Detectors, Sample and Hold Circuits, Analog Multipliers and their applications. Op-amp as a comparator, Zero crossing detector, Schmitt Trigger, Astable multi-vibrator, Mono-stable multi-vibrator, Generation of Triangular Waveforms

Unit V: Data Converters and PLL

A/D and D/A converters. Phase locked loop, Ex-OR Gates and multipliers as phase detectors, Block Diagram of IC PLL, Working of PLL and Applications of PLL.

Text Books:

- [1] R.A. Gayakwad: OP-amps and Linear Integrated circuits.
- [2] K.R. Botkar, Integrated circuits.
- [3] Roy Choudhury D, Jain Shail: Linear Integrated circuit”, New Age International (P) Limited Publisher, 2008.

References:

- [1] Michael Jacob: Applications and Design with Analog Integrated Circuits’, PHI, 2nd Edn, 2006
- [2] Jacob Milliman and Arvin Grabel: Microelectronics”, 2nd Edition, TMH, 2008.

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DIGITAL SIGNAL PROCESSING			
Course Code:	EC206	Credits:	3
No. of Lectures (Hrs/Week):	3	Mid Sem Exam Hours:	2
Total No. of Lectures:	45	End Sem Exam Hours:	3

Unit I: Discrete Time Signals and Systems

Characterization & classification of signals, Typical Signal Processing operations, Discrete-Time Signals, Discrete-Time Systems, Analysis and Implementation of Discrete-Time Linear Time-Invariant Systems, Discrete Time systems described by Difference Equation, Signal flow Graph representation of digital network.

Unit II: The Z-Transform

The Direct z-transform, Properties of the z-transform, ROC, Rational z-transforms, Inversion of the z-transform, analysis of Linear Time-Invariant systems in the z- domain.

Unit III: Finite Fourier Transform

Introduction to DFT - Efficient computation of DFT Properties of DFT - FFT algorithms - Radix-2 FFT algorithms - Decimation in Time - Decimation in Frequency algorithms -Use of FFT algorithms in Linear Filtering and correlation.

Unit IV: Digital Filters Design

Amplitude and phase responses of FIR filters - Linear phase filters - Windowing techniques for design of Linear phase FIR filters - Rectangular, Hamming, Kaiser windows - frequency sampling techniques - IIR Filters - Magnitude response - Phase response - group delay - Design of Low Pass Butterworth filters (low pass) - Bilinear transformation - prewarping, impulse invariant transformation.

Unit V: Finite Word Length Effects

Quantization noise - derivation for quantization noise power - Fixed point and binary floating point number representation - comparison - over flow error - truncation error - co-efficient quantization error - limit cycle oscillation - signal scaling - analytical model of sample and hold operations.

Text Books:

- [1] John G Proakis, Dimtris G Manolakis: Digital Signal Processing Principles, Algorithms and Application, PHI, 3rd Edition, 2000.
- [2] Johnny R.Johnson : Introduction to Digital Signal Processing, Prentice Hall, 1984.

References:

- [1] Alan V Oppenheim, Ronald W Schafer, John R Back: Discrete Time Signal Processing, PHI, 2nd Edition 2000.
- [2] Avtar singh, S.Srinivasan DSP Implementation using DSP microprocessor with Examples from TMS32C54XX -Thamson / Brooks cole Publishers, 2003.
- [3] S.K.Mitra: Digital Signal Processing - A Computer based approach, Tata McGraw-Hill, 1998, New Delhi

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ELECTROMAGNETIC THEORY			
Course Code:	EC208	Credits:	3
No. of Lectures (Hrs/Week):	3	Mid Sem Exam Hours:	2
Total No. of Lectures:	45	End Sem Exam Hours:	3

Unit I: Introduction

Co-ordinate System, Vector Calculus: gradient, divergence, curl, Laplacians of scalar and vector fields. Vector identities.

Unit II: Electrostatics

Coulomb's law – electric field intensity – field due to continuous volume charge, line charge, sheet of charge – stream lines and sketches of fields – electric flux density – gauss's law – application of gauss law – divergence theorem – energy expended in moving a charge in an electric field – potential – potential gradient – dipole – energy density in a electrostatic field. Current and current density – metallic conductors – properties and boundary conditions – method of images – semiconductors – dielectrics – properties and boundary conditions – capacitance – Poisson's and Laplace's equation – uniqueness theorem.

Unit III: Magnetostatics

Biot-Savart law – Ampere's circuital law – curl – Stokes theorem – magnetic flux and flux density – scalar and vector magnetic potentials – steady state magnetic field laws – nature of magnetic materials – magnetization and permeability – boundary conditions – inductance and mutual inductance.

Unit IV: Time Varying Electromagnetic Fields

Lorenz Force, Faraday's law – displacement current – Maxwell's equation in point form and integral form – retarded potentials – wave motion in free space, perfect dielectrics, lossy dielectrics – poynting vector and power calculations – propagation in good conductors – reflection of uniform plane waves – standing wave ratio.

Unit V: Transmission Line Theory

Lumped circuit model for transmission line and general solutions. Characteristic impedance, propagation constant, attenuation and phase constants. Open circuited and short circuited lines. Reflection coefficient, transmission coefficient, standing wave pattern, standing wave ratio, return loss and insertion loss. Generator mismatches, distortion in transmission lines. Smith Chart. Impedance matching: single and double stub, quarter wave transformer.

Text book:

- [1] William H Hayt: Engineering Electromagnetics, Tata McGraw Hill, New Delhi, 2002.
- [2] Surinder P.Seth: Elements of Electromagnetic fields, Dhanpat Rai Publications.

References:

- [1] Mathew O Sadiku: Elements of Electromagnetics, Oxford University press, New York, 2003.
- [2] David J Griffith: Introduction to Electrodynamics, Pearson Education, 3/e, 2002.
- [3] John D Kraus: Electromagnetics, McGraw Hill, New York, 2003
- [4] D K Cheng: Field and wave Electromagnetics, Addison Wesley, 2001

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DIGITAL LOGIC DESIGN			
Course Code:	EC301	Credits:	3
No. of Lectures (Hrs/Week):	3	Mid Sem Exam Hours:	2
Total No. of Lectures:	45	End Sem Exam Hours:	3

Unit I: Introduction

Variables and functions, inversion, truth table, logic gates and networks, Boolean algebra, synthesis using basic gates ,SOP and POS ,NAND and NOR logic networks. Introduction to the CAD tools: Design entry, synthesis, functional simulation, physical design, timing simulation and chip configuration.

Unit II: Logic circuits

Transistor switches, NMOS and CMOS logic gates, Negative logic system,. Fabrication, behavior and on resistance of MOSFET, voltage levels , noise margin, power dissipation, Fan-in, Fan-out and dynamic operation of logic gates.

Unit III: VHDL

Digital system design process , Hardware simulation , Levels of abstraction , VHDL requirements ,Elements of VHDL Top down design, VHDL operators, Timing, Concurrency, Objects and classes , Signal assignments ,Concurrent and sequential assignments.

Unit IV: Modeling Techniques

Entity Declaration, Architecture Body, Process statement, Loop control statements, Multiple Processes, Delay Models, Signal Drivers, Block statements, Component declaration and Instantiation, Concurrent Assignment statements, Generics and Configuration, Subprogram, Overloading, Packages and Libraries, Design Libraries,

Unit V: Advance Topics

Introduction to FPGA, CPLD and ASIC Design, Programmable logic devices: PLA and PAL, Hardware Modeling Examples: Modeling of digital modulator and demodulators, digital filters,

Text Book:

- [1] J. Bhasker: A VHDL Primer, 3rd Edition, PHI.
- [2] Brown and Vranesic :Fundamentals of Digital Logic Design, TMH Publication.

References Books:

- [1] P.K. Chan & S. Mourad: Digital Design sing Field Programmable Gate Array, PHI.
- [2] J. V. Old Field & R.C. Dorf: Field Programmable Gate Array, John Wiley, 1995.
- [3] M. Bolton: Digital System Design with Programmable Logic, Addison Wesley, 1990.
- [4] Sudhakar Yalamanchili: Introductory VHDL- From Simulation to Synthesis”, 3rd Indian Reprint. Pearson Education,
- [5] Douglas Perry: VHDL, 3rd Edition, McGraw Hill 2001.

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DIGITAL COMMUNICATION SYSTEMS			
Course Code:	EC303	Credits:	3
No. of Lectures (Hrs/Week):	3	Mid Sem Exam Hours:	2
Total No. of Lectures:	45	End Sem Exam Hours:	3

Unit I: Sampling of Signal, Sampling Theorem for Low Pass and Band Pass Signals, Aliasing, Pulse Amplitude Modulation, Time Division Multiplexing, Channel Bandwidth for PAM-TDM Signal, Types of Sampling, Instantaneous, Natural and Flat Top-Mathematical and Spectral Analysis, Aperture Effect, Introduction to Pulse Position and Pulse Duration Modulation.

Unit II: Pulse Code Modulation: Quantization, Quantization Error, Pulse Code Modulation, Signal-to-Noise Ratio in PCM, Companding, Data Rate and Bandwidth of Multiplexed PCM Signal, Inter-symbol Interference, Eye Diagram, Line Coding, Differential PCM, Delta Modulation, Adaptive Delta Modulation Slope Overload Error, Granular Noise, Comparison of various system in terms of Bandwidth and Signal-to-Noise Ratio.

Unit III: Digital Modulation Techniques:- Analysis, Generation and Detection, Spectrum and Bandwidth of Amplitude Shift Keying, Binary Phase Shift Keying, Differential Phase Shift Keying, Quadrature Phase Shift Keying, M-ary PSK, Binary Frequency Shift Keying, M-ary FSK, Minimum Shift Keying, Quadrature Amplitude Modulation,

Unit IV: Probability of error, bit error rate, Comparison of digital modulation techniques on the basis of probability of error, Matched Filter.

Unit V: Line Coding: Unipolar RZ and NRZ, Bipolar RZ and NRZ, AMI, Split Phase etc. Properties for the selection of Line Codes, HDB Signaling, B8ZS Signaling, Inter-symbol Interference, Nyquist Criteria for Zero ISI, Differential Coding, Regenerative Repeaters, Eye Diagram.

