SCHOOL
OF
INFORMATION AND COMMUNICATION TECHNOLOGY

COURSE STURCTURE

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

SPECIALIZATION:

ISR

GAUTAM BUDDHAUNIVERSITY
GAUTAM BUDH NAGAR, GREATER NOIDA
2015-2016

5 Year Dual Degree B. Tech. (Computer Science & Engineering)+ M.Tech. / MBA

Effective from: 2015 -2016 **ISR**

SEMESTER I

Sr. No.	Courses Code	Courses	L-T-P		Credits
1	CY101	Engineering Chemistry	3-1-0	FC-C1	4
2	MA101	Engineering Mathematics – I	3-1-0	FC-C2	4
3	ES 101	Environmental studies	2-1-0	AECC1	3
4	CS101	Computer Programming – I	2-0-0	FC-C3	2
5	EC101	Basic Electronics	2-1-0	FC-C4	3
6	HU101	English Proficiency	2-0-0	AECC2	2
7	SS101	Human Values & Buddhist Ethics	2-0-0	AECC3	2
8	CY103	Engineering. Chemistry Lab	0-0-2	FC-C5	1
9	CS 181	Computer Programming Lab1	0-0-2	FC-C6	1
10	CE103	Engineering Graphics	0-0-3	FC-C7	2
11	EC181	Basic Electronics Lab	0-0-2	FC-C8	1
12	GP	General Proficiency	------	Non Credit	
		Total Credits			**25**
Total Contact Hours			**16-4-9**	**29**	

Ability Enhancement Compulsory Course (AECC):

1. HU101 English Proficiency
2. ES 101 Ecology and Environment
3. SS101 Human Values & Buddhist Ethics

SEMESTER II

Sr. No.	Courses Code	Courses	L-T-P		Credits
1	PH102	Engineering Physics	3-1-0	FC- C9	4
2	MA102	Engineering Mathematics – II	3-1-0	FC-C10	4
3	ME 101	Engineering Mechanics	2-1-0	FC-C11	3
4	CS102	Computer Programming – II	2-0-0	FC-C12	2
5	EE102	Electrical Technology	2-1-0	FC-C13	3
6	HU102	Professional Communication	2-0-0	AECC4	2
7	--	Open Elective 1	2-0-0	OE 1	2
9	PH104	Engineering Physics Lab	0-0-2	FC-C14	1
10	CS182	Computer Programming Lab - II	0-0-2	FC-C15	1
11	EE104	Electrical Technology Lab	0-0-2	FC-C16	1

12	ME102	Engineering Workshop	0-0-3	FC-C17	2
13	GP	General Proficiency	------	Non Credit	
Total Credits					**25**
Total Contact Hours			**16-3-10**	**29**	

Ability Enhancement Compulsory Course (AECC):

1. HU 102 Professional Communication

Skill Enhancement Course (SEC):

1. ME 102 Engineering Workshop

Open Elective I (OE) Courses offered from other school

SEMESTER – III

Sr. No.	Courses Code	Courses	L-T-P		Credits
1	MA201	Engineering Mathematics III	3-1-0	FC-C18	4
2	EC201	Digital Electronics	3-0-0	FC-C19	3
3	CS201	Internet Technology	3-0-0	C20	3
4	CS203	Operating Systems	3-0-0	C21	3
5	CS205	Data Structure & Algorithms	2-1-0	C22	3
6	CS207	System Analysis and Design	3-0-0	C23	3
7	EC281	Digital Electronics Lab	0-0-3	FC-C24	2
8	CS281	Internet Technology Lab	0-0-3	C25	2
9	CS283	Data Structure and Algorithms Lab	0-0-3	C26	2
10	GP	General Proficiency	------	Non Credit	
		Total Credits			**25**
		Total Contact Hours	**17-2-9**	**28**	

SEMESTER – IV

Sr. No.	Courses Code	Quantitative Techniques	L-T-P		Credits
1	MA202	Numerical and Statistical Analysis	3-1-0	C27	4
2	EC210	Principles of Communication	2-1-0	C28	3
3	CS202	Software Engineering	3-0-0	C29	3

4	CS204	Discrete Structure	3-0-0	FC-C30	3
5	CS206	Data Base Management System	3-0-0	C31	3
6	CS208	Principles of Programming Language	2-0-0	C32	2
7	EC282	Analog Communication Lab	0-0-3	C33	2
8	CS282	Software Engineering Lab	0-0-3	C34	2
9	CS284	Database Management System Lab	0-0-3	C35	2
10	GP	General Proficiency	------	Non Credit	0
Total Credits					**24**
Total Contact Hours			**16-2-9**	**28**	

SEMESTER – V

Sr. No.	**Courses Code**	**Courses**	**L-T-P**		**Credits**
1	CS301	Theory of Automata	3-1-0	C36	4
2	CS303	Web Development	3-1-0	C37	4
3	CS305	Computer Graphics	2-1-0	C38	3
4	CS307	Analysis and Design of Algorithms	2-1-0	C39	3
5	CS309	Computer Organization & Architecture	3-0-0	C40	3
6		Open Elective	2-0-0	OE2	2
7	CS381	Web Development Lab	0-0-3	C41	2
8	CS383	Computer Graphics Lab	0-0-3	C42	2
9	GP	General Proficiency	------	Non Credit	
Total Credits					**23**
Total Contact Hours			**15-4-6**	**25**	

Open Elective (OE):

1. **CS311 Ecommerce**
2. **CE311 Engineering Economics**

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SEMESTER – VI

Sr. No.	Courses Code	Courses	L-T-P		Credits
1	CS302	Distributed Operating System	3-1-0	C43	4
2	CS304	Concepts of Artificial Intelligence	3-0-0	C44	3
3	CS306	Advanced Computer Architecture	3-0-0	C45	3
4	CS308	Computer Networks	3-1-0	C46	4
5	EC304	Microprocessor and Interfacing	3-0-0	C47	3
6	CS 312	Management Information System	2-0-0	SEC2	2
7	EC384	Microprocessor and Interfacing Lab	0-0-3	C48	2
8	CS382	Computer Networks Lab	0-0-3	C49	2
9	GP	General Proficiency	------	Non Credit	
Total Credits					**23**
Total Contact Hours			**17-2-6**	**25**	

Skill Enhancement Course (SEC):

1. **CS312 Management Information System**

SEMESTER – VII

Sr. No.	Courses Code	Courses	L-T-P		Credits
1.		Generic Elective	3-1-0	GE 1	4
2	CS401	Compiler Design	3-0-0	C50	3
3	CS403	Object-Oriented Analysis	3-0-0	C51	3
4		Elective 1	3-0-0	DSE1	3
5		Elective 2	3-0-0	DSE2	3
6	CS481	Compiler Design Lab	0-0-3	C52	2
7	CS491	Seminar	0-0-2	DP1	1
8	CS493	Minor Project	0-0-8	DP2	4
9	GP	General Proficiency	------	Non Credit	
Total Credits					**23**

Total Contact Hours	**14-3-13**	**30**

Electives		
1.	CS405	Formal Methods
2.	CS451	Wireless Technologies
3.	EC405	Wireless Mobile Communication
4.	EC443	Telecommunication Security and Networks
5.	CS441	Software project management.

Generic Elective (GEI)

1. MA406 Operation Research Techniques
2. MA507 Optimization Techniques
3. MA417 Number Theory

SEMESTER VIII

Sr. No.	Courses Code	Courses	L-T-P		Credits
1		Generic Elective	3-1-0	GE1	4
2	CS562	Knowledge Engineering	3-0-0	C53	3
3	CS 564	Soft Computing Techniques	3-0-0	C54	3
4	CS 572	Introduction to Embedded System	3-0-0	C55	3
		Elective-1	3-0-0	DSE1	3
6	CS584	Soft Computing lab	0-0-3	C56	2
7	CS592	Major Project	0-0-10	DP1	5
8	GP	General Proficiency	------	NCC	
		Total Credits			**23**
		Total Contact Hours		**15-1-13 = 29**	

Electives (1)		
1	CS568	Machine Translation and Learning
2	CS 570	Speech Processing
3	EC477	Digital Image Processing
4	CS 566	Natural Language Processing
5	CS574	Any skill based course by NSDC*credits will be decided when the course is run.

Generic Elective (GE2)

1. MA 402 Modeling and Simulation
   MA416 Probability and Stochastic Process

	Summer Semester (After 8th Semester)				
Sr. No.	**Courses Code**	**Courses**	**L-T-P**		**Credits**
1	CS490	Summer Project / Industrial Training		DP4	5
Total Credits				**05**	
Total Contact Hours				**4-6 week**	

SEMESTER IX

Sr. No.	**Courses Code**	**Courses**	**L-T-P**		**Credits**
1	CS661	Expert System Design	3-0-0	C57	3
2	CS699	Robotics	3-0-0	C58	3
3		**Elective 2**	3-0-0	DSE2	3
4		**Elective 3**	3-0-0	DSE3	3
5	CS683	Expert System Design Lab	0-0-3	C59	2
6	CS691	Dissertation Part - I	0-0-14	DP2	7
7	GP	General Proficiency	------	NCC	
Total Credits				**21**	
Total Contact Hours			**12-0-17**	**29**	

Electives (2&3)		
1	CS663	Intelligent Information Retrieval
2	CS665	Pattern Matching
3	CS 667	Evolutionary Computation
4	CS669	Fuzzy Set Theory
5	CS671	Multimedia and Computer Graphics
6	CS673	Any skill based course by NSDC*credits will be decided when the course is run.

SEMESTER X

Sr. No.	**Courses Code**	**Courses**			**Credits**
1	CS690	Dissertation Part – II		DP3	23
2	GP	General Proficiency			0
Total Credits				**23**	

GRAND TOTAL CREDITS = 240

SEMESTER -1

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 Mgraw 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

Basic Electronics			
Course Code:	**EC 101**	**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 DiodesTheory 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 OpAmps 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.

COMPUTER PROGRAMMING – I			
Course Code:	**CS181**	**Credits:**	**1**
No. of Lectures (Hrs/Week):	**2**		
Total No. of Lectures:	**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
  4   4   4   4
```

```
        A
      B   B
    C   C   C
  D   D   D   D
```

BASIC ELECTRONICS LAB			
Course Code:	**EC181**	**Credits:**	**2**
No. of Lab (Hrs/Week):	**1**	**End Sem Exam Hours:**	**3**
Total No. of Lab Sessions:	**15**		

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.

(SEMESTER - II)

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.

Effective from: 2015 -2016 **ISR**

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:

1. Write a separate Java Code to implement each of the following:
   Class, Command Line Argument, how to enter value through keyboard

2. Write a separate Java Code to implement each of the following data types:
   Variable, Constant, Arrays, Strings, Vectors, Wrappers Classes, Type Casting

3. 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

4. Write a separate Java Code to implement each of the following control statements:
   Decision statement, Loops statement and Branch statements

5. Write a separate Java Code to implement each of the following sorting:
   Bubble Sort, Selection Sort, Insertion Sort, Merge Sort

6. Write a separate Java Code to implement each of the following:
   Class, Object, Constructors, Method, Method Overloading and Method Overriding

7. Write a separate Java Code to implement each of the following:
   Final variable, final class, final method, abstract class, abstract method and concrete method

8. Write a separate Java Code to implement each of the following OOPs concepts:
   Abstraction, Polymorphism, Encapsulation, Inheritance
9. 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

10. Write a separate Java Code to implement each of the following:
    Visibility Controls: Private, Public and Protected

11. Write a separate Java Code to implement each of the following:
    Interface, extending and implementing interface

12. Write a separate Java Code to implement each of the following:
    Multithreading: Create thread with thread class and runnable interface, thread priorities, synchronization

13. 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.
    i) First method: Factorial number with the help of recursion.
    ii) Second method: Fibonacci Series
    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)

Effective from: 2015 -2016 **ISR**

ENGINEERING MATHEMATICS III			
Course Code:	**MA201**	**Credits:**	**4**
No. of Lectures (Hrs/Week):	**3+1**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45+15**	**End Sem Exam Hours:**	**3**

UNIT-I

Random Events, Independent and dependent events, axioms of the theory of probability, Simple and conditional probability, Bayes theorem.

UNIT-II

One dimensional random variables (discrete and continuous), distribution of a random variable (density function and cdf), Characteristic function of a random variable and its utility, Bivariate random variable, joint, marginal and conditional distributions, joint characteristic function, Moments, Moment Generating functions, Skewness, Kurtosis.

UNIT-III

Bernoulli, Binomial, Poisson, Geometric, Uniform, Exponential, Normal, Earlang, Weibull, Method of least squares (Fitting of straight lines, Polynomials, Exponential and logarithmic curves), covariance and correlation.

UNIT-IV

Sampling theory (small and large), Test of hypothesis and significance: Chi-square test, t-test, z-test, F-test, Questionaire design.

UNIT-V

Markov chain, Chapman- Kolmogorov Equation, Classification of states.

Text Books:

1. T. Veerarajan. Probability, Statistics and Random Processes, Tata McGraw-Hill.

Reference Books:

2. V. K. Rohatgi: An Introduction to Probability Theory and Mathematical Statistics. John Wiley & Sons 1976.
3. John Freund: Introduction to Probability. Dover Publications.
4. Marylees Miller, John E. Freund, Irwin Miller: John E. Freund's Mathematical Statistics: With Applications, Prentice Hall, 2003.
5. Levin and Rubin, Statistics for Management, Prentice Hall.

DIGITAL ELECTRONICS			
Course Code:	**EC201/EC431**	**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

Number systems & codes, Binary arithmetic Boolean algebra and switching function. Minimization of switching function, concept of prime implecant etc. Karnaugh's map method, Quine & McCluskey's method, cases with don't care terms and multiple outputs switching function. Logic gates, NAND, NOR realization of switching function; half-adder half-subtractor full-adders full-subtractor circuits. Series & parallel addition and BCD adders, look-ahead carry generator.

UNIT II

Linear wave shaping circuits, Bistable, monostable & astable multivibrators, Schmitt trigger circuits .Introduction to D/A converters. Various types of Analog to Digital & Digital to Analog converters sample & hold circuits and V-F converters.

UNIT III

Logic families: RTL, DTL, all types of TTL circuits, ECL, 12 L and PMOS, NMOS &CMOS logic etc. Gated flip-flops and gated multivibrators etc; Interfacing between TTL to MOS, vice-versa.

UNIT IV

Introduction to shift registers / ring counters synchronous & asynchronous counters and designing of combinational circuits like code converters & counters etc.

UNIT V

Semiconductor memories & designing with ROM and PLA: Decoders Encoders multiplexers & demultiplexers**.**

Text Books:

1. Tocci, "Digital Systems Principles & Applications".
2. M. Mano, "Digital Logic & Computer Design", (PHI).

Reference Books:

3. John F. Wakerly, Digital Design: Principles & Practices, Pearson Education.2003
4. Richard F.Tinder, Engineering Digital Design, 2/e, Harcourt India Private Ltd., 2001
5. William I. Fletcher, An Engineering Approach to Digital Design, Pearson Education
6. William H.Gothmann, Digital Electronics: An Introduction to Theory and Practice, Eastern Economy Edition, Prentice-Hall of India Private Limited, New Delhi. 2001.
7. Jacob Millman & Herbert Taub,Pulse,Digitaland Switching Waveforms,13th Reprint,Tata McGraw Hill Publishing Company Ltd.,NewDelhi, 1999

INTERNET TECHNOLOGY			
Course Code:	**CS201**	**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 INTERNET AND WEB

Introduction to internet, history of Internet and web, Internet services and accessibility, uses of internet, Internet standards, Internet protocols- IP, TCP,UDP and host names, web server, proxy server, fast ready connections on the web, web browsers, Netscape communication suite, Microsoft Internet explorer, firewalls, data security.

UNIT II WEB DESIGN

Key issues in web site design, introduction to HTML, SGML- DTD, DTD elements, attributes, outline of an HTML document, head section- prologue, link, base, meta, script, style, body section- headers, paragraphs, text formatting, linking, internal linking, embedding images, lists, tables, frames, other special tags and characters, XHTML, XML, structuring data, XML schema documents, document object model, security and management issues for creating a website.

UNIT III BROWSING SYSTEMS

Searching and web casting technique, popular web servers, basic features, bookmarks, cookies, progress indicators, customization of browsers, browsing tricks, next generation web browsing, search engines, architecture of search engines, search tools, web crawlers, types of crawlers, scalable web crawler, incremental crawler, parallel crawler, focused crawler, agent based crawler, case study of IE, counters, Internet chat, hardware and software requirements for Internet and web based applications, Internet and web technologies.

UNIT IV JAVASCRIPT

Introduction, Language elements, objects of JavaScript, other objects like data, math, string, regular expressions, arrays.

UNIT V ACTIVE SERVER PAGES

Creating interactive applications using active server pages : client and server side script in C#, variables and constants, creating modules, creating objects from classes, ASP's object model, arrays, collections, control structures, using request and response objects, integration with database.

Reference Books:

1. Raj Kamal, Internet and Web Technologies, TMH, 2005.
2. Monica D'Souza, Web publishing, TMH, 2001.
3. David Crowder and Rhonda Crowder, Web Design, IDG Books India, 2001.
4. Musciano C., HTML and XHTML the Definitive Guide, 6th edition, OReilly, 2006.
5. Deitel H., Deitel P., Internet and World Wide Web: How to Program, 4 edition, PHI.

OPERATING SYSTEMS			
Course Code:	**CS203/CS431**	**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 OPERATING SYSTEM

Importance of operating systems, basic concepts and terminology about operating system, memory management functions, processor management functions, device management functions, information management functions.

UNIT II PROCESS MANAGEMENT

Elementary concept of process, job scheduler, process scheduling, operation on process, threads, overview, scheduling criteria, scheduling algorithms, algorithm evaluation process synchronization, synchronization hardware, semaphores, classical problem of synchronization, monitors and atomic transaction deadlocks: system model, deadlock characterization, deadlocks prevention, deadlocks avoidance, deadlocks detection, recovery from deadlock.

UNIT III MEMORY MANAGEMENT

Memory management, logical versus physical address space, swapping, contiguous allocation, paging, segmentation, demand paging, page replacement, page replacement algorithms, allocation of frames, thrashing, demand segmentation.

UNIT IV STORAGE MANAGEMENT

File concept, directory structure, protection, file-system structure, allocation method, free-space management, directory implementation.

UNIT V I/O SYSTEMS

I/O hardware, Application of I/O interface, Overview of Kernel I/O subsystem, three types of I/O systems, memory based I/O, I/O based I/O, peripheral based I/O.

Reference Books:

1. Galvin, Wiley, Operating Systems Concepts, 8th edition, 2009.
2. James L Peterson, Operating Systems Concept, John Wiley & Sons Inc, the 6Rev edition, 2007.
3. Deitel H. M., An Introduction to Operating Systems, Addison-Wesley, 1990.
4. Stallings William, Operating Systems, PHI, New Delhi, 1997.
5. Madnick and Donavon, Operating Systems, McGraw Hill, International edition, 1978.
6. S. Tanenbaum Modern Operating Systems, , Pearson Education, 3rd edition, 2007.
7. Nutt, Operating System, Pearson Education, 2009.
8. S. Tanenbaum, Distributed Operating Systems, Prentice Hall, 2nd edition, 2007.
9. M. Singhal & N. Shivaratri, Advanced Concepts in Operating Systems, McGraw Hill, 2003.

DATA STRUCTURES AND ALGORITHMS			
Course Code:	**CS205**	**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 DATA STRUCTURES

Abstract data types, sequences as value definitions, data types in C, pointers in C, data structures and C, arrays in C, array as ADT, one dimensional array, Implementing one dimensional array, array as parameters, two dimensional array, structures in C, implementing structures, Unions in C, implementation of unions, structure parameters, allocation of storage and scope of variables, recursive definition and processes: factorial function, fibonacci sequence, recursion in C, efficiency of recursion, hashing: hash function, open hashing, closed hashing: linear probing, quadratic probing, double hashing, rehashing, extendible hashing.

UNIT II STACK, QUEUE AND LINKED LIST

Stack definition and examples, primitive operations, example -representing stacks in C, push and pop operation implementation, queue as ADT, C Implementation of queues, insert operation, priority queue, array implementation of priority queue, inserting and removing nodes from a list-linked implementation of stack, queue and priority queue, other list structures, circular lists: stack and queue as circular list - primitive operations on circular lists, header nodes, doubly linked lists, addition of long positive integers on circular and doubly linked list.

UNIT III TREES

Binary trees: operations on binary trees, applications of binary trees, binary tree representation, node representation of binary trees, implicit array representation of binary tree, binary tree traversal in C, threaded binary tree, representing list as binary tree, finding the Kth element, deleting an element, trees and their applications: C representation of trees, tree traversals, evaluating an expression tree, constructing a tree.

UNIT IV SORTING AND SEARCHING

General background of sorting: efficiency considerations, notations, efficiency of sorting, exchange sorts: bubble sort; quick sort; selection sort; binary tree sort; heap sort, heap as a priority queue, sorting using a heap, heap sort procedure, insertion sorts: simple insertion, shell sort, address calculation sort, merge sort, radix sort, sequential search: indexed sequential search, binary search, interpolation search.

UNIT V GRAPHS

Application of graph, C representation of graphs, transitive closure, Warshall's algorithm, shortest path algorithm, linked representation of graphs, Dijkstra's algorithm, graph traversal, traversal methods for graphs, spanning forests, undirected graph and their traversals, depth first traversal, application of depth first traversal, efficiency of depth first traversal, breadth first traversal, minimum spanning tree, Kruskal's algorithm, round robin algorithm.