Text Books:

- [1] B. Sklar: Digital Communication, Pearson Education
- [2] Haykin Simon: Digital Communication, Wiley Publication.

References:

- [1] Taub & Schilling: Principles of Communication system, TMH.
- [2] Lathi B.P.: Modern Analog and Digital Communication systems, Oxford Uni. Press.
- [3] Proakis: Digital communication, McGraw Hill
- [4] Schaum's Outline series: Analog and Digital Communication.
- [5] Tomasi: Advanced Electronics Communication Systems, 6th Edition, PHI
- [6] Singh and Sapre: Communication System, TMH
- [7] Couch: Digital and Analog Communication, Pearson Education

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ANTENNA AND WAVE PROPAGATION			
Course Code:	EC305	Credits:	4
No. of Lectures (Hrs/Week):	3+1T	Mid Sem Exam Hours:	2
Total No. of Lectures:	45	End Sem Exam Hours:	3

Unit I: Introduction.

Antenna as transducer, operating spectrum, Mathematical background, Maxwell's Equation and its physical interpretation, Wave equation and its solution, wave polarization, wave phase velocity, wave power flow and Poynting Vector. Antenna as impedance: transformation and matching, power transfer between antenna and medium, Impedance/Admittance Smith Chart.

Unit II: Radiation Mechanism and Antenna Parameters

Potential function, Radiated Fields from a Hertzian dipole, half wave dipole and quarter wave monopole, Power radiated and radiation resistance, Radiation parameters of a transmitting and receiving Antenna, Reciprocity principle, Effective length, Effective area and radiation resistance, antenna temperature. FCC Antenna standards A and B, Measurements - radiation pattern- Gain- Directivity and Impedance.

Unit III: Design of Arrays

Linear Array - Two element array, N-element linear array- broadside array, End fire array- Directivity, radiation pattern. Planar array – array factor, beam width, directivity, Circular array-array factor

Unit IV: Design of Antennas

Wire Antenna, V-Antenna, Rhombic antenna, folded dipole antenna, helical antenna, Spiral antenna, Log periodic antenna, Yagi-Uda antenna, Aperture antennas - Horn antenna, parabolic reflector antenna. Micro-strip antenna, RF- MEMS Antenna.

Unit V: Wave Propagation

Propagation Mechanism- Reflection, refraction and transmission, Scattering and diffraction. Propagation Model- Path Loss, Free space loss, Plane earth Loss. Noise Modeling, Modes of propagation- Ground wave Propagation, Sky wave Propagation, Space wave, Tropospheric Refraction, Obstruction Loss, Diffraction, Influence of Cluster, Tropospheric effects, Ionospheric Effects, Link budget. Terrestrial fixed Link- Satellite Fixed Link.

Text Books:

- [1] D. K. Cheng, Fields and Waves Electromagnetics, 2nd edition, Addison-Wesley.
- [2] J.D. Kraus, Antennas for All Applications, McGraw Hill,.
- [3] R. E. Collins: Antennas and Radio Propagation, McGraw-Hill.

References:

- [1] Matthew O H. Sadiku: Principles of Electromagnetics, Oxford University Press.
- [2] E.C. Jordan and Balman: Electro Magnetic Waves and Radiating Systems, PHI.
- [3] C. A. Ballanis: Antenna Theory, John Wiley & Sons.
- [4] G.S.N. Raju: Electromagnetic Field Theory & Transmission Lines, Pearson Education.
- [5] G.S.N. Raju: Antenna and Wave Propagation, Pearson Education.
- [6] W. H. Hayt & J. A. Buck, Engineering Electromagnetics, McGraw-Hill.
- [7] D. J. Griffiths, Introduction to Electrodynamics, PHI

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COMPUTER ORGANIZATION AND ARCHITECTURE			
Course Code:	CS309	Credits:	3
No. of Lectures (Hrs/Week):	3	Mid Sem Exam Hours:	2
Total No. of Lectures:	45	End Sem Exam Hours:	3

Unit I: Computer Arithmetic and Number System

Number representation; Number System, fixed and floating point number representation, Arithmetic Algorithms (addition, subtraction, Booth Multiplication).

Unit II: Register Transfer and Micro operation

Register Transfer Language, Bus and Memory Transfers, Bus Architecture, Bus Arbitration, Arithmetic Logic, Shift Micro operation, Arithmetic Logic Shift Unit, Design of Fast address

Unit III: Processor Design

Processor Organization: General register organization, Stack organization, Addressing mode, Instruction format, Data transfer & manipulations, Program Control, Reduced Instruction Set Computer.

Unit IV: Input-Output Organization

I/O Interface, Synchronous and Asynchronous Data Transfer, strobe, handshaking schemes Modes of transfer, Interrupts & Interrupt handling, Direct Memory access, Input-Output processor.

Unit V: Memory Organization

Memory Hierarchy, Main Memory (RAM and ROM Chips), organization of 2D and 2^{1/2} D, Auxiliary memory, Cache memory, Virtual Memory, Memory management hardware.

Text Books:

- [1] Patterson, Computer Organization and Design, Elsevier Pub. 2009.
- [2] William Stalling, "Computer Organization", PHI

References:

- [1] Vravice, Hamacher & Zaky, "Computer Organization", TMH
- [2] Mano, "Computer System Architecture", PHI
- [3] John P Hays, "Computer Organization", McGraw Hill
- [4] Tannenbaum, "Structured Computer Organization", PHI
- [5] P Pal chaudhry, "Computer Organization & Design", PHI

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MICROWAVE ENGINEERING			
Course Code:	EC302	Credits:	4
No. of Lectures (Hrs/Week):	3+1T	Mid Sem Exam Hours:	2
Total No. of Lectures:	45	End Sem Exam Hours:	3

UNIT I: Introduction

Microwave Frequencies Spectrum, Microwave Devices and Systems, types of transmission lines: Coaxial, parallel wire, twisted pair, strip line and micro-strip lines. Waves propagation at Interface: Dielectric interface, layered medium, Lossy media Interface, Conducting boundary, Field and Power flow at Media Interface,

UNIT II: Waveguides and Waveguide Components

General solutions for TEM, TE and TM waves- parallel plate waveguide. Rectangular waveguide: TE, TM modes, power transmission, losses in rectangular waveguide, Cavity Resonator, Circular waveguide: TE, TM modes, power transmission, Dielectric Slab waveguide, Circular dielectric waveguide, Dielectric and rod waveguide, waveguide coupling, attenuation factor and Q of waveguide. Microwave Hybrid Circuits, Waveguide Tees, Waveguide Corners, Bends and Twists, Directional Coupler.

UNIT III: Microwave Network Parameters

Matrix representations, impedance and admittance, parameters, scattering parameters, ABCD parameters and signal flow graphs, microwave resonators, microwave filters, active microwave circuits; noise, detectors and mixers, microwave integrated circuits.

UNIT IV: Analysis and Design of Passive and Active Circuits

Passive Circuits: Impedance matching networks, stub tuning, quarter wave and multi-section matching transformers, design of power dividers, branch line hybrids, directional couplers and filters. Active Circuits: Noise figure definition, characteristics of microwave transistors, single stage amplifier design, design of LNA and broadband amplifier design, principle of oscillators.

UNIT V: Measurements and Microwave Applications

Measurement of unknown impedance using Slotted line, VSWR measurement, attenuation measurements, measurement of scattering parameters, measurement of dielectric constant. Applications: Fiber Optics Communication, Satellite Communication, Telephone Networks, Radar, Remote Sensing, Radio Astronomy, EMC, etc.

Text Books:

- [1] R.E. Collin: Foundations for Microwave Engineering - IEEE Press Second Edition, 2002.
- [2] David M. Pozar: Microwave Engineering. - John Wiley & Sons - 2nd Edition, 2003.

References:

- [1] Annapurna Das and Sisir K. Das: Microwave Engineering - Tata McGraw-Hill, 2000
- [2] Samuel Y. Liao: Microwave Devices and Circuits - Prentice Hall of India - 3rd Edition, 2003.

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MICROPROCESSORS AND INTERFACING			
Course Code:	EC304	Credits:	3
No. of Lectures (Hrs/Week):	3	Mid Sem Exam Hours:	2
Total No. of Lectures:	45	End Sem Exam Hours:	3

Unit I: Introduction to 8085 microprocessor: Pin diagram, architecture, programming model, instruction set, and classification of instruction set, instruction and data format, timing diagram of instructions. Basic concept of programming, Addressing Modes of 8085 microprocessors

Unit II: Microprocessor 8086 Architecture - BIU and EU, Registers, Pin Diagram, Memory Addressing, Clock Generator 8284, Buffers and Latches, Maximum and Minimum Modes

Unit III: Addressing Modes, Instruction set of 8086, Assembly Language Programming, Assemblers, Procedures, Macros, Interrupts, 8086 Based Multiprocessor Systems

Unit IV: Interfacing Chips- IC 8155 (Static Ram with I/O Ports and Timer), 8755 (EPROM with I/O Ports), 8251A (USART), 8255A(Programmable Peripheral Interface), 8253/8254 (Programmable Interval Timer/Counter), 8257 (DMA Controller), 8259A (Programmable Interrupt Controller)

Unit V: The 8051 architecture Microprocessor and Microcontroller, Comparison of microprocessors and microcontrollers Microcontroller survey – microcontrollers of different word length, make and features, selection criteria for microcontroller ,8051 microcontroller hardware – I/O pins and internal architecture internal RAM,ROM organization , I/O port circuits ,connecting external memory, addressing modes , Instruction set and assembly language programming.