Text Books:

1. Aaron M. Tenenbaum, Yeedidyah Langsam, Moshe J. Augenstein, 'Data structures using C', Pearson Education, 2004 / PHI.

References Books:

2. E. Balagurusamy, 'Programming in Ansi C', Second Edition, TMH, 2003.
3. Robert L. Kruse, Bruce P. Leung Clovis L.Tondo, 'Data Structures and Program Design in C', Pearson Education, 2000 / PHI.

SYSTEM ANALYSIS AND DESIGN			
Course Code:	**CS207**	**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 DATAANDINFORMATION

Types of information: operational, tactical, strategic and statutory, why do we need information systems, management structure, requirements of information at different levels of management, functional allocation of management, requirements of information for various functions, qualities of information, small case study.

UNIT II SYSTEMS ANALYSIS AND DESIGN LIFE CYCLE

Requirements determination, requirements specifications, feasibility analysis, final specifications, hardware and software study, system design, system implementation, system evaluation, system modification, role of systems analyst, attributes of a systems analyst, tools used in system analysis

UNITIII INFORMATION GATHERING

Strategies, methods, case study, documenting study, system requirements specification, from narratives of requirements to classification of requirements as strategic, tactical, operational and statutory.

UNIT IV FEASIBILITY ANALYSIS

Deciding project goals, examining alternative solutions, cost benefit analysis, quantifications of costs and benefits, payback period, system proposal preparation for managements, parts and documentation of a proposal, tools for prototype creation.

UNIT V TOOLS FOR SYSTEMS ANALYSTS

Data flow diagrams, case study for use of DFD, good conventions, leveling of DFDs, leveling rules, logical and physical DFDs, software tools to create DFDs, decision tables for complex logical specifications, specification oriented design vs procedure oriented design

Reference Books:

1. System Analysis and Design – Elias M.Awad.
2. System Analysis and Design –Perry Edwards
3. Analysis and Design of Information Systems – James A.Senn

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.

INTERNET TECHNOLOGY LAB			
Course Code:	**CS281**	**Credits:**	**2**
No. of Lectures (Hrs/Week):	**3**		
Total No. of Lectures:	**10**	**End Sem Exam Hours:**	**2**

List of Experiments

1. Design a web page using XHTML which shows the Hyperlinks, List, Tables.
2. Design a web page in which users insert the username and password using XHTML form.
3. Design a web page using XHTML to insert an image and adding a marquee.
4. Write XML schema document for Book domain.
5. Design a website using HTML, XHTML and JavaScript.
6. Using Java Script display a line of text in a web page.
7. Using Java Script display a text in an alert Dialog box.
8. Using Java Script , take input of two integer from the user and display the result in the web page.
9. Using Java Script, Show the equality and relational operators.
10. Write a script that reads integers and determines the square root of the integer using square root method of Math object.
11. Write a script which uses the control statements.
12. Write a script that reads five integers and determines the largest and the smallest integers in the group.
13. Write a code to show connectivity between SQL server and ASP.net.
14. Introduction to different types of tools using in ASP.net Technology.
15. Design a web page using ASP.net.

DATA STRUCTURE AND ALGORITHMS LAB			
Course Code:	**CS283**	**Credits:**	**2**
No. of Lectures (Hrs/Week):	**3**		
Total No. of Lectures:	**10**	**End Sem Exam Hours:**	**2**

List of Experiments

1. Run time analysis of Fibonacci Series
2. Study and Application of various data Structure
3. Study and Implementation of Array Based Program
    a. Searching (Linear Search, Binary Search)
    b. Sorting (Bubble, Insertion, Selection, Quick, Merge etc)
    c. Merging
4. Implementation of Link List
    a. Creation of Singly link list, Doubly Linked list
    b. Concatenation of Link list
    c. Insertion and Deletion of node in link list
    d. Splitting the link list into two link list
5. Implementation of STACK and QUEUE with the help of
    a. Array
    b. Link List
6. Implementation of Binary Tree, Binary Search Tree, Height Balance Tree
7. Write a program to simulate various traversing Technique
8. Representation and Implementation of Graph
    a. Depth First Search
    b. Breadth First Search
    c. Prims Algorthim
    d. Kruskal's Algorithms
9. Implementation of Hash Table

(SEMESTER - IV)

Quantitative Techniques			
Course Code:	**MA202**	**Credits:**	**4**
No. of Lectures (Hrs/Week):	**3+1**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45+15**	**End Sem Exam Hours:**	**3**

UNIT-I

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

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, Error analysis,Least square approximation.

UNIT-III

Numerical differentiation, Numerical integration, Error Analysis, Newton-Cote quardrature formulae, Trapezoidal, Simpson's one third and three-eight rules.

UNIT IV

Solution of system of linear equations, (Direct and Indirect Methods) Gauss- Seidal method, Gauss-Jordan Method, Crout method, Gauss-elimination and LU-Decomposition, successive-overrelaxation, Power method for largest eigenvalue, Jacobi method for real symmetric matrices.

UNIT V

Numerical Solutions of ODE and PDE: Runge-Kutta and predictor corrector methods for IVPs. Finite difference methods for BVPs, Numerical solutions of parabolic and elliptic partial differential equations, Finite element method.

Text Books:

1. Gerald C.F., Wheatley P.O., Applied Numerical Analysis, 6th Ed., Pearson Education, 1999.
2. Gupta R.S., Elements of Numerical Analysis, 1st Ed., Macmillan 2009.

Reference Books:

1. Jain M.K., Iyen S.R.K., Jain R.K.: Numerical Methods for Scientific and Engineering Computation 5th Ed., New Age International, New Delhi, 2007.
2. Smith G.D. : Numerical Solution of Partial Differential Equations, 2nd Ed., Oxford, 1978.

PRINCIPLES OF COMMUNICATION			
Course Code:	**EC210**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**2+1**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**30+15**	**End Sem Exam Hours:**	**3**

UNIT I LINEAR MODULATION

Modulation techniques: need and types of modulation techniques, amplitude modulation, frequency spectrum, power distribution, generation and detection of AM, comparision of various AM systems, synchronous detection technique, error in synchronous detection, SSB signal detection, Frequency Division Multiplexing(FDM).

UNIT I IANGLE 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 (Parameter Variation Method) and Indirect (Armstrong) method of frequency modulation. FM Detector: slope detector, foster seely discriminator, ratio detector and PLL detectors, pre-emphasis & de-emphasis, capture effect.

UNIT III SAMPLING AND RECONSTRUCTION:

Sampling of signal, sampling theorem for low pass and band pass signals, aliasing, Pulse Amplitude Modulation (PAM), Time Division Multiplexing (TDM), types of sampling, PAM, PWM and PPM, Pulse Code Modulation: quantization, quantization error, signal-to-noise ratio in PCM, companding, line coding, Differential PCM (DPCM), Delta Modulation (DM), Adaptive Delta Modulation (ADM), slope overload error, granular noise.

UNIT IV DIGITAL MODULATION TECHNIQUES :Amplitude Shift Keying (ASK), Binary Phase Shift Keying (BPSK), Differential Phase Shift Keying (DPSK), Quadrature Phase Shift Keying (QPSK), M-ary PSK, Binary Frequency Shift Keying (BFSK), M-ary FSK, Minimum Shift Keying, Quadrature Amplitude Modulation (QAM), probability of error, Bit Error Rate (BER), comparison of digital modulation techniques on the basis of probability of error, matched filter.

UNIT V INFORMATION THEORY AND CODING:

Information,amount of information, unit of information, average information or entropy, information rate, joint and conditional entropy, discrete memory less channel, special channels, mutual information and channel capacity, mutual information and channel capacity for special channels, shannon's theorem, shannon- hartley theorem, bandwidth & s/n trade off, source coding, code length and code efficiency, source coding theorem, fixed length codes, variable length codes, source coding techniques: Shannon Fano and Huffman coding algorithms, linear block codes, systematic linear blocks codes, parity check matrix, syndrome testing, cyclic code, hamming code, error detection and correction codes, convolution codes

Text Books:

1. Lathi B.P., Analog and Digital Communication systems, 3/E Oxford Press, 2007
2. Taub & Schilling, Principles of communication systems, 3/E McGraw Hill, 2000.
3. B. Sklar, Digital Communication, Pearson Education

Reference Books:

4. Taub & Schilling, Principles of Communication system, TMH.
5. Singh and Sapre: Communication System, TMH
6. Proakis and Salehi, Fundamentals of Communication Systems, 1/E Pearson Education, 2005.
7. Hwei P Hsu,Analog and Digital Communication Schaum Series TMH, 2 Edition.
8. Tomasi: Advanced Electronics Communication Systems, 6th Edition, PHI
9. Couch: Digital and Analog Communication, Pearson Education
10. Carlson, Communication Systems, 5/E McGraw Hill, 2004.

SOFTWARE ENGINEERING			
Course Code:	**CS202/CS433**	**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 SOFTWARE ENGINEERING

Introduction to software engineering: definitions, role of software engineering, planning a software project, defining the problem, developing a solution strategy, planning the development process, software engineering process paradigms, principles of software engineering, software engineering activities.

UNIT II REQUIREMENT ANALYSIS AND DESIGN

Software Requirement Specification (SRS): Introduction, need of SRS, significance, characteristics of SRS, Structure of SRS, IEEE standards for SRS design, functional and non-functional requirements, Requirement gathering and analysis, requirement engineering and management.

UNIT III SOFTWARE DESIGN PROCESS

Software Design: Introduction, design process activities: architectural design, Abstract specification, Interface design, component design, data structure design, algorithm design modular approach, top-down design, bottom-up design, design methods: data-flow model: data flow diagram, entity-relation-attribute model: E-R diagram, structural model: structure charts, context diagrams, objectmodels: use case modeling, use case diagrams, sequence diagrams, cohesion and coupling.

UNIT IV SOFTWARE LIFE CYCLE MODELS

Software Development Life Cycle (SDLC), SDLC models, waterfall model and its variations, prototype model, iterative enhancement model, spiral model, RAD model, comparison of these models, software development teams, software development environments, validation and traceability, maintenance, prototyping requirements, Software project management.

UNIT V SOFTWARE TESTING AND MAINTENANCE

Testing Methods: unit testing, integration testing, system testing, acceptance testing, testing techniques: white box testing, black box testing, thread testing, regression testing, alpha testing, beta testing, static testing, dynamic testing, Evolution of software products, economics of maintenance, category of software maintenance, Role of product development life cycle, deployment model, adaptive maintenance, corrective maintenance, perfective maintenance, enhancement request, proactive defect prevention, problem reporting, problem resolution, software maintenance from customers' perspective, maintenance standard: IEEE-1219, ISO-12207.

Reference Books:

1. Pankaj Jalote, An Integrated Approach to Software Engineering, Narosa Publishing House, New Delhi 1997.
2. Ian Sommerville, Software Engineering, Pearson Education, 2009.
3. Pressman Roger S., Software Engineering: Practitioner's Approach, McGraw-Hill Inc., 2004.
4. Software Engineering: Software Reliability, Testing and Quality Assurance, Nasib S. Gill, Khanna Book Publishing Co (P) Ltd., New Delhi, 2002.

DISCRETE STRUCTURE			
Course Code:	**CS204**	**Credits:**	**4**
No. of Lectures (Hrs/Week):	**3+1**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45+15**	**End Sem Exam Hours:**	**3**

UNIT I MATHEMATICAL LOGIC

Statements and notations, connectives, well formed formulas, truth tables, tautology, equivalence implication, normal forms, predicates: predicative logic, free & bound variables, rules of inference, consistency, proof of contradiction, automatic theorem proving.

UNIT II SET THEORY

Properties of binary relations, equivalence, compatibility and partial ordering relations, hasse diagram. functions: inverse function comports of functions, recursive functions, lattice and its properties, pigeon hole principles and its application, algebraic structures: algebraic systems examples and general properties, semi groups and monads, groups sub groups' homomorphism, isomorphism.

UNIT III ELEMENTARY COMBINATORICS