Text Books:

- [1] A K Ray : Advanced Microprocessors and Interfacing, 2nd edition,TMH
- [2] Mazidi and Mazidi: The 8051 Microcontroller and Embedded Systems, Pearson Education

References:

- [1] B. B. Brey: The Intel Microprocessors, Architecture, Programming and Interfacing, Pearson Education.
- [2] Liu Gibson: Microcomputer Systems: The 8086/8088 Family- Architecture, Programming and Design, PHI
- [3] D. V. Hall: Microprocessors and Interfacing, TMH.
- [4] Ayala Kenneth:The 8051 microcontroller, Third Edition, Cengage Learning
- [5] A. V. Deshmukh: Microcontroller (Theory and Application), TMH.
- [6] Raj Kamal: Embedded Systems- Architecture, Programming and Design, TMH, New Delhi.
- [7] V. Udayashankara and M. S. Mallikarjunaswamy: 8051 Microcontroller, TMH, New Delhi.
- [8] R S Gaonkar, Microprocessor, Architecture, Programming, and Applications with the 8085, Penram International Publication, 5/e
- [9] P.K. Ghosh and P. R. Sridhar, 0000 to 8085 Introduction to microprocessor for Engineers and Scientists, PHI, 2/e

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MICROELECTRONICS ENGINEERING			
Course Code:	EC306	Credits:	3
No. of Lectures (Hrs/Week):	3	Mid Sem Exam Hours:	2
Total No. of Lectures:	45	End Sem Exam Hours:	3

Unit I: MOSFETS

Device Structure and Physical Operation, V-I Characteristics, MOSFET Circuits at DC, Biasing in MOS amplifier Circuits, Small Signal Operation and Models, MOSFET as an amplifier and as a switch, biasing in MOS amplifier circuits, small signal operation. MOSFET internal capacitances and high frequency mode, CMOS digital logic inverter, depletion type MOSFET.

Unit II: Single Stage IC Amplifier

IC Design philosophy, comparison of MOSFET and BJT, Current sources, Current mirrors and Current steering circuits, high frequency response, CS and CF amplifiers, CG and CB amplifiers, Cascade amplifiers, CS and CE amplifiers with source (emitter) degeneration source and emitter followers, some useful transfer parings, current mirrors with improved performance.

Unit III: Differential and Multistage Amplifiers

MOS differential pair, small signal operation of MOS differential pair, the BJT differences pair, other non-ideal characteristics and differential pair, Differential amplifier with active loads, frequency response and differential amplifiers, Multistage amplifier.

Unit IV: Feedback and Operational Amplifiers

General Feedback structure, properties of negative feedback, basic feedback topologies, loop gain, Stability problem, effect of feedback on amplifier poles, stability analysis by Bode plots, frequency compensation. Two stage CMOS Op-amp, folded cascade CMOS op-amp, 741 op-amps. Data Converters, A-D and D-A converters.

Unit V: Digital CMOS circuits

Overview. Design and performance analysis of CMOS inverter. Logic Gate Circuits. Pass-transistor logic. Dynamic Logic Circuits.

Text Books:

- [1] Adel Sedra and K.C. Smith, Microelectronic Circuits, 5th Edition, Oxford Uni. Press, 2004.
- [2] Richard C. Jaeger and Blalock, Microelectronic Circuit Design, 3rd Edition, TMH 2007

References:

- [1] Behzad Razavi, Fundamentals of Microelectronics, John Wiley, 2008

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INFORMATION THEORY AND CODING			
Course Code:	EC308	Credits:	4
No. of Lectures (Hrs/Week):	3+1T	Mid Sem Exam Hours:	2
Total No. of Lectures:	45	End Sem Exam Hours:	3

Unit I: Probability, random variables, probability distribution and density functions, joint statistics, conditional statistics, independence, function of random variables and random vectors, expectation, moments, characteristic functions, convergence of a sequence, Central Limit theorem, random processes, mean, autocorrelation, stationary ergodicity, power spectral density, Gaussian, Poisson, and Markovian processes

Unit II: Information, Amount of Information, Unit of Information, Average Information or Entropy, Information Rate, Joint and Conditional Entropy, Discrete Memoryless Channel-Channel representation, channel matrix, properties of channel matrix, Special channels-(Lossless, Deterministic, Noiseless, Binary Symmetric Channel, Binary Channel, Binary Erasure Channel)

Unit III: Mutual Information and Channel Capacity, Mutual Information and Channel Capacity for Special Channels. Coding to increase Average Information per Bit, Shannon's Theorem & Its Application, Capacity of Gaussian Channel, Shannon Hartley Theorem, Bandwidth & S/N Trade off

Unit IV: Source coding, Code Length and Code Efficiency, Source Coding Theorem, Fixed Length Codes, Variable Length Codes, Distinct Code, Prefix-free Codes, Uniquely Decodable Codes, Instantaneous Codes, Optimal Codes, Kraft Inequality.

Unit V: Source Coding Techniques: Shannon Fano and Huffman Coding Algorithms. Coding Efficiency Error control coding : Linear Block Codes, Systematic Linear Blocks Codes, Parity Check Matrix, Syndrome Testing, Cyclic code, Hamming Code, Error Detection and Correction Codes, Convolution Codes: State Diagram, Tree Diagram and Trellis Diagram, Maximum Likelihood Decoding, Viterbi decoding.

Text Books:

- [1] Taub & Schilling, Principles of Communication system, TMH.
- [2] Lathi B.P., Modern Analog and Digital Communication systems, Oxford Uni. Press.

References:

- [1] Haykin Simon, Digital Communication, Wiley Publication.
- [2] Proakis, Digital communication, McGraw Hill
- [3] Schaum's Outline series, Analog and Digital Communication.
- [4] B. Sklar, Digital Communication, Pearson Education.
- [5] Tomasi: Advanced Electronics Communication Systems, 6th Edition, PHI
- [6] Singh and Sapre: Communication System, TMH
- [7] Couch: Digital and Analog Communication, Pearson Education

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DATA NETWORKS			
Course Code:	CS310	Credits:	3
No. of Lectures (Hrs/Week):	3	Mid Sem Exam Hours:	2
Total No. of Lectures:	45	End Sem Exam Hours:	3

UNIT I INTRODUCTION OF NETWORK MODEL

Principal of computer Network, Internet, protocols and standards, network models, layered task, internet model, peer-peer processes, functions of layers, OSI model and TCP/IP model.

UNIT II Physical Layer

Analog and digital, analog signals, digital signals, analog vs. digital, data rate limit, transmission, digital transmission, line coding, block coding, sampling, transmission mode, modulation and digital data, telephone modem, modulation of analog signals, multiplexing: FDM, WDM, TDM. Guided media, unguided media, radio waves, microwaves, infrared, circuit switching, and telephone network.

UNIT III DATA LINK LAYER

Space division switch, time division switch, TDM bus, telephone network, high-speed digital access: DSL, cable modems and SONET, DSL technology, types of errors, detection, error correction. Flow and error control, ARQ, HDLC, point-to-point access, PPP stack, multiple access, ALOHA, random access, controlled access, channelization, LAN, Ethernet, wireless LANs, IEEE 802.11, bluetooth, connecting device, cellular telephone and satellite network circuit switching, frame relay.

UNIT IV NETWORK LAYER AND TRANSPORT LAYER

Routing and routing algorithms, addressing, IPv4, ICMP, ARP, IPv6 and ICMPv6 extensions and functionality, mobile IP, service integration and quality of service (QoS) in IP networks. Transport services, element of transport protocols, TCP and UDP, RTP, SCTP, congestion control and congestion avoidance, integrated services.

Unit V: Application Layer

Introduction to Application layer, SMTP, HTTP, Remote login, DNS, FTP, DHCP.

Reference Books:

1. Data Communications and Networking, Forouzan, 4th edition, McGraw Hill, 2007.
2. Data and Computer Communications, W. Stallings, 8th edition, Prentice Hall, 2007.
3. Computer Networks, S. Tanenbaum, 4th edition, Prentice Hall, 2003.
4. Internetworking With TCP/IP Volume 1: Principles Protocols, and Architecture, Douglas E Comer, 5th edition, PHI.
5. TCP/IP Protocol Suite, B.A. Forouzan, TMH, 3rd edition, 2006.

(SEMESTER - VII)

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OPTICAL COMMUNICATION			
Course Code:	EC401	Credits:	3
No. of Lectures (Hrs/Week):	3	Mid Sem Exam Hours:	2
Total No. of Lectures:	45	End Sem Exam Hours:	3

Unit I: Introduction

Forms of communication system, evolution of fiber optic system, elements of a fiber transmission link, advantages of optical fiber communication

UNIT II: Optical Fibers

The nature of light, basic optical Laws, fiber types, electromagnetic theory of propagation of light in optical fibers, waveguide equations for step index fibers, modes in step index fiber, power flow in the step index fibers, graded index fiber, modes in graded index fiber. Fiber fabrication: outside vapor phase oxidation, vapor phase axial deposition, modified chemical vapor deposition, double crucible method, and mechanical properties of fibers. Signal degradation in optical fibers: absorption, scattering losses, bending loss, material dispersion, waveguide dispersion, intermodal distortion, pulse broadening in graded index waveguides. Fiber to fiber joints, fiber end face preparation. Fiber splicing: splicing techniques, optical fiber connectors.

Unit III: Optical Sources

Types of optical sources, Lasers: basic concepts, absorption and emission of radiation, population inversion, optical feedback and laser oscillation, p-n junction, spontaneous emission, stimulated emission and lasing, laser modes, single mode operation, non-semiconductor laser, Light emitting diodes: the double heterojunction LED, Planar LED, surface emitter LEDs, edge emitter LEDs, LED characteristics, optical output power, output spectrum, modulation bandwidth, reliability.

Unit IV: Detectors and Amplifiers

Device type, optical detection principles, absorption, quantum efficiency, responsivity, long wavelength cutoff, semiconductor photodiodes without internal gain, photodiodes with internal gain, phototransistors, photoconductive detectors, Optical amplifiers: semiconductor amplifiers, fiber amplifiers

Unit V: Advanced Systems And Applications

Wavelength Division Multiplexing, local area networks, photonic switching, nonlinear optical effects. Public network applications: trunk network, junction network, local access network, synchronous networks, military applications, optical sensor systems, computer applications

Text Books:

- [1] Senior, J M, "Optical Communication Principle and Practices", II edition Pearson Education Ltd, 2006.
- [2] Keiser G, "Optical Fiber communications", second edition, McGrawhill. Inc.1993.

REFERENCES:

- [1] Biswas Sambhu Nath, 'Optoelectronic Engineering', Dhanpat Rai Publication 1994.
- [2] Gowar J., optical communication systems, PHI.
- [3] William B. Jones jr., Introduction to optical fiber communication systems, Holt, Rinehart and Winston, Inc

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SEMICONDUCTOR DEVICE MODELLING AND TECHNOLOGY			
Course Code:	EC403	Credits:	4
No. of Lectures (Hrs/Week):	3+1T	Mid Sem Exam Hours:	2
Total No. of Lectures:	45	End Sem Exam Hours:	3

Unit I: Introduction

Semiconductors, Conduction Mechanism, Contact Potentials, PN Junctions, Flat Band voltages, Potential Balance and Charge Balance, Depletion and Inversion Regions, Small Signal Capacitance.

Unit II: MOS Transistor Models

Contacting the inversion layer, Body Effect, Pinch Off Voltage, General Charge Sheet Model, Models based on Quasi Fermi potentials, Region of Inversions in terms of terminal voltages, Source Referenced and body referenced modeling, Effective mobility, Temperature effects, Breakdown.

Unit III: MOS Transistor with Ion Implanted Models

Charges and Threshold voltages, Drain to Source Current Model for strong inversion, Depletion MOSFets, need for n type implant, Surface Channel Enhancement Mode NMOS and PMOS, channel length Modulation, Punch Through, Barrier Lowering.

Unit IV: MOS Transistor Large Signal Modeling

Quasi Static operation, Quasi Static Models and its limitations, Non Quasi Static Modeling, The continuity equation, Non Quasi Static Analysis.

Unit V: MOS Small Signal Models

Low Frequency small signal model: Strong, Weak and Moderate Inversions, Medium Frequency small Signal Models, Intrinsic capacitances, White noise, Flicker Noise, Small Dimensions effects, High Frequency small signal models, High Frequency noise.

Text Books:

[1] Operation and Modelling of the MOS Transistor, Yannis Tsividis.

References:

[1] Carlos Galup Montoro: CMOS Analog Design using All Region MOSFET Modeling, Cambridge University Press.

[2] Guide Yuhua Cheng, Chenming Hu: MOSEFET Modeling and BSIM3 User's.

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WIRELESS MOBILE COMMUNICATION			
Course Code:	EC405	Credits:	4
No. of Lectures (Hrs/Week):	3+1T	Mid Sem Exam Hours:	2
Total No. of Lectures:	45	End Sem Exam Hours:	3

Unit I: Cellular concept, frequency reuse, channel assignment schemes, handoff strategies, interference and system capacity, trunking, grade of service, coverage and capacity enhancement techniques

Unit II: Mobile radio propagation-free space propagation model, two ray model, link budget using path loss models, outdoor and indoor propagation models, small scale fading-multipath propagation, IR model, multipath measurements, parameters of multipath channels, small scale fading, statistical models for multipath fading channels

Unit III: Modulation techniques-overview of digital modulation, line coding, pulse shaping techniques, spread spectrum modulation-PN sequence, DS-SS, FH-SS, modulation performance in fading and multipath channels, speech coding-vocoder, LPC

Unit IV: Multiple access techniques-FDMA, TDMA, spread spectrum multiple access- FHMA, CDMA, SDMA, packet radio-protocols, CSMA protocols, reservation protocols, capacity of cellular systems

Unit V: GSM-services and features, architecture, radio sub systems, channels types, frame structure and signal processing, CDMA-specifications, forward and reverse CDMA channels, CT2, DECT, PACS, PDC, PHS

Text books:

- [1] Theodore S. Rappaport, “ Wireless Communication, Principles and Practice” Pearson
- [2] Kaveh Pahlavan, Prashant Krishnamurthy, “ Principles of Wireless Networks”, PHI

References:

- [1] W.C. Jakes: Microwave Mobile Communication, IEEE Press
- [2] Kaveh Pahlavan & Allen H. Levesque: Wireless Information Networks, Wiley series in Telecommunications and signal processing.
- [3] Kamilo Feher: Wireless Digital communications, Modulation and Spread Spectrum Applications. PHI

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DESIGN WITH MICROCONTROLLERS			
Course Code:	EC441	Credits:	3
No. of Lectures (Hrs/Week):	3	Mid Sem Exam Hours:	2
Total No. of Lectures:	45	End Sem Exam Hours:	3

Unit I: The 8051 architecture

Microprocessor and Microcontroller, Comparison of microprocessors and microcontrollers
Microcontroller survey –microcontrollers of different word length, make and features, selection criteria for microcontroller, 8051microcontroller hardware – I/O pins and internal architecture internal RAM, ROM organization, I/O port circuits, connecting external memory

Unit II: Assembly Language Programming

Addressing modes, data transfer, arithmetic, logical, branch transfer, stack and bit related instructions
Programming 8051for basic operations, connecting 8255, Programming tools and techniques

Unit III: Interrupts

Timer interrupt, serial port interrupt, external interrupt, reset, interrupt control, interrupt priority Interrupt destinations ,software generated interrupts, connecting A/D and D/A ,application programs using interrupt.

Unit IV: Counter and timers

Timer modes of operation, timer counter interrupt, counter, serial data transmission, reception, Serial data transmission modes, programming based on timer application and serial transmission.

Unit V: Interfacing and applications

Scanning programs for small keyboards interrupt driven programs, program for matrix keyboard LCD display, frequency measurement, pulse measurement, multiple interrupts, measurement and control of physical parameter as Temperature, stepper motor control

Text Books:

- [1] Mazidi Mazidi McKinley, the 8051 Microcontroller & Embedded system Using Assembly and C, 2/E Pearson Education, 2006
- [2] Kenneth J.Ayala, The 8051 Microcontroller, 3/E Penram International, 2007.

Reference Books:

- [1] A. V. Deshmukh: Microcontroller (Theory and Application), TMH.
- [2] Raj Kamal: Embedded Systems- Architecture, Programming and Design, TMH, New Delhi.
- [3] V. Udayashankara and M. S. Mallikarjunaswamy: 8051 Microcontroller, TMH, New Delhi.

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TELECOMMUNICATION SWITCHING AND NETWORKS			
Course Code:	EC443	Credits:	3
No. of Lectures (Hrs/Week):	3	Mid Sem Exam Hours:	2
Total No. of Lectures:	45	End Sem Exam Hours:	3

Unit-I: Digital switching systems-analysis, hierarchy, evolution, SPC, call processing, communication and control- level 1,2,& 3 control, interface control, network control processor, central processor, control architecture, multiplexed highways, switching fabric-space division switching, time division switching, STS, TST, TTT, switching system software-architecture, OS, database management

Unit-II: MPLS-label stack and label distribution, traffic engineering, design of switching systems, and routers, switching networks-crossbar switches, multistage switches, shared memory switches, optical networks, and WDM techniques, , IP over optical core switches

Unit-III: Congestion control: integrated services, differentiated services, congestion control, congestion control in packet switching, frame relay congestion control, flow control at link level, TCP congestion control

Unit-IV: Voice over IP: basic IP telephone system, digital voice sampling, compression techniques, protocol for VoIP, session initiation protocol,

Unit-V: Frame relay, ATM, protocol architecture, logical connections, cells, AAL, High speed LAN, Ethernet, Fiber channel

Text books:

- [1] Syed R. Ali, “Digital Switching Systems, System Reliability and analysis, Tata McGraw-Hill
- [2] William Stallings, “High Speed Networks and Internet” 2nd ed. Pearson Ed., 2005

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SATELLITE COMMUNICATION			
Course Code:	EC445	Credits:	3
No. of Lectures (Hrs/Week):	3	Mid Sem Exam Hours:	2
Total No. of Lectures:	45	End Sem Exam Hours:	3

Unit-I

Overview of satellite systems: Introduction, Frequency allocations for satellite systems.

Orbits and launching methods: Kepler's three laws of planetary motion, terms used for earth orbiting satellites, orbital elements, apogee and perigee heights, orbit perturbations, inclined orbits, local mean solar point and sun-synchronous orbits, standard time.

Unit-II

The Geostationary orbit: Introduction, antenna look angles, polar mount antenna, limits of visibility, near geostationary orbits, earth eclipse of satellite, sun transit outage, launching orbits.

Polarization: antenna polarization, polarization of satellite signals, cross polarization discrimination.

Depolarization: ionospheric, rain, ice.

Unit-III

The Space segment: introduction, power supply, attitude control, station keeping, thermal control, TT&C subsystem, transponders, antenna subsystem, Morelos and Satmex 5, Anik-satellites, Advanced Tiros-N spacecraft.

The Earth segment: introduction, receive-only home TV systems, master antenna TV system, Community antenna TV system, transmit-receive earth station.

Unit-IV

The space link: Introduction, Equivalent isotropic radiated power (EIPR), transmission losses, the link power budget equation, system noise, carrier-to-noise ratio (C/N), the uplink, the downlink, effects of rain, combined uplink and downlink C/N ratio, inter-modulation noise, inter-satellite links. Interference between satellite circuits.

Unit-V**Satellite services**

VSAT (very small aperture terminal) systems: overview, network architecture, access control protocols, basic techniques, VSAT earth station, calculation of link margins for a VSAT star network.

Direct broadcast satellite (DBS) Television and radio: digital DBS TV, BDS TV system design and link budget, error control in digital DBS-TV, installation of DBS-TV antennas, satellite radio broadcasting.

Text Books:

- [1] D. Roddy: Satellite Communications, 4th Edition, TMH, New Delhi.
- [2] T. Pratt, C. Bostian and J. Allnut: Satellite Communications, 2nd Edition, Wiley India
- [3] D.C. Agarwal: Satellite Communications, Khanna Publishers.

References:

- [1] W. L. Pritchard, H. G. Suyderhoud and R. A. Nelson: Satellite Communication Systems Engineering, 2nd Edition, Pearson Education.
- [2] R. M. Gangliardi: Satellite Communications, CBS Publishers.
- [3] M. R. Chartrand: Satellite Communication, Cengage Learning.
- [4] Raja Rao: Fundamentals of Satellite communications, PHI Learning.
- [5] Monojit Mitra: Satellite Communication: PHI Learning.