Basis of counting, combinations & permutations, with repetitions, constrained repetitions, binomial coefficients, binomial multinomial theorems, the principles of inclusion – exclusion.

UNIT IV RECURRENCE RELATION

Generating functions, function of sequences calculating coefficient of generating function, recurrence relations, solving recurrence relation by substitution and generating funds, characteristics roots solution of in homogeneous recurrence relation.

UNIT V GRAPH THEORY

Representation of graph, DFS, BFS, spanning trees, planar graphs. graph theory and applications, basic concepts isomorphism and sub graphs, multi graphs and euler circuits, hamiltonian graphs, chromatic numbers

Text Books :

1. Discrete and Combinational Mathematics- An Applied Introduction-5th Edition – Ralph. P.Grimaldi, Pearson Education
2. Discrete Mathematical Structures with applications to computer science Trembly J.P. & Manohar .P, TMH
3. Discrete Mathematics and its Applications, Kenneth H. Rosen, Fifth Edition.TMH.

Reference Books:

4. Discrete Mathematics with Applications, Thomas Koshy, Elsevier
5. Discrete Mathematical Structures, Bernand Kolman, Roberty C. Busby, Sharn Cutter Ross, Pearson Education/PHI.
6. Discrete Mathematical structures Theory and application-Malik & Sen
7. Discrete Mathematics for Computer science, Garry Haggard and others, Thomson.
8. Discrete Mathematics for Computer Scientists & Mathematicians, J.L. Mott, A. Kandel, T.P. Baker Prentice Hall.
9. Logic and Discrete Mathematics, Grass Man & Trembley, Person Education.

DATABASE MANAGEMENT SYSTEM			
Course Code:	**CS206/CS436**	**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 DATA BASE SYSTEM

Data base system vs. file system, view of data, data abstraction, instances and schemas, data models, ER model, relational model, database languages, DDL, DML, database access for applications programs, data base users and administrator, transaction management, data base system structure, storage manager, query processor, history of data base systems, data base design and ER diagrams, beyond ER design entities, attributes and entity sets, relationships and relationship sets, additional features of ER model, concept design with the ER model, and conceptual design for large enterprises.

UNIT II RELATIONAL MODEL

Introduction to the relational model, integrity constraint over relations, enforcing integrity constraints, querying relational data, and logical data base design, destroying /altering tables and views. relational algebra and calculus: relational algebra, selection and projection set operations, renaming, joins, division, relational calculus, tuple relational calculus, domain relational calculus, expressive power of algebra and calculus.

UNIT III BASIC SQL QUERY

Examples of basic SQL queries, nested queries, correlated nested queries set, comparison operators, aggregative operators, NULL values, comparison using null values, logical connectivity's, AND, OR and NOTR, impact on SQL constructs, outer joins, disallowing NULL values, complex integrity constraints in SQL triggers and active data bases.

UNIT IV SCHEMA REFINEMENT

Problems caused by redundancy, decompositions, problem related to decomposition, reasoning about FDS, FIRST, SECOND, THIRD normal form, BCNF, forth normal form, lossless join decomposition, dependency preserving decomposition, schema refinement in data base design, multi valued dependencies.

UNIT V OVERVIEW OF TRANSACTION MANAGEMENT

ACID properties, transactions and schedules, concurrent execution of transaction, lock based concurrency control, performance locking, and transaction support in SQL, crash recovery, concurrency control, Serializability and recoverability, lock management, lock conversions, dealing with dead locks, specialized locking techniques, concurrency without locking, crash recovery: ARIES, log, other recovery related structures, the write, ahead log protocol, check pointing, recovering from a system crash, media recovery, other approaches and interaction with concurrency control.

References Books:

1. Elmasri Navrate, Data Base Management System, Pearson Education, 2008.
2. Raghurama Krishnan, Johannes Gehrke, Data Base Management Systems, TMH, 3rd edition, 2008.
3. C. J. Date, Introduction to Database Systems, Pearson Education, 2009.
4. Silberschatz, Korth, Database System Concepts, McGraw hill, 5^{th} edition, 2005.
5. Rob, Coronel & Thomson, Database Systems Design: Implementation and Management, 2009.

PRINCIPLES OF PROGRAMMING LANGUAGE			
Course Code:	**CS208**	**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

Characteristics of programming Languages, Factors influencing the evolution of programming language, developments in programming methodologies, desirable features and design issues. Programming language processors: Structure and operations of translators, software simulated computer, syntax, semantics, structure, virtual computers, binding and binding time.

UNIT II ELEMENTARY AND STRUCTURED DATA TYPES

Data object variables, constants, data types, elementary data types, declaration, assignment and initialization, enumeration, characters, strings. Structured data type and objects: Specification of data structured types, vectors and arrays, records, variable size data structure, pointers and programmer constructed data structure, Sets files. Sub Program and programmer defined data types: Evolution of data types, abstractions, encapsulations, information hiding, sub programms, abstract data types.

UNIT III SEQUENCE CONTROL

Implicit and Explicit sequence control, sequence control with within expression and statements, recursive sub programmes, exception handling, co routines, scheduled sub programmes, concurrent execution. Data control referencing environments, static and dynamic scope, local data local data referencing environment, shared data: explicit common environment dynamic scope parameter passing mechanism.

UNIT IV STORAGE MANAGEMENT

Major run time requirements, storage management phases, static storage management, stack based, heap based storage management. Syntax and translation: General syntactic criteria, syntactic element of a language, stages in translation, formal syntax and semantics.

UNIT V OPERATING ANDPROGRAMMING ENVIRONMENT

Batch processing environments, embedded system requirements, theoretical models, introduction to functional programming, lambda calculus, data flow language and object oriented language, comparison in various general and special purpose programming languages e.g. fortran, C, Pascal, Lisp, etc.

Reference Books:

1. Terrance W Pratt, "Programming Languages: Design and Implementation" PHI
2. Sebesta, "Concept of Programming Language", Addison Wesley
3. E Horowitz, "Programming Languages", 2nd Edition, Addison Wesley
4. "Fundamentals of Programming Languages", Galgotia

Analog Communication Lab			
Course Code:	**EC282**	**Credits:**	**2**
No. of Lectures (Hrs/Week):	**3**	**End Sem Exam Hours:**	**3**
Total No. of Lectures:	**15**		

Experiment List:

1. To study and analyze the waveforms of amplitude modulation using Digital Oscilloscope.
2. Performance analysis of amplitude modulation using simulink.
3. To study and analyze the spectrum of amplitude modulation using spectrum analyzer.
4. To perform amplitude modulation and demodulation of Double side band suppressed carrier using simulink.
5. To study and analyze the waveforms of frequency modulation using DSO.
6. To study and analyze the spectrum of Frequency modulation using spectrum analyzer.
7. Study the narrow band FM and wide band FM using simulink.
8. To study and analyze the phase modulation using DSO.
9. To study and analyze the spectrum of phase modulation using spectrum analyzer.
10. To perform amplitude modulation and demodulation transmission and reception techniques using generating equipments.
11. To perform frequency modulation and demodulation techniques using generating equipments.
12. To study frequency and time division multiplexing using generating kits.

SOFTWARE ENGINEERING LAB			
Course Code:	**CS282**	**Credits:**	**2**
No. of Lab (Hrs/Week):	**3**		
Total No. of Lab Sessions:	**10**	**End Sem Exam Hours:**	**2**

List of Experiments

1. Introduction and project definition.
2. Software process overview with configuration management tool.
3. Design the software requirements by using Requisite Pro.
4. Introduction to UML and use case diagrams with the help of Rational Rose.
5. System modelling and design of DFD and ER diagram.
6. Design of Flow of events and activity diagram by using Rational Rose.
7. OO analysis and discovering classes with the help of Requisite Pro.
8. Design the Interaction diagrams, sequence and collaboration diagrams with the help of software engineering tool.
9. Software architecture and object-oriented design by using Rational Rose.
10. Draw the traceability matrix with the help of designing the requirements and feature matrix

DATABASE MANAGEMENT SYSTEM LAB			
Course Code:	**CS284**	**Credits:**	**3**
No. of Lab (Hrs/Week):	**3**	**End Sem Exam Hours:**	**3**
Total No. of Lab Sessions:	**10**		

List of Experiments

1. Introduction to MySQL, an exercise of data types in MySQL & Data Definition Language Commands
2. Exercise on Data Manipulation Language and Transaction Control Commands
3. Exercise on Types of Data Constraints
4. Exercise on JOINS (Single-Table) Using Normalization
5. Exercise on JOINS (Multiple-Table) Using Normalization
6. Exercise on GROUP BY/ORDER BY Clause and Date Arithmetic
7. Exercise on different Functions (Aggregate, Math and String)
8. Exercise on different types of sub queries
9. Procedures
10. View
11. Triggers

(SEMESTER - V)

Theory of Automata			
Course Code:	**CS301**	**Credits:**	**4**
No. of Lectures (Hrs/Week):	**3+1**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45+15**	**End Sem Exam Hours:**	**3**

UNIT I AUTOMATA

Introduction; alphabets, strings and languages; automata and grammars, deterministic finite automata (DFA)-formal definition, simplified notation: state transition graph, transition table, language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transition, language of NFA, equivalence of NFA and DFA, minimization of finite automata, distinguishing one string from other, Myhill-Nerode Theorem

UNIT II REGULAR EXPRESSIONS AND LANGUAGES

Regular expression (RE), definition, operators of regular expression and their precedence, algebraic laws for regular expressions, Kleen‟ s theorem, regular expression to FA, DFA to regular expression, arden theorem, non regular languages, pumping lemma for regular languages. application of pumping lemma, closure properties of regular languages, decision properties of regular languages, FA with output: moore and mealy machine, equivalence of moore and mealy machine, applications and limitation of FA.

UNIT III CONTEXT-FREE GRAMMAR AND LANGUAGES

Context Free Grammar (CFG) and Context Free Languages (CFL): definition, examples, derivation, derivation trees, ambiguity in grammar, inherent ambiguity, ambiguous to unambiguous CFG, useless symbols, simplification of CFGs, normal forms for CFGs: CNF and GNF, closure properties of CFLs, decision properties of CFLs: emptiness, finiteness and membership, pumping lemma for CFLs.

UNIT IV PUSH DOWN AUTOMATA

Push Down Automata (PDA): description and definition, instantaneous description, language of PDA, acceptance by final state, acceptance by empty stack, deterministic PDA, equivalence of PDA and CFG, CFG to PDA and PDA to CFG, two stack PDA

UNIT V TURING MACHINES (TM)

Basic model, definition and representation, instantaneous description, language acceptance by TM, variants of turing machine, TM as computer of integer functions, universal TM, church‟ s thesis recursive and recursively enumerable languages, halting problem, introduction to undecidability, undecidable problems about TMs. Post Correspondence Problem (PCP), modified PCP, introduction to recursive function theory.

References Books:

1. Hopcroft, Ullman, “Introduction to Automata Theory, Languages and Computation”, Pearson Education
2. K.L.P. Mishra and N.Chandrasekaran, “Theory of Computer Science : Automata, Languages and Computation”, PHI
3. Martin J. C., “Introduction to Languages and Theory of Computations”, TMH
4. Papadimitrou, C. and Lewis, C.L., “Elements of the Theory of Computation”, PHI

WEB DEVELOPMENT			
Course Code:	**CS303**	**Credits:**	**4**
No. of Lectures (Hrs/Week):	**3+1**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45+15**	**End Sem Exam Hours:**	**3**

UNIT I INTRODUCTION TO .NET

.NET, advantages of .NET, Common Language Runtime (CLR), CLR architecture, Just-in-time complier, Microsoft Intermediate Language, IL with IL Disassembler, framework, types and version of framework, common class library, common type system, common language specifications, languages under .NET.

UNIT II LANGUAGE FUNDAMENTALS