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DIGITAL IMAGE PROCESSING			
Course Code:	EC447	Credits:	3
No. of Lectures (Hrs/Week):	3	Mid Sem Exam Hours:	2
Total No. of Lectures:	45	End Sem Exam Hours:	3

Unit I: Digital Image Processing (DIP)

Introduction, examples of fields that use DIP, fundamental Steps in DIP, components of an image processing System., Digital Image Fundamentals- elements of visual perception, image sensing and acquisition, image sampling and quantization, basic relationships between pixels

Unit II: Image Transforms

Two-dimensional (2-D) impulse and its shifting properties, 2-D continuous Fourier Transform pair, 2-D sampling and sampling theorem, 2-D Discrete Fourier Transform (DFT), properties of 2-D DFT. Other transforms and their properties: Cosine transform, Sine transform, Walsh transform, Hadamard transform, Haar transform, Slant transform, KL transform.

Unit III: Image Enhancement

Spatial domain methods- basic intensity transformation functions, fundamentals of spatial filtering, smoothing spatial filters (linear and non-linear), sharpening spatial filters (unsharp masking and highboost filters), combined spatial enhancement method. Frequency domain methods- basics of filtering in frequency domain, image smoothing filters (Butterworth and Gaussian low pass filters), image sharpening filters (Butterworth and Gaussian high pass filters), selective filtering.

Unit IV: Image Restoration

Image degradation/restoration, noise models, restoration by spatial filtering, noise reduction by frequency domain filtering, linear Position invariant degradations, estimation of degradation function, inverse filtering, Wiener filtering, image reconstruction from Projection.

Unit V: Image Compression

Fundamentals of data compression- basic compression methods: Huffman coding, Golomb coding, LZW coding, Run-Length coding, Symbol based coding. Digital Image Watermarking, Representation and Description- minimum perimeter polygons algorithm (MPP).

Text Books:

- [1] R. C. Gonzalez and R. E. Woods: Digital Image Processing, 3rd Edition, Pearson Education.
- [2] A. K. Jain: Fundamentals of Digital Image Processing, PHI Learning.
- [3] S. Annadurai and R. Shanmugalakshmi: Fundamentals of Digital Image Processing, Pearson Education.

References:

- [1] M. Sonka, V. Hlavac and R. Boyle: Digital Image Processing and Computer Vision: Cengage Learning.
- [2] B. Chanda and D. D. Majumder: Digital Image Processing and Analysis, PHI Learning.
- [3] S. Jayaraman, S. Esakkirajan and T. Veerakumar: Digital Image Processing, TMH.

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COMMUNICATION NETWORKS AND TRANSMISSION LINES			
Course Code:	EC449	Credits:	3
No. of Lectures (Hrs/Week):	3	Mid Sem Exam Hours:	2
Total No. of Lectures:	45	End Sem Exam Hours:	3

Unit I:

Characteristic Parameters of symmetrical and asymmetrical two port networks and their design: image impedance, iterative impedance, characteristic impedance, propagation coefficient, image transfer coefficient, iterative transfer coefficient, Lattice and Bridged-T networks, reactive matching networks, matching techniques, Insertion Loss, symmetrical and asymmetrical attenuators and their design.

Unit II:

Passive LC Filters: Analysis and design of Low pass, high pass, band pass and band elimination filters, m-derived filters, composite filters, Filter specifications, Butterworth approximation, Chebyshev approximation, elliptic function approximation, frequency transformation.

Unit III:

Positive real function, LC, RL, RC, and RLC network synthesis, Foster and Cauer network, minimum positive real function, Brune's method, Bott-Duffin method, Synthesis-Coefficient.

Unit IV:

Transmission line fundamentals: Lumped parameter equivalent, voltage and current on a transmission line, infinite line, characteristic impedance and propagation constant, waveform distortion, attenuation and phase equalizers, distortion-less line, loading, line reflection on a line, reflection coefficient, input and transfer impedances, open circuit and short circuit line, reflection factors, reflection loss, insertion loss, T and π equivalents of a line, location of line fault. Construction and design of two wire line and coaxial cable.

Unit V:

Line at radio frequencies, parameters of line and coaxial cable at radio frequencies, dissipation-less line, voltage and current on a dissipation-less line, standing waves, standing wave ratio, input impedance of open circuit and short circuit, power and impedance measurement on lines, eighth-wave, quarter-wave and half wave line, circle diagram, Smith chart, solution of problems using Smith chart, single and double stub matching .introduction to micro-strip linesand its analysis.

Text Book:

- [1] J.D. Ryder: Networks and Transmission Lines, 2nd edition, PHI
- [2] Umesh Sinha: Networks and Transmission Lines, Satya Prakashan.

References:

- [1] M.E. Valkenberg: Introduction to Modern Network synthesis, Wiley Eastern Ltd.
- [2] G.K. Mithal: Network Analysis, Khanna Publishers.
- [3] Suresh: Electric Circuits and Networks, Pearson Education.

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PRINCIPLES OF VLSI DESIGN			
Course Code:	EC465	Credits:	3
No. of Lectures (Hrs/Week):	3	Mid Sem Exam Hours:	2
Total No. of Lectures:	45	End Sem Exam Hours:	3

Unit I: Basic MOS Technology

Integrated circuit's era. Enhancement and depletion mode MOS transistors. nMOS fabrication. CMOS fabrication. Thermal aspects of processing. BiCMOS technology. Production of E-beam masks. MOS Device Design Equations, The Complementary CMOS Inverter: DC Characteristics, Static Load MOS Inverters, The Differential Inverter, The Transmission Gate, Tristate Inverter.

Unit II: Circuit Design Processes and CMOS Logic Structures

MOS layers, Stick diagrams, Design rules and layout – lambda-based design and other rules, Layout diagram, Symbolic diagrams, Basic Physical Design of Simple logic gates, CMOS Complementary Logic, Bi CMOS Logic, Pseudo-nMOS Logic, Dynamic CMOS Logic, Clocked CMOS Logic, Pass Transistor Logic, CMOS Domino Logic Cascaded Voltage Switch Logic.

Unit III: MOS Circuits Concepts

Sheet resistance, Area capacitances, Capacitance calculations, delay unit, Inverter delays, Driving capacitive loads, Propagation delays, Wiring capacitances, Scaling models and factors, Limits on scaling, Limits due to current density and noise.

Unit IV: CMOS Subsystem Design and Processes

Architectural issues, Switch logic, Gate logic, Design examples – combinational logic, Clocked circuits, other system considerations, Clocking Strategies, Subsystem design processes: General considerations, Process illustration, ALU subsystem, Adders. Multipliers.

Unit V: Advance Topic

Memory registers and clock: Timing considerations. Memory elements, Memory cell arrays. Testability: Performance parameters. Layout issues. I/O pads, System delays, Ground rules for design, Test and testability.

Text Books:

- [1] CMOS VLSI Design – A Circuits and Systems Perspective, 3rd Edition, N.H. Weste and David Harris. Addison- Wesley, 2005.
- [2] Basic VLSI Design - Douglas A. Pucknell & Kamran Eshraghian, PHI 3rd Edition, 2005.

Reference Books:

- [1] Principles of CMOS VLSI Design: A Systems Perspective, Neil H. E. Weste, K. Eshraghian, Pearson Education (Asia) Pvt. Ltd.

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RADAR AND TV ENGINEERING			
Course Code:	EC467	Credits:	3
No. of Lectures (Hrs/Week):	3	Mid Sem Exam Hours:	2
Total No. of Lectures:	45	End Sem Exam Hours:	3

Unit I: Elements of system of television, scanning sequence, interlacing determination of bandwidth synchronizing pulses, equalizing pulse, composite video signal, television camera tubes, monochrome picture tube.

Unit-II: Television transmitter, block diagram of T.V receiver, video detector design and operation of sound signal, transmitting and receiving antennas.

Unit III: Basic principle of color T.V, three color theory, color mixing, chromaticity chart, colour picture tube, delta gun, PIL and Trinitron picture tube, PAL, SECAM and NTSE systems, brief introduction of VCP and VCR, introduction of HDTV.

Unit IV: Introduction to radar, radar frequencies, radar block diagram, radar equation and its performance factors such as cross section and its fluctuation, transmitter power, pulse repetition frequency. Antenna parameters, system losses and propagation effect.

Unit V: Doppler effect, CW radar, frequency modulated and multiple Doppler frequency radar, oving target indication radar, delay line canceller blind speed, duplexer, scanning and racking radar, lobe switching, monopoles, conical scan,Adcock antenna, instrument ending system (ILS) ground controlled approach (CGA) kit port surveillance radar (PSR), precision approach radar(PAR).

Text Books:

- [1]. R. R. Gulati: Monochrome and Colour Television, New Age Publication.
- [2]. M. I. Skolnik: Introduction to Radar Systems, TMH, New Delhi.
- [3]. M. Dhake: Television and Video Engineering, 2nd Edition, TMH, New Delhi.

References:

- [1]. R. G. Gupta: Television Engineering and Video Systems, TMH, New Delhi.
- [2]. Grob and Herndon: Basic Television and Video Systems, McGraw Hill International.
- [3]. P. Z. Peebles, Jr.: Radar Principles, Wiley India Pvt. LTD.
- [4]. Edde: Radar-Principles, Technology Applications, Pearson Education.

(SEMESTER - VIII)
WCN

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WIRELESS SYSTEM DESIGN			
Course Code:	EC534	Credits:	3
No. of Lectures (Hrs/Week):	3	Mid Sem Exam Hours:	2
Total No. of Lectures:	45	End Sem Exam Hours:	3

Unit-I: RF system design procedures, methodology, link budget, propagation models, tower-top amplifiers, RF design guidelines, traffic projections, cell site design.

Unit-II: Network design- traffic forecasts, node dimensioning, interface design, placement of network nodes, topology.

Unit-III: Antenna systems,-base station antenna, cross pole antenna, dual band antenna, intelligent antenna, diversity techniques-derivation of selection diversity and maximal ratio combining improvement, polarization diversity, frequency diversity, time diversity, RAKE receiver. Communication sites-types, installation, towers, stealth, in-building and tunnel systems, inter, modulation, collocation.

Unit-IV: UMTS system design-design principles, coverage analysis, capacity analysis, radio access networks, overlaid UMTS over GSM, CDMA system design-design methodology, deployment guidelines, traffic estimation, radio elements, fixed network design requirements, traffic models, link budget, case studies-CDMA2000 1xRTT, EVDO, CDMA2000 1xRTT with EVDO overlay

Unit-V: Simulation of Wireless network systems-discrete event simulation, simulation models, performance evaluation and analysis of IEEE802.11 WLAN. Study of various network simulators, GloMoSim, ns-2, Opnet, design and performance evaluation of transport and routing protocols of mobile and wireless networks.

Text Books:

- [1] Clint Smith, P.E. Daniel Collins, “ 3G Wireless Networks” Tata McGraw-Hill, 2nd Edition
- [2] Theodore S. Rappaport, “ Wireless Communication, Principles and Practice” Pearson
- [3] P. Nicopolitidis, M.S. Obaidat, G.I. Papadimitriou, A.S. Pomportsis, “ Wireless Networks”, John Wiley & Sons,

References:

IEEE Journals and proceedings

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AD-HOC WIRELESS NETWORKS			
Course Code:	EC546	Credits:	3
No. of Lectures (Hrs/Week):	3	Mid Sem Exam Hours:	2
Total No. of Lectures:	45	End Sem Exam Hours:	3

Unit I : Introduction to Wireless Communication

Electromagnetic spectrum, radio propagation mechanisms, characteristics of the wireless channel, modulation techniques, multiple access techniques, voice coding, error control, computer network software, computer network architecture, IEEE 802 networking standards, wireless networks, issues in ad hoc wireless networks, Ad Hoc, wireless Internet.

Unit II: MAC Protocols For Wireless Networks

Issues in designing a MAC protocol for ad hoc wireless networks, design goals of a MAC protocol for ad hoc wireless networks, classifications of MAC protocols, contention-based protocols, contention-based protocols with reservation mechanisms, contention-based MAC protocols with scheduling mechanisms.

Routing Protocols for Ad Hoc Wireless Network

Issues in designing a routing protocol for ad hoc wireless networks, classifications of routing protocols, table-driven routing protocols, on-demand routing protocols, hybrid routing protocols, routing protocols with efficient flooding mechanisms, hierarchical routing protocols, power-aware routing protocols.

Unit III: Multicast Routing In Ad Hoc Wireless Networks

Issues in designing a multicast routing protocol, operation of multicast routing protocol, an architecture reference model for multicast routing protocol, classifications of multicast routing protocol, tree based multicast routing protocol, mesh-based multicast routing protocol, energy-efficient multicasting, multicasting with QoS guarantees, application- dependent multicast routing.

Unit IV: Transport Layer And Security Protocols For Ad Hoc Wireless Networks

issues in designing a transport layer protocol for ad hoc wireless networks, design goals of a transport layer protocol, classification of transport layer solutions, TCP over ad hoc wireless networks, other transport layer protocol for ad hoc wireless networks, security in ad hoc wireless networks, network security requirements, issues and challenges in security provisioning, network security attacks, key management, secure routing in ad hoc wireless networks.

Unit V: Quality of Service In Ad Hoc Wireless Networks

Issues and challenges in providing QoS in ad hoc wireless networks, classifications of QoS solutions, MAC layer solutions, network layer solutions, QoS frameworks for ad hoc wireless networks. energy management in ad hoc wireless networks, need for energy management in ad hoc wireless networks, classification of energy management schemes, battery management schemes, transmission power management schemes, system power management schemes.

Text Books:

- [1] C. Siva Ram Murthy, B.S. Anoj, "Ad Hoc Wireless Networks, Architectures and Protocols", Prentice Hall, 2004.
- [2] C. K. Toh, "Ad Hoc Mobile Wireless Networks 1/e: Protocols and Systems, "PH PTR, 2001.

References:

- [1] Hekmat Ramin,"Ad-hoc Networks: Fundamental Properties and Network Topologies", Springer Publication.
- [2] Mohammad Ilyas, "The Handbook of Ad Hoc Wireless Networks", CRC Press

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OPTICAL NETWORKS			
Course Code:	EC562	Credits:	3
No. of Lectures (Hrs/Week):	3	Mid Sem Exam Hours:	2
Total No. of Lectures:	45	End Sem Exam Hours:	3

UNIT I INTRODUCTION

Optical Source and detectors , Types of Optical Fibers , Optical Networks, Multiplexing Techniques, Second-Generation Optical Networks, The Optical Layer, Transparency , All-Optical Networks, Network Evolution, Loss and Bandwidth Windows, Optical Fiber as a Waveguide, Chromatic Dispersion, Nonlinear Effects, Self-Phase Modulation, cross phase modulation, four wave mixing, solitons, Photonic crystal fiber.

UNIT II OPTICAL COMPONENTS

Couplers, isolators and circulators , Multiplexers and filters , Gratings, Bragg Gratings, Mach-Zehnder Interferometers, Arrayed waveguide Grating, Filter EDFA , Raman Amplifier , Semiconductor Optical Amplifiers, Laser , LED , Tunable Lasers, Photo detectors, Switches, Optical Switch Technologies , Wavelength Converters.

UNIT III OPTICAL NETWORKS

SONET/SDH ,Multiplexing, SONET/SDH Layers, SONET Frame Structure, Elements of a SONET/SDH Infrastructure , Optical Transport Network, Hierarchy, Ethernet, WDM Network Elements, optical Line Terminals; Optical Line Amplifiers , Optical Add/Drop Multiplexers . OADM Architectures Reconfigurable OADMs, Optical Cross connects, All-Optical OXC Configurations

UNIT IV NETWORK SURVIVABILITY

Basic Concepts ,Protection in SONET/SDH , Point-to-Point ,Self-, Unidirectional Path-Switched Rings ,Bidirectional Line-Switched Rings , Ring Interconnection, Protection in the Client ,Optical Layer Protection Schemes,1:N Transponder Protection

UNIT V: ACCESS NETWORKS

Network Architecture overview, Enhanced HFC, Fiber to the curb, PON Evolution, Optical Code Division Multiplexing, Line coding in Optical links, Soliton communication system, photonics, High Speed Networks.

Text Books:

- [1] Rajiv Ramaswami , “Optical Networks” Third Edition , 2008.
- [2] Djafar K Mynbaev, Lowell L Scheiner , “Fiber- Optic Communications Technology” , 2000.
- [3] Keiser G, “Optical Fiber communications”, Second edition, McGrawhill. Inc., 1993.

REFERENCES:

- [1] Biswas Sambhu Nath, “Optoelectronic Engineering”, Dhanpat Rai Publication 1994.
- [2] Gowar J., Optical Communication Systems, PHI.
- [3] Senior, J M, “Optical Communication Principle and Practices”, II edition Pearson Education Ltd, 2006.

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ADVANCED RF ENGINEERING			
Course Code:	EC544	Credits:	3
No. of Lectures (Hrs/Week):	3	Mid Sem Exam Hours:	2
Total No. of Lectures:	45	End Sem Exam Hours:	3

Unit I: INTRODUCTION TO RF ELECTRONICS

Introduction to RF Design and Wireless Technology: Design and Applications,

Unit II: COMPLEXITY AND CHOICE OF TECHNOLOGY

Basic concepts in RF design: Nonlinearly and Time Variance, Inter symbol interference, random processes and noise. Sensitivity and dynamic range, conversion of gains and distortion

Unit III: RF MODULATION

Analog and digital modulation of RF circuits, Comparison of various techniques for power efficiency, Coherent and non-coherent detection, Mobile RF communication and basics of Multiple Access techniques. Receiver and Transmitter architectures, direct conversion and two-step transmitters. RF Testing: RF testing for heterodyne, Homodyne, Image reject, Direct IF and sub sampled receivers.

Unit IV: BJT AND MOSFET BEHAVIOR AT RF FREQUENCIES

BJT and MOSFET behavior at RF frequencies, modeling of the transistors and SPICE model, Noise performance and limitations of devices, integrated parasitic elements at high frequencies and their monolithic implementation Overview of RF Filter design, Active RF components & modeling,

Unit V: RF CIRCUITS DESIGN

Matching and Biasing Networks. Basic blocks in RF systems and their VLSI implementation, Low noise Amplifier design in various technologies, Design of Mixers at GHz frequency range, Various mixers- working and implementation. Oscillators- Basic topologies VCO and definition of phase noise, Noise power and trade off. Resonator VCO designs, Quadrature and single sideband generators. Radio frequency Synthesizers- PLLS, Various RF synthesizer architectures and frequency dividers, Power Amplifier design, Linearization techniques, Design issues in integrated RF filters.

Text Books :

- [1] B. Razavi, "RF Microelectronics" PHI 1998
- [2] R. Jacob Baker, H.W. Li, D.E. Boyce "CMOS Circuit Design, layout and Simulation", PHI 1998.

References:

- [1] Thomas H. Lee "Design of CMOS RF Integrated Circuits" Cambridge University press 1998.
- [2] Y.P. Tsividis, "Mixed Analog and Digital Devices and Technology", TMH 1996
- [3] David M. POZAR: Microwave Engineering. - John Wiley & Sons - 2nd Edition (2003).

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ADVANCED MICROWAVE COMMUNICATION			
Course Code:	EC550	Credits:	3
No. of Lectures (Hrs/Week):	3	Mid Sem Exam Hours:	2
Total No. of Lectures:	45	End Sem Exam Hours:	3

Unit I: Microwave And Millimeter Wave Devices

Overview of microwave and millimeter wave vacuum tube devices, limitations of microwave vacuum tubes, gyatron vacuum tube devices. Advances in microwave and millimeter wave solid state devices, Gunn devices, oscillator using, Gunn diode, and injection locked oscillators, IMPATT devices, and microwave and mm wave performance of IMPATT. Other solid state devices like Tunnel diode, BARITT and TRAPAT. Microwave and mm wave circuits:

Unit II: Microwave and MM Wave Circuits

Review of scattering matrix concept in the light of vector network analyzer, impedance matching network, couplers, power dividers, resonators and filters. Detectors, mixers, attenuators, phase shifters, amplifier and oscillator, Ferrite based circuits.

Unit III: Antennas

Hertzian dipole, loop antenna, helical antenna, frequency independent antenna: DuHamel principle, log spiral and log periodic dipole antenna array. Babinet principle, waveguide slot antenna, microstrip antenna, horn antenna, parabolic reflector. Antenna arrays and phased array antenna.