Basic programming rules, data types, variable declaration and initialization, using the *using* and *imports* keywords, literals, unicode characters and strings, operators, conditional statements, looping statements, arrays, structures, concept of class and objects, creating and using class library, creating and using namespaces, oops paradigm: encapsulation, abstraction, polymorphism, inheritance.

UNIT III VISUAL BASIC PROGRAMMING

Creating interactive applications using active server pages: client and server side script in C#, creating modules, creating objects from classes, flow control and exception handling, working with windows and web forms, mouse event, hiding and displaying controls, button control, label control, TextBox control, radio button control, check box control, list box control, using requestand response objects, integration with database, ADO.NET.

UNIT IV JAVA SERVER PAGES (JSP)

Evolution of web application, overview of Hyper Text Transfer Protocol, servlet, servlet life cycle, servlet classes, threading models, HTTP session, Java Server Pages, JSP syntax and sementics, expression, scriptlets and declaration, request dispatching, session and thread management.

UNIT V JSP APPLICATIONS AND JDBC

Develop and deploy web application with JSP, JSP and XML, JSP testing and debugging, JDBC,

Text Books:

1. Hanna, The Complete Reference JSP 2.0, Tata McGraw Hill, 2003.
2. Mike Mcgrath, Java Server Pages, Dreamtech Press, 2009.
3. Visual Basic 2008 Programming, Black Book, Dreamtech Press, 2009.

Reference Books:

8. E. Balagurusawamy, Programming with JAVA, Tata McGraw Hill, 1998.
9. Christian Nagel, Professional C# and .NET 4, Wrox, 2010.
10. Karli Watson, Beginning Microsoft Visual C#, Wrox, 2010.

COMPUTER GRAPHICS			
Course Code:	**CS305**	**Credits:**	**4**
No. of Lectures (Hrs/Week):	**3+1**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45+15**	**End Sem Exam Hours:**	**3**

UNIT I INTRODUCTION

Application areas of Computer Graphics, overview of graphics systems, video-display devices, raster-scan systems, random scan systems, graphics monitors and work stations and input devices, Output primitives : Points and lines, line drawing algorithms, mid-point circle and ellipse algorithms. Filled area primitives: Scan line polygon fill algorithm, boundary-fill and flood-fill algorithms

UNIT II 2-D GEOMETRICAL TRANSFORMS

Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transforms, transformations between coordinate systems, 2-D viewing : The viewing pipeline, viewing coordinate reference frame, window to view-port coordinate transformation, viewing functions, Cohen-Sutherland and Cyrus-beck line clipping algorithms, Sutherland –Hodgeman polygon clipping algorithm

UNIT III REPRESENTATION AND TRANSFORMATION

3-D object representation Polygon surfaces, quadric surfaces, spline representation, Hermite curve, Bezier curve and B-Spline curves, Bezier and B-Spline surfaces, basic illumination models, polygon rendering methods, 3-D Geometric transformations: Translation, rotation, scaling, reflection and shear transformations, composite transformations, 3-D viewing: Viewing pipeline, viewing coordinates, view volume and general projection transforms and clipping

UNIT IV VISIBLE SURFACE DETECTION METHODS

Classification, back-face detection, depth-buffer, scan-line, depth sorting, BSP-tree methods, area sub-division and octree methods.

UNIT V COMPUTER ANIMATION

Design of animation sequence, general computer animation functions, raster animation, computer animation languages, key frame systems, motion specifications.

References Books :

1. “Computer Graphics C version”, Donald Hearn and M.Pauline Baker, Pearson Education.
2. “Computer Graphics Principles & practice”, second edition in C, Foley, VanDam, Feiner and Hughes, Pearson Education.

ANALYSIS AND DESIGN OF ALGORITHMS			
Course Code:	**CS307**	**Credits:**	**4**
No. of Lectures (Hrs/Week):	**3+1**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45+15**	**End Sem Exam Hours:**	**3**

UNIT I BASIC CONCEPTS OF ALGORITHMS

Introduction, notion of algorithm, fundamentals of algorithmic solving, important problem types, fundamentals of the analysis framework, asymptotic notations and basic efficiency classes.

UNIT II MATHEMATICAL ASPECTS AND ANALYSIS OF ALGORITHMS

Mathematical analysis of non-recursive algorithm, mathematical analysis of recursive algorithm, example: fibonacci numbers, empirical analysis of algorithms, algorithm visualization.

Unit III ANALYSIS OF SORTING ANDSEARCHING ALGORITHMS

Brute force, selection sort and bubble sort, sequential search and brute-force string matching, divide and conquer, merge sort, quick sort, binary search, binary tree, traversal and related properties, decrease and conquer, insertion sort, depth first search and breadth first search.

UNIT IV ALGORITHMIC TECHNIQUES

Transform and conquer ,presorting, balanced search trees, avl trees, heaps and heap sort, dynamic programming, Warshall's and Floyd's algorithm, optimal binary search trees, greedy techniques, Prim's algorithm, Kruskal's algorithm, Dijkstra's algorithm, Huffman trees.

UNIT V ALGORITHM DESIGN METHODS

Backtracking, n-Queen's problem, Hamiltonian circuit problem, subset-sum problem, branch and bound, assignment problem, knapsack problem, traveling salesman problem.

Text Books:

1. Anany Levitin, "Introduction to the Design and Analysis of Algorithm", Pearson Education Asia, 2003.

References Books:

2. T.H. Cormen, C.E. Leiserson, R.L. Rivest and C. Stein, "Introduction to Algorithms", PHI Pvt. Ltd., 2001
3. Sara Baase and Allen Van Gelder, "Computer Algorithms - Introduction to Design and Analysis", Pearson Education Asia, 2003.
4. A.V.Aho, J.E. Hopcroft and J.D.Ullman, "The Design and Analysis of Computer Algorithms", Pearson Education Asia, 2003.

COMPUTER ORGANIZATION & ARCHITECTURE			
Course Code:	**CS309/CS438**	**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 MICROOPERATION

Register transfer language, bus and memory transfers, bus architecture, bus arbitration, arithmetic logic, shift microoperation, arithmetic logic shift unit, design of fast address.

UNIT II 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.

Reference Books:

1. Patterson, Computer Organisation and Design, Elsevier Pub. 2009
2. William Stalling, " Computer Organization", PHI
3. Vravice,Hamacher & Zaky, "Computer Organization", TMH
4. Mano," Computer System Architecture", PHI
5. John P Hays, " Computer Organization", McGraw Hill
6. Tannenbaum," Structured Computer Organization', PHI
7. P Pal chaudhry, ' Computer Organization & Design', PHI

ECOMMERCE(OPEN ELECTIVE)			
Course Code:	**CS311**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT 1

Ecommerce and Ebusiness, Overview of E-Business; Information Services; Shopping Services; Virtual Enterprises, Need of E-Commerce; The Emerging landscape forces affecting E-Commerce; Economic potential of E-Commerce; Business dimension and technological dimension of E-Commerce;

UNIT 2

E-Commerce industry frame work; Ecommerce models, Internet as an E-Commerce enabler handling business transactions; Handling payments: Electronic Fund Transfer System, Digital Token an notational based electronic payment system, smart card, credit card and emerging financial instruments

UNIT 3

Introduction to mobile commerce; Frame required for mobile computing; Challenges emerging in mobile commerce security considerations

UNIT 4

Ecommerce applications; E-Commerce and Banking: changing dynamics in banking industry; Home banking and its implementation; Management issues in on-line banking E-Commerce and retailing: On-line retail industry dynamics; On-line mercantile models from customer perspective; Management challenges in on-line retailing E-Commerce and on-line publishing: On-line publishing approach from customer prospective; Supply chain management fundamentals; Intranets and Supply Chain Management; Managing retail supply chains, Supply chain Application Software, EDI: EDI application in business development; EDI technology; EDI as a re-engineering tool; Financial EDI

UNIT 5

Web security: Introduction; Firewalls and transaction security; Client server network security; Emerging client service security threats; Data security; Inscription secret key and inscription; Legal Implications of E-Business, transaction; Cyber laws and implementation of cyber laws

Suggested Readings:

Text Book

Ecommerce business, technology, society, Laudon & Traver, Pearson Education.

Other Books and Reference:

1. Ecommerce Strategy, Technologies and Applications, David whitley, Tata McGraw Hills.
2. E-Business and E-Commerce Management, Dave Chaffey, 3rd Edition, Pearson Education.
3. E-Commerce An Indian perspective, Joseph, P.T. 3rd Edition, PHI.
4. Frontiers of Electronic Commerce, Kalakota & Whinston, Pearson Education.
5. E-Commerce Management Text and Cases, Sandeep Krishnamurthy, Thomson Press.

Web Development Lab			
Course Code:	**CS 381**	**Credits:**	**2**
No. of Lectures (Hrs/Week):	**3hrs/week**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**10**	**End Sem Exam Hours:**	**3**

1. Using XHTML to Create Web Pages.

2. Creating Links, texts, images.

3. Introducing Cascading Style Sheets.

4. Formatting Text and Hyperlinks.

5. Working with the Box Model.

6. Creating Fixed-Width Layouts.

7. Creating Liquid Layouts.

8. Creating Data Tables and frames.

9. Creating Forms.

10. Color Names, Color Values, and HTML Character Entities

11. HTML Elements

12. CSS Styles and Selectors

13. ASP.NET Controls and Data Access Technologies

Computer Graphics Lab			
Course Code:	**CS 383**	**Credits:**	**2**
No. of Lectures (Hrs/Week):	**3hrs/week**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**10**	**End Sem Exam Hours:**	**3**

1. Implementation of Algorithms for drawing 2D Primitives – Line (DDA, Bresenham) – all slopes Circle (Midpoint)
2. 2D Geometric transformations –

- Translation
- Rotation Scaling
- Reflection Shear
- Window-Viewport

3. Composite 2D Transformations
4. Line Clipping (CohenSutherland2DlineclippingandWindowing).
5. 3D Transformations – Translation, Rotation, Scaling.
6. 3D Projections – Parallel, Perspective.
7. Creating 3D Scenes.
8. Image Editing and Manipulation – Basic Operations on image using any image editing software, Creating gif animated images, Image optimization.
9.GeneratingFractal images.

(SEMESTER - VI)

DISTRIBUTED OPERATING SYSTEM			
Course Code:	**CS302**	**Credits:**	**4**
No. of Lectures (Hrs/Week):	**3+1**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45+15**	**End Sem Exam Hours:**	**3**

UNIT I INTRODUCTION TO DISTRIBUTED SYSTEMS

Distributed systems : goals hardware concepts software, design, communication distributed systems: layered protocol: ATM networks client server model, remote procedure call, group communication.

UNIT II SYNCHRONIZATION

Clock synchronization, mutual exclusion, election atomic transactions, dead locks, process and processors: threads, system models processor, Allocation, scheduling fault tolerance, real time distributed systems.

UNIT III DISTRIBUTED FILE SYSTEMS

File system design and implementation, trends in distributed file systems.

UNIT IV SHARED MEMORY

Introduction, bus based multi processors ring based multiprocessors switched multiprocessors - NUMA comparison of shared memory systems.

UNIT V

consistency models, page based distributed shared memory, shared variable distributed shared memory, object based distributed shared memory.

Reference Books:

1. Andrew S.Tanenbaum: Distributed Operating System, Prentice Hall International Inc. 1995.
2. A.S. Tanenbaum, Modern Operating Systems, Pearson Education Asia, 2001.
3. M. Singhal and N. G. Shivaratri, Advance Concepts in Operating Systems, McGraw-Hill, 1994.
4. J. W. S. Liu, Real-Time Systems, Pearson Education, 2000.

CONCEPTS OF ARTIFICIAL INTELLIGENCE			
Course Code:	**CS304**	**Credits:**	**4**
No. of Lectures (Hrs/Week):	**3+1**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45+15**	**End Sem Exam Hours:**	**3**

UNIT I INTRODUCTION TO ARTIFICIAL INTELLIGENCE

Basic concept of artificial intelligence (AI), history of AI, AI and consciousness, weak and strong AI, physical symbol system hypothesis, comparison of computer and human skills, practical systems based on AI, development of logic, components of AI.

UNIT II PROBLEM SOLVING THROUGH AI

Defining problem as state space search, analyzing the problem, representing the problems from AI viewpoint, production system, developing production rules, characteristics of production system, algorithm for problem solving using AI technique.

UNIT III SEARCH TECHNIQUES

Use of search in AI problem solution, blind search techniques, heuristic search techniques, concept of heuristic knowledge, designing of the heuristic function, types of heuristic search techniques: generate and test, best first search, problem reduction using AND – OR graph, local search technique, branch and bound search, memory bounded search technique, local beam search, properties of heuristic search techniques, overestimation and underestimation of heuristic function, hill climbing search, simulated annealing search, constraint satisfaction, means ends analysis.