Unit IV: Satellite Communication

Orbital parameters, satellite trajectory, period, geostationary satellites, non-geostationary constellations. Communication satellites – Space craft subsystems, payload – repeater, antenna, attitude and control systems, telemetry, tracking and command, power sub system and thermal control. Earth stations antenna and feed systems, satellite tracking system, amplifiers, fixed and mobile satellite service earth stations. Terrestrial: line of sight transmission, relay towers and distance considerations. Communication link design: Frequency bands used, antenna parameters, transmission equations, noise considerations, link design, propagation characteristics of fixed and mobile satellite links, channel modeling, very small aperture terminals (VSAT), VSAT design issues.

Unit V: Microwave and MM Wave Propagation.

Overview of basic radio wave propagation mechanisms, Friis transmission formula, plane earth propagation model, troposcatter systems, ionosphere propagation, duct propagation, microwave radio link and calculation of link budget. Effect on radio wave propagation due to rain, fog, snow, ice, atmospheric gases, Earth's magnetic field.

Text Books:

- [1] David M Pozar, Microwave Engineering, John Wiley & Sons
- [2] R E Collin, Antenna & Radio wave Propagation, McGraw Hill Book Co.

References:

- [1] M Richharia: 'Satellite Communication Systems'.(Second Ed.),Macmillan Press Ltd.
- [2] Ferdo Ivanek (Editor): 'Terrestrial Digital Microwave Communications', Artech House
- [3] E. Hund: 'Microwave Communications', IEEE Press
- [4] Jordan & Balman, Electromagnetic waves & Radiating System
- [5] R E Collin, Microwave Engineering, McGraw Hill CO.

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ADVANCED COMMUNICATION NETWORKS			
Course Code:	EC532	Credits:	3
No. of Lectures (Hrs/Week):	3	Mid Sem Exam Hours:	2
Total No. of Lectures:	45	End Sem Exam Hours:	3

Unit I: Digital switching systems-analysis, hierarchy, evolution, SPC, call processing, communication and control- level 1,2,& 3 control, interface control, network control processor, central processor, control architecture, multiplexed highways, switching fabric-space division switching, time division switching, STS, TST, TTT, switching system software-architecture, OS, database management

Unit II: MPLS-label stack and label distribution, traffic engineering, design of switching systems, and routers, switching networks-crossbar switches, multistage switches, shared memory switches, optical networks, DWDM techniques, IP over optical core switches

Unit III: Congestion control: integrated services, differentiated services, congestion control, congestion control in packet switching, frame relay congestion control, flow control at link level, TCP congestion control

Unit IV: Voice over IP: basic IP telephone system, digital voice sampling, compression techniques, protocol for VoIP, session initiation protocol

Unit V: Internetworking-connection mode network service, x.75 internetworking, network through ISDN, internetworking SNA, and x.25, x.300 internetworking standards, personal computer networking, data transmission in PTN, Data network standards, voice-data integration, fast packet switches

Text books:

- [1] Syed R. Ali, "Digital Switching Systems, System Reliability and analysis, Tata McGraw-Hill
- [2] William Stallings, "High Speed Networks and Internet" 2nd ed. Pearson edu, 2005
- [3] Bellamy John, "Digital Telephony" Wiley 3rd Ed, 2000
- [4] Viswanathan, T, "Telecommunications Switching Systems and Networks," PHI

References:

- [1] Andrew S. Tanenbaum: Computer networks, PHI.
- [2] W. Stallings: Data and computer communications, MC, Milan.
- [3] Alberto Leon-Gercia, India Widjaja: Communication networks, fundamental concepts and key architecture, TATA McGraw Hill.
- [4] Bertsekas D. and Gallager R.: Data Networks, PHI.
- [5] Keshav S: An Engineering Approach to computer Networking, Addison Wesley.

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DESIGN LAB-1			
Course Code:	EC482	Credits:	2
No. of Lab (Hrs/Week):	3		
Total No. of Lab Sessions:	10	End Sem Exam Hours:	3

List of Experiments

1. Introduction to transmission media(CAT5, OFC, COAXIAL CABLE Wireless)
2. Introduces network interfaces(Wired and Wireless)
3. Configure and installing a Ethernet(10/100)
4. Performance evaluation of Ethernet(10/100)
5. Topology design(Ring, Bus, Star)
6. Generation of data packet and measurement(CBR, VBR, Poison)
7. Router configuration
8. Switch configuration
9. Server configuration
10. Congestion control of network
11. QoS of network
12. Protocols and the configuration
13. Wireless systems
14. Security (WEP, WPA)
15. Study about Qualnet

(SEMESTER - IX)
WCN

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SECURITY IN WIRELESS NETWORKS			
Course Code:	EC631	Credits:	3
No. of Lectures (Hrs/Week):	3	Mid Sem Exam Hours:	2
Total No. of Lectures:	45	End Sem Exam Hours:	3

Unit I: Security goals, attacks, services and mechanisms, cryptography and steganography

Unit II: Symmetric key ciphers-substitution ciphers, transposition ciphers, stream and block ciphers, algebraic structures and GF (2^n) fields in cryptography

Unit III: Modern block ciphers, modern stream ciphers, DES and AES, Elliptic curve cryptosystems

Unit IV: Message integrity, random oracle model, message authentication , Hash function, Integrity authentication , Digital signature- process, services, attacks, schemes, key management-symmetric key distribution, kerberos, symmetric key agreement, public key distribution

Unit V: Security in wireless LAN, IEEE802.11 security, eavesdropping, unauthorized access, interference and jamming, physical threats, counter majors, WEP, encryption, authentication, WPA, authorization, non repudiation, authentication and secure session, security architecture, VPN, wireless access to the Internet

Text book

[1] Behrouz A. Forouzan, “ Cryptography & Network Security” Tata McGraw Hill

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MOBILE COMPUTING			
Course Code:	EC635	Credits:	3
No. of Lectures (Hrs/Week):	3	Mid Sem Exam Hours:	2
Total No. of Lectures:	45	End Sem Exam Hours:	3

Unit I: Mobile Computing Architecture

Introduction to Mobile Communications and Computing : novel applications, limitations, and architecture. GSM: Mobile services, System architecture, Radio interface, Protocols, Localization and calling, Handover, Security, and New data services.

Unit II: Client Programming

Desktop vs. mobile, hardware overview, mobile phones, PDA, design constraints in applications for handheld devices.

Unit III: Programming For the Palm OS

History of palm OS, palm OS architecture, application development, communication in palm OS, multimedia, and enhancements in the current release. Wireless devices with symbian OS; Introduction to Symbian OS, Symbian OS architecture, application for Symbian, control and compounds controls, active objects, localization, security on the Symbian OS, different flavors of windows CE, windows CE architecture, windows CE development environment.

Unit IV: Wireless Application Protocol (WAP)

Overview of the WAP, component of the WAP standards, protocol architecture, and treatment of protocols of all layers, services supporting WAP client, WAP architecture design principle, Bluetooth, J2ME.

Unit V: Special Topics in Mobile Computing

Mobile agent & its application, mobile data management, security framework for mobile environment, m-commerce: emerging applications, different players in m-commerce, m-commerce life cycle, mobile financial services, mobile entertainment services, and proactive service management.

Text Books:

- [1] Mobile Computing, Asoke. K Talukder and Roopa R. Yavagal, TMH, 2005
- [2] Mobile Communication, Jachan Schiller, Adison-Wesley, 2nd edition, 2003.

References:

- [1] Wireless Communication: T. S. Rappapost, Peasson Education, New Delhi, 2001
- [2] Wireless Networks: Kareh Pallavan & P. Krishnamurthy, Peasson Education, New Delhi, 2nd edition, 2004.
- [3] Mobile Commerce and Applications, Upkar Varshney, A tutorial at IEEE International Conference on Wireless Communications (WCNC), 1999.

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NETWORK RELIABILITY			
Course Code:	EC641	Credits:	3
No. of Lectures (Hrs/Week):	3	Mid Sem Exam Hours:	2
Total No. of Lectures:	45	End Sem Exam Hours:	3

Unit I: Reliability Fundamentals

Causes of Failures, Useful Life of Components, Hazard Functions, Bathtub Curve, Characteristic Type of Failures: Early Failures, Constant Failure Rate, Wear-Out Failures, Failure Data Analysis, Mean Time to Failure (MTTF), Mean Residual Life (MRL), Reliability Measures

Unit II: Reliability Mathematics

Classical Set Theory, Boolean algebra, Sample Space, Probability Theory, Bayes Theorem, Probability Distributions, Cumulative Distributions, Variance, Moments, Estimation Theory, Laplace Transform, Markov Processes, Random Number Generation, Probability Plots

Unit III: System Reliability Analysis

Reliability Block Diagrams, Series Systems, Series Parallel Systems, Open and short Circuit Failures, Standby Systems, System Modeling, Assumptions for Modeling, Two State Modeling, Three State Models, Statistical Estimation of Failure Data, Interval Estimates, Hazard Models.

Unit IV: Reliability Modeling

Stress-Strength Model, System Modeling, Assumptions for Modeling, Two State Modeling, Three-state Modeling, Graphical Approach, Path Set/Cut Set Approach: Inclusion-Exclusion Method, Calculation of Bounds Method, Monte Carlo Simulation Method, Domination Theory, Sum of Disjoint Product Method, Non-path Set/cut Set approach: State Enumeration Method Transformation Method Topological Method BDD/OBDD/ROBDD Method, Reliability Measures: Connectivity Measures, Multicommodity Flow Measures, Maximum Flow (Capacity) Measures, Performability Measures.

Unit V: Maintability and Availability Analysis

Availability Prediction, Effects of Repair Strategies, Fault Trees, Event Tree Analysis, FMEA, FMECA, Theoretical and Analytical Overview of Availability and Maintainability in Communication System Design: Prediction in Assessment, Preliminary in Design, Evaluation in Detail Design. Application Modeling of Availability and Maintainability in Engineering Design

Text Books:

- [1] Aggarwal K. K., Reliability Engineering, Kluwer Academic Publishers, Boston Publication
- [2] Ramakumar R., Reliability Engineering: Fundamentals and Applications, Prentice Hall

Reference Books:

- [1] Misra K. B., Reliability Analysis and Prediction: A Methodology Oriented Treatment, Elsevier Publication
- [2] Kapur K. C. and L. R. Lamberson, Reliability in Engineering Design, John Wiley & Sons,
- [3] Martin L Shooman, Reliability of Computer Systems and Networks, John Wiley Sons
- [4] Naikan V.N.A., Reliability Engineering and life testing, PHI 2010.