UNIT IV INTRODUCTION TO LOGIC

Introduction, propositional calculus, syntax of propositional calculus, semantics of propositional calculus, well formed formula, properties of statements, inferencing of propositional logic, predicate logic, syntax of predicate logic, semantics of predicate logic, representation of facts First Order Predicate Logic (FOPL), inferencing in predicate logic, concept of resolution, resolution algorithm, skolemization, Types of resolution, unit resolution, binary resolution.

UNIT V PROLOG and LISP

Basic concept of programming languages related to artificial intelligence problems, concept of programming in Logic, basic prolog constructs, atoms, defining the rules, writing small programs in prolog, concept of list processing, basic LISP constructs, writing functions in LISP, some simple programs of LISP.

Reference books:

1. Artificial Intelligence, Elanie Reich: Tata mcgraw Hill publishing house, 2008.
2. Artificial intelligence, Peterson, TataMcGraw Hill, 2008.
3. Artificial intelligence, Russel and Norvig, Pearson Printice Hall Publication, 2006.
4. Artificial Intelligence, Winston, PHI publication, 2006.

ADVANCED COMPUTER ARCHITECTURE			
Course Code:	**CS306**	**Credits:**	**4**
No. of Lectures (Hrs/Week):	**3+1**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45+15**	**End Sem Exam Hours:**	**3**

UNIT I INTRODUCTION TO PARALLEL PROCESSING

Parallelism in uniprocessor system, basic uniprocessor architecture, parallel processing mechanism, balancing of sub system bandwidth, multiprogramming and time sharing, parallel computer structures, pipeline computers, array computers, multiprocessor systems, dataflow computer concept, architectural classification scheme: multiplicity of instruction-data streams, serial versus parallel processing, parallelism versus pipelining, parallel processing applications, productive modeling simulation, engineering design and automation.

UNIT II PRINCIPLES OF PIPELINING AND VECTOR PROCESSING

Pipelining- an overlapped parallelism, principles of linear pipelining, clock period, efficiency, throughput, classification of pipeline processors, general pipeline and reservation tables.

UNIT III PRINCIPLES OF DESIGNING PIPELINE PROCESSORS

Effect of branching , data buffering and bussing structures, internal forwarding and register tagging, hazard detection and resolution, job sequencing and collision prevention, reservation and latency analysis, collision free scheduling, state diagram, greedy cycle, pipeline schedule optimization, pipeline throughput, pipeline efficiency.

UNIT IV STRUCTURE ANDALGORITHM FOR ARRAY PROCESSORS

SIMD array processor, SIMD computer organization, inter –PE communication, SIMD interconnection network, static versus dynamic networks, cube interconnection network, shuffle-exchange omega networks, parallel algorithms and SIMD matrix multiplication.

UNIT V MULTIPROCESSOR ARCHITECTURE AND SCHEDULING

Functional structure, loosely coupled and tightly coupled multiprocessor, deterministic scheduling strategy, deterministic scheduling model, control flow versus data flow computer, data flow graphs and languages.

Reference Books

1. Kai Hwang, “Advanced Computer Architecture”, Tata McGrawHill Edition
2. Kai Hwang and Faye A. Briggs, “Computer Architecture and Parallel Processing”, McGraw-Hill International Edition
3. Richard Y. Kain, “Advanced computer architecture: a systems design”, Prentice Hall.
4. James M. Feldman, Charles T. Retter, “Computer architecture: a designer's text based on a generic RISC”, McGraw-Hill
5. Jurij Silc, Borut Robic, Theo Ungerer, “Processor Architecture: From Dataflow to Superscalar and Beyond”, Springer.
6. Hennessy and Patterson, “Computer Architecture: A Quantitative Approach”, Elsevier.
7. Dezso and Sima, “Advanced Computer Architecture”, Pearson.
8. Quinn, “Parallel Computing: Theory & Practice”, TMH.
9. Quinn, “Parallel Programming in C with MPI and Open MP”, TMH

COMPUTER NETWORKS			
Course Code:	**CS308**	**Credits:**	**4**
No. of Lectures (Hrs/Week):	**3+1**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45+15**	**End Sem Exam Hours:**	**3**

UNIT I INTRODUCTION AND PHYSICAL LAYER

Key concepts of computer network, transmission media, network devices, network topology, topology design issues, types of network: LAN, MAN, WAN, PAN, ISDN systems and ATM network, OSI-reference model, open system standards, characteristics of network, TCP/IP model, protocols and standards, encoding technique.

UNIT II SWITCHING ANDDATALINK LAYER

Circuit switching, packet switching, message switching, hybrid switching, and ATM switching, multiplexing techniques: TDMA, FDMA, WDMA, CDMA, data link layer: LLC &MAC level protocols and design issues, issues IEEE 802 LAN Standards, framing, CRC, error control, flow control, HDLC, ALOHA and performance issues. Frames relay networks and performance parameters.

UNIT III NETWORK LAYER

Network layer design issues, overview of IPv4 and IPv6, addressing: class full and classless, static and dynamic, subnet and supernet, autoconfiguration through DHCP, routing protocols: RIP, DVR,LSR, OSFP, BGP, congestion control algorithm, subnet concept, virtual LAN, ICMP, multicasting, mobile IP.

UNIT IV TRANSPORT LAYER

Port addressing schemes, connectionless and connection oriented services: TCP and UDP, wireless TCP, Congestion control, queue management, NAT, PAT, socket format at transport level, socket interface and programming.

UNIT V APPLICATION LAYER

Client server architecture, domain name services, application services: HTTP, TELNET, RLOGIN, FTP, CBR, NFS, SMTP, POP, IMAP, MIME, voice and video over IP.

Text Books:

1. S. Tanenbaum, Computer Networks, 4th edition, Prentice Hall, 2008

References:

2. Data and Computer Communications, W. Stallings, 8th edition, Prentice Hall, 2007
3. TCP/IP Principles, Protocols and Architecture, Douglus E. Comer, Pearson Education
4. F. Haball ,Data Communication, Computer network & open systems - Computer Networks : An Engineering approach - S. Keshav

MANAGEMENT INFORMATION SYSTEM			
Course Code:	**CS 312**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT 1

Foundations Concepts Foundations of Information Systems in Business, The Components of Information Systems, Competing with Information Technology, Fundamentals of Strategic Advantage, Using Information Technology for Strategic Advantage

UNIT 2

Information Technologies Computer Hardware, Computer Systems: End User and Enterprise Computing, Computer Peripherals: Input, Output, and Storage Technologies, Computer Software, Application Software: End-User Applications, System Software: Computer System Management, Data Resource Management, Technical Foundations of Database Management, Managing Data Resources, Telecommunications and Networks, The Networked Enterprise, Telecommunications Network Alternatives

UNIT 3

Business Applications e-Business Systems, Functional Business Systems, Enterprise Business Systems, managing at the Enterprise Level, Enterprise Resource Planning: The Business Backbone, Supply Chain Management: The Business Network, e-Commerce Systems, e-Commerce Fundamentals, e-Commerce Applications and Issues, Supporting Decision Making, Decision Support in Business

UNIT 4

Development Processes Developing Business/IT Strategies, Planning Fundamentals, Implementation Challenges, Developing Business/IT Solutions, Developing Business Systems, Implementing Business Systems,

UNIT 5

Management Challenges Security and Ethical Challenges, Security and Ethical, and Societal Challenges of IT, Security Management of Information Technology,Enterprise and Global Management of Information Technology, Managing Information Technology, Managing Global IT

Text Books:

1. MIS James O'Brien, George M Marakas, Ramesh Behl: Management Information System, Mc Graw Hills .

Reference Book

1. laudon & Laudon : Management Information Systems, Managing the Digital Age, 2007 edition Printice hall
2. O'Brien : Management Information System , 5th Edition, Tata Mc Graw Hills.
3. D. Boody, Boonstra and Kennedy: Managing Information Systems , Pearson

MICROPROCESSORS AND INTERFACING			
Course Code:	**EC304/EC559**	**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/OPorts 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:

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

MICROPROCESSORS AND INTERFACING LAB			
Course Code:	**EC384**	**Credits:**	**2**
No. of Lab Hours (Hrs/Week) :	**3**	**End Sem Exam Hours:**	**3**
Total No. of Lab Sessions :	**10**		

1. Addition of two 8-bit numbers, result 8-bit.
2. Addition of two 8-bit numbers, result 16-bit.
3. Subtraction of two 8-bit numbers.
4. Addition of two 16-bit numbers.
5. Multiplication of two 8-bit numbers.
6. Division of two 8-bit numbers.
7. 1's Compliment and 2's Compliment of a 8-bit number.
8. Arrange the array in ascending order.
9. Arrange the array in descending order.
10. Moving the block of data from one memory location to another memory location.
11. Largest number in an array.
12. Smallest number in an array.
13. BCD to HEX conversion.
14. HEX to BCD conversion.
15. HEX to ASCII conversion.
16. ASCII to HEX conversion.
17. Square of a number using lookup table method.
18. Interfacing of 8255.
19. Interfacing of 8253/8354.
20. Interfacing of 8237/8257.
21. Interfacing of 8259.
22. Interfacing of 8251.

Computer Network Lab			
Course Code:	**CS 382**	**Credits:**	**2**
No. of Lectures (Hrs/Week):	**3hrs/week**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**10**	**End Sem Exam Hours:**	**3**

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)
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. S3curity (WEP, WPA)
15. Qualnet.

(SEMESTER - VII)

COMPILER DESIGN			
Course Code:	**CS401**	**Credits:**	**4**
No. of Lectures (Hrs/Week):	**3+1**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45+15**	**End Sem Exam Hours:**	**3**

UNIT I INTRODUCTION TO COMPILER

Introduction to compiler, phases and passes, bootstrapping, finite state machines and regular expressions and their applications to lexical analysis, optimization of DFA-based pattern matchers implementation of lexical analyzers, lexical-analyzer generator, LEX-compiler, formal grammars and their application to syntax analysis, BNF notation, ambiguity, YACC, syntactic specification of programming languages: Context free grammars, derivation and parse trees, capabilities of CFG.

UNIT II PARSING TECHNIQUE

Parsers, shift reduce parsing, operator precedence parsing, top down parsing, predictive parsers Automatic construction of efficient parsers: LR parsers, the canonical collection of LR(0) items, constructing SLR parsing tables, constructing canonical LR parsing tables, constructing LALR parsing tables, using ambiguous grammars, an automatic parser generator, implementation of LR parsing tables.

UNIT III SYNTAX-DIRECTED TRANSLATION

Syntax-directed translation schemes, implementation of syntax directed translators, intermediate code, postfix notation, parse trees & syntax trees, three address code, quadruple & triples, translation of assignment statements, boolean expressions, statements that alter the flow of control, postfix translation, translation with a top down parser, more about translation: array references in arithmetic expressions, procedures call, declarations and case statements.

UNIT IV SYMBOL TABLES

Data structure for symbols tables, representing scope information, run-time administration: implementation of simple stack allocation scheme, storage allocation in block structured language, Error detection & recovery: lexical phase errors, syntactic phase errors, semantic errors.

UNIT V CODE GENERATION

Design issues, the target language. addresses in the target code, basic blocks and flow graphs, optimization of basic blocks, code generator. code optimization: machine-independent optimizations, loop optimization, DAG representation of basic blocks, value numbers and algebraic laws, global data-flow analysis

Reference Books:

1. Aho, Sethi & Ullman, "Compilers: Principles, Techniques and Tools", Pearson Education
2. V Raghvan, " Principles of Compiler Design", TMH
3. Kenneth Louden," Compiler Construction", Cengage Learning.
4. Charles Fischer and Ricard LeBlanc," Crafting a Compiler with C", Pearson

OBJECT-ORIENTED ANALYSIS			
Course Code:	**CS403**	**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 OBJECT-ORIENTED FUNDAMENTALS

Object model, classes and objects, complexity, classification, notation, process, pragmatics, binary and entity relationship, object types, object state, Object-Oriented Software Development (OOSD) life cycle, foundations of the object-oriented approach, concept of objects, object vs. classes, encapsulation, aggregation, inheritance and polymorphism, de-facto industry standard for general-purpose object-oriented modeling.

UNIT II OBJECT-ORIENTED ANALYSIS

Overview of object analysis: Shater/Mellor, Coad/Yourdon, Rumbaugh, Booch, usecase, conceptual model, behavior, class, analysis patterns, aggregation, advanced principles and strategies for object-oriented analysis, encapsulation and connascence, encumbrance and cohesion, type conformance and closed behavior.