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SMART ANTENNA SYSTEMS			
Course Code:	EC643	Credits:	3
No. of Lectures (Hrs/Week):	3	Mid Sem Exam Hours:	2
Total No. of Lectures:	45	End Sem Exam Hours:	3

Unit I: Basic Concepts of Radiation

Radiation mechanism: Basic sources of Radiation- Current distribution on antennas, Basic antenna parameters.

Unit II: Analysis And Synthesis of Antennas

Vector potential, Antenna theorems and definitions, dipole, loop, reflector, slot antennas. Types of linear arrays, current distribution in linear arrays, Antenna array synthesis techniques.

Unit III: Smart Antennas

Spatial processing for wireless systems: Introduction, Vector channel impulse response & the spatial signature. Spatial processing receivers, fixed beam forming Networks, switched beam systems, Adaptive antenna systems, Wide band smart antennas, Digital radio receiver & software radio for smart antennas.

Unit IV: Smart Antenna Techniques for CDMA

Non-coherent & coherent CDMA spatial processors, spatial processing rake receiver, Multi-user spatial processing, dynamic resectoring, down link beam forming for CDMA, MIMO.

Unit V: Micro Strip Antenna

Radiation Mechanism and Excitation techniques : Microstrip dipole; Patch ,Rectangular patch, Circular patch, and Ring antenna – radiation analysis from cavity model; input impedance of rectangular and circular patch antenna; Microstrip array and feed network; Application of microstrip array antenna.

Text Books:

- [1] Balanis A., “Antenna Theory Analysis and Design”, John Wiley and Sons, New York, 1982.
- [2] Joseph C. Liberti, Theodore S. Rappaport – “Smart Antennas for Wireless Communications: IS95 and third generation CDMA Applications”, Prentice Hall, Communications Engineering and Emerging Technologies Series.

References:

- [1] Kraus J.D., “Antennas”, II edition, John Wiley and Sons, New York, 1977.
- [2] Collin R.E. and Zucker F. – “Antenna theory” Part I, Tata Mc Graw Hill, New York, 1969.
- [3] I.J. Bahl and P. Bhartia,” Microstrip Antennas”,Artech House,Inc.,1980
- [4] W.L.Stutzman and G.A.Thiele,”Antenna Theory and Design”, 2nd edition,John Wiley& Sons Inc.,1998.

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BRAODBAND WIRELESS NETWORKS			
Course Code:	EC645	Credits:	3
No. of Lectures (Hrs/Week):	3	Mid Sem Exam Hours:	2
Total No. of Lectures:	45	End Sem Exam Hours:	3

Unit I: Introduction to broadband wireless, fixed broadband wireless, mobile broadband wireless, 3G cellular systems, spectrum options for BW, BW channels, fading, modeling of broadband fading channels, mitigation of fading

Unit II: OFDM-basics, timing and frequency synchronization, PAR computational complexity, simulation of OFDM systems, , MAC layer, performance enhancement, architecture, performance characterization, Multiple antenna techniques-spatial diversity, receiver diversity, transmit diversity, beam foaming, spatial multiplexing, channel estimation for MIMO-OFDM, advanced techniques for MIMO,OFDMA in WiMAX

Unit III: WiMAX, Physical layer- channel coding, hybrid ARQ, interleaving, symbol mapping, symbol structure, sub channel and subcarrier permutations, slot and frame structure, ranging power control, channel quality measurements, MAC layer-convergence SL, MAC PDU, bandwidth request, and allocation, QoS, network entry, an initialization, power saving, mobility management

Unit IV: WiMAX network architecture- design principle, reference model, protocol layering, network discovery and selection, IP address assignment, authentication and security, QoS architecture, mobility management, radio resource management, link level performance-methodology, AWGN channel performance, fading channel performance, advanced receiver architecture, system level architecture-channel modeling, methodology, system level simulation,

Unit V: Ultrawideband, Unlicensed wireless access, IEEE 802.20 MBWA, FOMA, iMODE, WiBRO, FWA, AWS, Multimedia-MedaiFLO, T-DBM, DVB-H, MVNO

Text Books:

- [1] Jeffrey G. Andrews, Arunabha Ghosh, Rias Muhamed, “ Fundamentals of WiMAX, Understanding Broadband Wireless Networking”, Pearson
- [2] Clint Smith, P.E. Daniel Collins, “ 3G Wireless Networks” Tata McGraw-Hill, 2nd Edition

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SENSOR NETWORKS			
Course Code:	EC647	Credits:	3
No. of Lectures (Hrs/Week):	3	Mid Sem Exam Hours:	2
Total No. of Lectures:	45	End Sem Exam Hours:	3

Unit I: Sensor Network Operations

Overview of mission-oriented sensor networks, trends in sensor development, mission oriented sensor networks, dynamic systems perspective, Dense sensor networks, robust sensor positioning in wireless ad hoc sensor networks, trigonometric k clustering (TKC) for censored distance estimation, sensing coverage and breach paths in surveillance wireless sensor networks.

Unit II: Lower Layer Issues-Mac, Scheduling, And Transmission

Medium access control for sensor networks, comprehensive performance study of IEEE 802.15.4, providing energy efficiency for wireless sensor networks, link adaptation techniques.

Unit III: Network Routing

Load balanced query protocols for wireless sensor networks, energy efficient and MAC aware routing for data aggregation in sensor networks, ESS low energy security solution for large-scale sensor networks based on tree ripple zone routing scheme.

Unit IV: Sensor Network Applications

Evader centric program, Pursuer centric program, hybrid pursuer evader program, efficient version of hybrid program, Implementation and simulation results

Unit V: Embedded Soft Sensing For Anomaly Detection

Mobile robot simulation setup, software anomalies in mobile robotic networks, soft sensor, software anomaly detection architecture, anomaly detection mechanisms, test bed for software anomaly detection in mobile robot application, multisensor network-based framework; Basic model of distributed multi sensor surveillance system, super resolution imaging, optical flow computation, super resolution image reconstruction, experimental results.

Text Books:

- [1] Shashi Phoha, Thomas F. La Porta , Chrisher Griffin, “Sensor Network Operations”, Wiley-IEEE Press March 2006.
- [2] Jr. Edger H. Callaway, “Wireless sensor networks”, CRC Press.

References:

- [1] I. F. Akyildiz and M. C. Vuran, “Wireless Sensor Networks”, John Wiley and Sons Publ. Company
- [2] Feng Zho, Morgan Kaufmann ,”Wireless Sensor Networks: An Information Processing Approach”.

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MULTICAST COMMUNICATION			
Course Code:	EC651	Credits:	3
No. of Lectures (Hrs/Week):	3	Mid Sem Exam Hours:	2
Total No. of Lectures:	45	End Sem Exam Hours:	3

Unit I: Multicast Communication

Types of Communication, Scalability, Applications of Group Communication, Characteristics of Groups - Special Aspects of Group Communication Quality of Service: What is QOS?, Describing a stream, Queuing techniques, Signalling QOS requirements, Integrated Services, RSVP, ST2, Differentiated Services, Differences and Integration Options, Multi Protocol Label Switching, Subnet Bandwidth Manager, Improving QOS in the best effort class - Issues in slow links

Unit II: Multicast Routing

Multicast Routing: Introduction, frame work, Controlling scope, delivery tree, Basic Routing Algorithms, Group Dynamics, Scoping and Multicast Address Allocation, Source-Based Routing, Steiner Trees, Trees with Rendezvous Points, Multicast Routing in the Internet, DVMRP, MOSPF, PIM, CBT, Multicast Routing between Domains

Unit III: Multicast in IP

The IP -Host Name Resolution - IP multicast, RTP, RTCP, RSVP, RTSP, Ipv6, IGMP (v1, v2 & v3), IP multicast applications - IP multicast security issues, Switching technology, multicast, Replication, Mirroring and Caching, IP TV.

Unit IV: Multicast in Transport Protocols

UDP, XTP, MTP, RMP, LBRM, SRM, RMTP, PGM, MFTP Inter-domain multicast routing, Multicast caveats, multicast on non-broadcast media, flooding, address allocation, Multicast in LANs

Unit V: Mbone and Multicast Security

the Multicast Backbone of the Internet, Mbone Architecture, Mbone Tools, Mbone Applications, Multicast routing and Mobile Systems, Multicast and DiffServ, Active Networks for Supporting Group Communication - Group Management for Large Dynamic Groups - Video conferencing, SDR : session directory, VIC & VAT, Reliable Multicast, Security issue of Source, Security issues of receivers.

Text Books:

- [1] Multicast Communication: Protocols, Programming, & Applications, Morgan Kaufmann in Networking, Ralph Wittmann, Martina Zitterbart, Edition 2001, Academic Press, USA.
- [2] Multicast Networking And Application, Kennet Miller AW Publication, 1999
- [3] IP Telephony, Oliver Hersent, David Gurle, Jean - Pierre Petit, A, Pearson Asia, LPE, 2001
- [4] Multicast Sockets: Practical Guide for Programmers by David Makofske, Kevin Almeroth, Edition 2003, Elsevier, USA.
- [5] Introduction to Data Multicasting, IP Multicast Streaming for Audio and Video Media Distribution Lawrence Harte, First Edition, 2008, Althos Publishing House.

References:

- [1] Multicast Communication: Protocols, Programming, & Applications, Morgan Kaufmann in Networking, Ralph Wittmann, Martina Zitterbart, Edition 2001, Academic Press, USA.
- [2] Multicast Networking And Application, Kennet Miller AW Publication, 1999
- [3] IP Telephony, Oliver Hersent, David Gurle, Jean - Pierre Petit, A, Pearson Asia, LPE, 2001
- [4] Multicast Sockets: Practical Guide for Programmers by David Makofske, Kevin Almeroth, Edition 2003, Elsevier, USA.