UNIT III OBJECT-ORIENTED METHODS

Unified Modeling Language (UML), diagrams, collaboration, sequence, class, frameworks, diagramming and notational techniques within UML, visual nature of UML, CASE tools, structural models in UML; through the use of class diagrams, component diagrams and deployment diagrams, behavioural models in UML; through the use of use-case models, state-chart diagrams and activity diagrams.

UNIT IV OBJECT-ORIENTED DEVELOPMENT METHODOLOGY

Managing analysis and design, evaluation testing, coding, maintenance, metrics, importance of development methodology, object-oriented processes in the context of a development life cycle, Rational Unified Process (RUP), RUP splits project life cycle into four phases: inception, elaboration, construction and transition, workflows and models within each phase.

UNIT V REQUIREMENT AND ANALYSIS MODELLING

Requirements modeling, requirement model principle, use-case models, domain object models, documentation the requirements model, challenges and benefits of requirement modeling, agile requirement modeling, foundation class libraries, object-oriented databases, client/server computing, middleware, design vs. analysis, persistent objects, cohesion and coupling, analysis modeling, use-case analysis, analysis models.

References Books:

1. Object-Oriented Analysis and Design, John Deacon, Pearson Education, 2009.
2. Object-Oriented Modeling and Design, James Rumbaugh, Michael Blaha,William Premerlani, Prentice Hall, 1991.
3. Object-Oriented Design, Grady Booch, 1991.
4. Applying UML and Patterns, Craig Larman, Addison Wesley, 2000.
5. The Unified Modeling Language User Guide, Grady Booch, James Rumbaugh, Ivar Jacobson, Addison-Wesley Longman, 1999.
6. Object Oriented System Development, Ali Bahrami, McGraw Hill International Edition, 1999.
7. Analysis Patterns, Fowler, Addison Wesley, 1996.
8. Design Patterns, Erich Gamma, Addison Wesley, 1994.
9. Object-Oriented Systems Analysis and Design Using UML 2/e , Simon Bennett, Steve McRobb, Ray Farmer McGraw-Hill Education 2002.

COMPILER DESIGN LAB			
Course Code:	**CS481**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**10**	**End Sem Exam Hours:**	**3**

1. Practice of Lex/Yacc of Compiler writing.
2. Write a program to check whether a string belongs to the grammar or not.
3. Write a program to generate a parse tree.
4. Write a program to find leading terminals.
5. Write a program to find trailing terminals.
6. Write a program to compute FIRST of non-terminals.
7. Write a program to compute FOLLOW of non-terminals.
8. Write a program to check whether a grammar is left recursive and remove left recursion.
9. Write a program to remove left factoring.
10. Write a program to check whether a grammar is Operator precedent.
11. To show all the operations of a stack.
12. To show various operations i.e read, write and modify in a text file
13. Write a program to implement Thomson's construct.

ELECTIVES

FORMAL METHODS			
Course Code:	**CS405**	**Credits:**	**4**
No. of Lectures (Hrs/Week):	**3+1**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45+15**	**End Sem Exam Hours:**	**3**

UNIT I INTRODUCTION

Why formal methods were developed, problems in natural language specifications, formal versus informal programming, advantages of formal methods, requirements of formal system, types, prepositionallogic, predicatelogic, relationships and functions.

UNIT II FORMALSPECIFICATIONSTYLE

Model-oriented, specifications, concurrency-based specifications, example specification languages.

UNIT III VDM

Introduction to VDM, basic types, quote types, compound types, optional types, functions, operations, additional constructs, modules.

UNIT IV THEZNOTATION

Interchangelanguage,user-definedidentifiers,datatypes,basictypes, compound types, schemas, additional constructs.

UNIT V FORMALSEMANTICSANDTOOLS

Operational semantics, denotationa, semantics, axiomatic semantics proof editors, proof analyzer, symbolic simulators, translators, testg eneration tools.

Text Books:

1. AndrewHarry, "Formal Methods:FactFileVDMandZ",JohnWileyand Sons,1996.

Reference Books

2. Jim Woodcock, Jim Davies,"UsingZSpecification,RefinementandProof",Prentice Hall International, 1996.

Effective from: 2015 -2016 **ISR**

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

SOFTWARE PROJECT MANAGEMENT			
Course Code:	**CS441**	**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 SOFTWARE PROJECT MANAGEMENT

Scope of project management, project life cycle, software project planning- Step by Step planning, Introduction of project management activities: cost estimation, project scheduling, staffing, software configuration management, quality assurance, project monitoring, risk management, problem with software projects, roles and responsibilities of software project manager.

UNIT II PROJECT EVALUATION AND APPROACHES

Project management and evaluation: Cost benefit analysis, payback period, NPV, ROI, Selection of appropriate project approach: Waterfall model, V-process model, prototyping, spiral model, incremental delivery, iterative process. Capability Maturity Model (CMM).

UNIT III ACTIVITIES PLANNING AND RISK MANAGEMENT

Project scheduling, Project network diagram fundamentals, PERT techniques, Gantt charts, Risk assessment, planning and management, Resource allocation: creating critipaths, scheduling, cost schedules. Monitoring and controlling the projects. Introduction to Microsoft Project.

UNIT IV MONITORING PROJECTS AND CONTRACTS

Monitoring the progress of projects, accessing the risk of slippage, reporting, earned value analysis, control procedures, Managing Contracts: stages needed to acquire software, types of contracts contents of contracts and the evaluation of proposal on the basis of contracts.

UNIT V PROJECT QUALITY AND PEOPLE ISSUES

People: player, team leader, software team, coordination and communication issues; inducting motivating teams, improving efficiency. Software quality and its importance defining, designing and monitoring the software quality.

Reference Books:

1. Software Project Management, Cottrell M. and Hughes B., Tata McGraw Hill, 2006.
2. Software Project Management-A Real-World Guide to Success, Henry J., Addison Wesley, 2009.
3. Effective Software Project Management, Robert K. Wysocki, Wiley India, 2006.
4. Introduction to Software Project Management and Quality Assurance, Ince D., Sharp H. and Woodman M., McGraw Hill, 1993.
5. Project Management, Maylor H., Prentice Hall, 2003.
6. Success in Your Project-A Guide to Student System Development Projects, Weaver P., Prentice Hall, 2004.
7. Managing Global Projects, Ramesh Gopalaswamy, Tata McGraw Hill, 2001.
8. Managing the Software Process, Humphrey, Watts, Addision-Wesley, 1986.
9. Software Engineering: A Practitioner's Approach, Pressman, Roger, McGraw Hill, 1997.
10. Software Engineering: Software Reliability, Testing and Quality Assurance, Nasib S. Gill, Khanna Book Publishing Co. (P) Ltd., New Delhi, 2002.
11. Fundamental of Software Engineering, Rajib Mall, Prentice Hall of India, 2003.
12. Software Engineering Concepts, Richard E. Fairley, Tata McGraw Hill, 1997.
13. An Integrated Approach to Software Engineering, Pankej Jalote, Narosa Publishing House, New Delhi 1997.
14. Software Engineering, Ian Sommerville, Pearson Education, 2009.

WIRELESS MOBILE COMMUNICATION			
Course Code:	**EC405**	**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: 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

SEMESTER VIII

KNOWLEDGE ENGINEERING			
Course Code:	**CS562**	**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 FUNDAMENTALS OF KNOWLEDGE

Concept of knowledge, types of knowledge, declarative knowledge, procedural knowledge, inheritable knowledge, inferential knowledge, relational knowledge, heuristic knowledge, commonsense knowledge, explicit knowledge, tacit knowledge, uncertain knowledge.

UNIT II KNOWLEDGE REPRESENTATION

The need of knowledge representation, levels of knowledge representation, granularity of knowledge representation, granularity vs. size of knowledgebase, techniques of knowledge representation, frames, reasoning with frames, frame based knowledge representation, semantic network, partitioned semantic nets, conceptual graphs, scripts.

UNITIII KNOWLEDGE STORAGE AND ACQUISITION

Need of knowledge storage, characteristic of good knowledge representation, knowledge acquisition, indexing techniques, fuzzy distance calculation, issues in knowledge acquisition, requirements of knowledge acquisition techniques, issues in knowledge acquisition in organization, knowledge organization and management, consistency of knowledge representation.

UNIT IV KNOWLEDGEORGANISATION AND MANAGEMENT

Need of organizing the knowledge, techniques of knowledge organization, forward reasoning and backward reasoning, combination of forward and backward chaining, matching, conflict resolution, information retrieval from knowledge base, indexing, matching, RETE matching algorithm.

UNIT V APPLICATIONS OF KNOWLEDGE

Knowledge reuse technique in the designing of expert systems, components of knowledge engineering based problem solution methodology: identification of task, assembly of relevant knowledge, identification of lexicon, encoding general and domain specific knowledge, choosing inference procedure, identifying the bugs, rule based systems, blackboard architectures.

Text Books:

1. Artificial Intelligence and Knowledge Engineering, Winston, PHI publication , 2004.
2. Conceptual Information Processing, R.C Schank, Amsterdum North Holland, 2003.

Reference Books:

1. The basic concepts of knowledge engineering by Shank and J.G. Carbonell, PHI publication, 2003.
2. Principles of Artificial intelligence, Nillson, N.J., Morgan Kaufmann publication, 2004.
   Knowledge Management, by Shelda Debowski, John Wiley & Sons publication,

SOFT COMPUTING TECHNIQUES			
Course Code:	**CS564**	**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 FUZZY LOGIC

Introduction to fuzzy logic, classical and fuzzy sets, overview of fuzzy sets, membership function, fuzzy rule generation, operations on fuzzy sets: compliment, intersection, union, combinations on operations, aggregation operation.

UNIT II FUZZY ARITHMETIC

Fuzzy numbers, linguistic variables, arithmetic operations on intervals & numbers, uncertainty based information, information and uncertainty, no specificity of fuzzy and crisp sets, fuzziness of fuzzy sets.

UNIT III NEURAL NETWORK

Overview of biological neurons, computational neuron, mathematical model of neurons, ANN architecture, single layer and multilayer architectures, activation function, threshold value, self learning and forced learning algorithms, feed forward and feedback architectures.

UNIT IV LEARNING FUNDAMENTALS

Learning paradigms, supervised and unsupervised learning, reinforced learning, ANN training, algorithms perceptions, training rules, delta, back propagation algorithm, multilayer perception model, Hopfield networks, associative memories, applications of artificial neural networks,

UNIT V GENETIC ALGORITHMS

History of genetic algorithm, terminology of genetic algorithm, biological background, creation of offspring, working principles of genetic algorithms, fitness function, reproduction: Roulette wheel selection, Boltzmann selection, cross over mutation, inversion, deletion, and duplication, generation cycle.

UNIT VI CONCEPT OF UNCERTAINTY

Presence of uncertainty in real world problems, handling uncertain knowledge, degree of belief, degree of disbelief, uncertainty and rational decisions, decision theory, utility theory, concept of independent events, Bay's rule, using Bay's rule for combining events.

Text Books:

1. Artificial Neural Networks: An introduction to ANN Theory and Practice, Peteus J. Braspenning, PHI publication, 2005.
2. Fuzzy Logic: A spectrum of Theoretical and Practical issues, Paul P. Wang, pearson publication 2004.

Reference Books:

3. Fuzzy Sets, Fuzzy logic, and Fuzzy Systems: Selected Papers- Lotfi Asker Zadeh, George J. Kilr, Bo yuan, 2005.
4. Foundations of Fuzzy logic and Soft Computing: 12th International Fuzzy conference proceeding, 2005.
5. Neural Networks Theory, Particia Melin, Oxford University press, 2003
6. Neural Networks Theory and Application, Oscar Castillo, Wiley Eastern publication

Introduction to Embedded System			
Course Code:	**CS572**	**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 Embedded Systems Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

UNIT -II:

Typical Embedded System: Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS), Memory: ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: Onboard and External Communication Interfaces.

UNIT -III:

Embedded Firmware: Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

UNIT -IV:

RTOS Based Embedded System Design: Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.

UNIT -V:

Task Communication: Shared Memory, Message Passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication/Synchronization Issues, Task Synchronization Techniques, Device Drivers, How to Choose an RTOS.

TEXT BOOKS:

1.Introduction to Embedded Systems - Shibu K.V, Mc Graw Hill.

REFERENCE BOOKS:

1. Embedded Systems - Raj Kamal, TMH.
2. Embedded System Design - Frank Vahid, Tony Givargis, John Wiley.
3. Embedded Systems – Lyla, Pearson, 2013
4. An Embedded Software Primer - David E. Simon, Pearson Education.

NATURAL LANGUAGE PROCESSING			
Course Code:	CS566	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

Fundamental aspects of natural language processing, brief history of natural language processing, significance of natural language processing, some early natural language processing systems like ELIZA, LUNAR, SHRDLU, practical front ends, general NLP system, role of knowledge in language processing, fundamental aspects of English grammar

UNIT II PHASES OF NATURAL LANGUAGE PROCESSING

Various phases of natural language processing: phonological analysis, morphological analysis, lexical analysis, syntactic analysis, semantic analysis, pragmatic and discourse analysis, parsing techniques: top down parsing, bottom up parsing bidirectional parsing, deterministic parsing, non deterministic parsing, comparison of various parsing techniques.

UNITIII APPROACHES TO SYNTACTIC ANALYSIS

Word class and part of speech tagging, rule based part of speech tagging, stochastic part of speech tagging, HMM algorithm of tagging, basic parsing techniques, top down parsing, bottom up parsing, comparison of top down and bottom up parsing, problems of top down and bottom up parser, left recursion, ambiguity, repeated parsing of subtrees, Early algorithm.

UNIT IV APPROACHES TO SEMANTIC ANALYSIS

Syntax driven semantic analysis, lexical semantic approach, use of knowledge for language analysis, representation of knowledge for language analysis, first order predicate calculus, concept of pragmatic and discourse analysis, concept of anaphora, basic types of anaphora, some elementary anaphora resolution approaches.

UNIT V TRANSITION NETWORKS AND GRAMMARS

Concept of transition network, use of transition network for basic language analysis, recursive transition network, augmented transition network, fundamental aspects of grammars, context free grammars, feature and augmented grammars, unification grammar, Fillmore's grammar.

Text Books:

1. Natural language understanding, James Allen: Tata Mc Graw hill publishing house, 2004.
2. Language and speech processing, James Martin: PHI publication, 2003.

References:

1. Natural Language Processing, Gazdar, PHI publication, 2004.
2. Natural Language Processing, Sampson, Narosa publication, 2005.

Soft Computing Lab			
Course Code:	**CS 584**	**Credits:**	**2**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**15**	**End Sem Exam Hours:**	**3**

1. Implementation of operations on classical setsusing C/MATLAB
2. Implementation of Fuzzy operations using C/MATLAB.
3. Implementation of a fuzzy inference system on a given problem using MATLAB.
4. Implementing Simple perceptron model to show effect of inputs, weights and bias on decision boundary using MATLAB.
5. Train the simple perceptron to show its limitation to solve only linearly separable boundary problem using MATLAB.
6. To design, implement and train a feedforward ANN to solve a pattern recognition problemusing MATLAB.
7. To design, implement and train a linear adaptive filter using tapped delay line and ANNusing MATLAB.
8. Implementing SGA to solve function optimization problem in a given rangeusing MATLAB.
9. Implementation of ACO for Travelling Salesperson Problemusing MATLAB.
10. Using ANFIS to solve a given problemusing MATLAB.

INTELLIGENT SYSTEMS AND ROBOTICS

(ELECTIVE - 1)

MACHINE TRANSLATION AND LEARNING			
Course Code:	**CS568**	**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 MACHINE TRANSLATION

Definition, fundamental concepts, applications, language similarities and differences, cross language information retrieval, computer aided human translation, sublanguage classification, concept of polysynthetic language, Sapir – Whorf hypothesis, concept of ontology, direct vs. indirect translation, statistical model of machine translation.

UNIT II DIFFERENT MACHINE TRANSLATION MODELS

Graphical models: belief networks, Bayesian networks, Hidden Markov models, incremental learning, reinforcement learning, machine learning applications.

UNITIII MACHINE TRANSLATION METHODOLOGIES

Decision trees, linear discrimination, Neural networks, support vector machines (SVMs), quantifying fluency and faithfulness, usability and system development, direct transfer, quantifying fluency and faithfulness, boosting and bagging, naive Bayes classifiers, gradient-descent, Q-learning.

UNIT IV MACHINE-LEARNING FUNDAMENTALS

Classification, regression and clustering; noisy, noise-free and incomplete data; supervised and unsupervised learning; hypothesis classes, model complexity, model selection, Ockham's razor and bias-variance dilemma, dynamic environments, reinforcement learning and the exploration-exploitation dilemma.

UNIT V BASIC LEARNING METHODS

Unsupervised learning: K-means, vector quantization, self-organizing neural networks. Supervised learning: K nearest neighbor, learning vector quantization, decision tree, supervised neural networks, the transfer metaphor, syntactic transformations, lexical transformations.

Text Books:

1. Machine Translation of Languages, Wilen Sky R. Planning and understanding, Addison Wisely, ReadingMA, 2003.
2. Artificial Neural Networks: An Introduction to ANN Theory and Practice by Peteus J. Braspenning, PHI publication, 2005.

References Books:

1. A New Approach to Machine Translation, Russel S, and Norvig P, Pearson education publication, 2003.
2. Evolutionary Language Understanding, Sampson G. Mc. Graw Hill publication, 2002.
3. The Machine Translation perspective, Schank, R.C., PHI publication 2000.

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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 Guassian low pass filters), image sharpening filters (Butterworth and Guassian 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.

SPEECH PROCESSING			
Course Code:	**CS570**	**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 AND OVERVIEW

Fundamentals of speech processing, ambiguity and uncertainty in speech processing, representation of speech signal in electrical format, manipulation of speech signal, acquisition of speech signal, storage of speech signal.

UNIT II WAVE SHAPING OF SPEECH SIGNAL

Basic concept of wave shaping, Fourier series, representation of signal using Fourier series, calculation of bandwidth, sending a signal through the limited bandwidth channel, multiplexing and de-multiplexing of a signal.

UNITIII STRING EDIT DISTANCE

Key algorithmic tool: dynamic programming, use of dynamic programming in optimal alignment of sequences, string edit operations, edit distance, and examples of use in spelling correction, and machine translation.

UNIT IV PROBABILITY

Introduction to probability theory, concepts related to modern speech processing, events and counting, joint and conditional probability, marginal's, independence, Bayes rule, combining evidence. application of probability in speech processing, non-probabilistic methods of speech processing.

UNIT V INFORMATION THEORY

Concept of information, measurement of information in bits, characteristics of noiseless and noisy channel. Entropy, cross-entropy, information gain, application of information theory to some language phenomenon, probabilistic language modeling and its applications.

INTELLIGENT SYSTEMS AND ROBOTICS

(SEMESTER - IX)

EXPERT SYSTEM DESIGN			
Course Code:	**CS661**	**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 EXPERT SYSTEM AND KNOWLEDGE REPRESENTATION

Introduction, Advantages, General Concepts, Characteristics, Development of Expert System Technology, Applications and Domain, Language, Shells, Tools, Elements, Production Systems, Procedural Paradigms, Artificial Neural Systems, Meaning of Knowledge, Productions, Semantic Nets, Object-Attribute-Value Triples, Prolog and Semantic Nets, Difficulties With Semantic Nets, Schemata, Frames, Difficulties With Frames, Logic and Sets, Propositional Logic, First Order Predicate Logic, Universal Quantifier, Existential Quantifier and Limitations of Predicate Logic

UNIT II INFERENCE

Introduction, Trees , Lattice, Graphs, State and Problem Spaces, And-Or Trees and Goals, Deductive Logic Syllogisms, Rule of Inference, Limitations of Propositional Logic, Logic Systems, Resolution, Resolution System and Deduction, Shallow and Casual Knowledge, Forward and Backward Knowledge, Other Method of Inference, Metaknowledge, Hidden Markov Models.

UNITIII DESIGN OF EXPERT SYSTEM

Introduction, Selection of Appropriate Problem, Stages in the Development of Expert System, Errors in Development Stages, Software Engineering and Expert Systems, The Expert System Life Cycle, A Detailed Life Cycle Model.

UNIT IV REASONING UNDER UNCERTAINITY

Introduction, Uncertainty, Errors, Induction, Classical Probability, Experimental and Subjective Probabilities, Compound Probabilities, Conditional Probabilities, Hypothetical Reasoning and Backward Induction, Temporal Reasoning and Markov Chains, Odds of Belief, Sufficiency and Necessity, Uncertainty in Inference Chains, Combination of Evidence.

UNIT V INEXACT REASONING

Introduction, Uncertaininty and Rules, Ceratinity Factors, Dempster-Shafer Theory, Approximate Reasoning, The State of Uncertaininty, Commercial Applications of Fuzzy Logic.

Reference Books:

1. Measuring and Managing Knowledge for Expert System , Mc. Graw- hill Boston, 2001.
2. Dendral: Expert System, Feigenbaum et al, by PHI publication, 1992.
3. Modal Operators in expert systems, Berners Lee, Mc Garw hill publication, 2002.
4. The Frame Based Knowledge Representation in Expert Systems, Mc Carthy and Hays, PHI publication, 2003.
5. Decision Theoretic Expert Systems, Russel, Wiley Eastern publication, 2002.

ROBOTICS			
Course Code:	**CS699**	**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 KINEMATICS OF ROBOTICS

Forward and inverse kinematics, motion kinematics, low-level and high-level trajectory planning. static force and torque relations, internal sensory devices: position and velocity sensors, external sensory devices: force, tactile and proximity sensors, machine vision, robot programming: multi-level approach, programming techniques, world modeling, off-line programming and simulation.

UNIT II BASIC ROBOT FUNCTIONING

History of robots, types of robots, uses of robots, present status and future trends in robotics, overview of robot subsystems, Issues in designing and controlling robots: resolution, repeatability and accuracy, transmission, Robot configurations and concept of workspace, mechanisms and transmission, motion planning obstacle avoidance, configuration space, road map methods, graph search algorithms, potential field methods.

UNITIII SPATIAL DESCRIPTIONS

Descriptions, postings, orientations, and frames, mappings, operators : translations, rotations, and transformations, transformation arithmetic, transform equations, transformation of free vectors, computational considerations.

UNIT IV ROBOT ANATOMY

End effectors and actuators, Different types of grippers, vacuum and other methods of gripping. pneumatic, hydraulic and electric actuators, Sensors and controllers, internal and external sensors, position, velocity and acceleration sensors, proximity sensors, force sensors, laser range finder, camera, micro-controllers, centralized controllers, real time operating systems.

UNIT V TASK SPECIFICATION OF ROBOT

Point to point and continuous motion specifications for typical applications, joint interpolation, task space interpolation, executing user specified tasks, Robot analysis, position and orientation of rigid bodies, spatial mechanism description, Denavit-Hartenberg notation, homogenous transformation, forward and inverse position analysis, velocity mapping, static force analysis, singularities, acceleration mapping, robot control Independent joint control, PD and PID feedback, actuator models, nonlinearity of manipulator models, issues in nonlinear control, force feedback, hybrid control, Case studies: Robot in assembly (Puma). Mobile robot (Nataraj)

Reference Books:

1. Introduction to Robotics, Mechanics and control, John J. Craig, Pearson Education publication, 2004.
2. Robotic moments, S Mujtaba and R. Goldman , PHI publication, 2003.
3. An Advance Robotic Programming, A. Gilbert, American Robot corporation 1984.
4. Design of an Interactive Manipulator Programming environment, UMI Research Press, 1985.
5. Mechanical Engineering design, J Shigley, 3rd edition, Mc, Graw hill, New York 1977.

Expert System Design Lab			
Course Code:	**CS683**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

1. Design and Development of an expert system which incorporate following programs-

I. Feasibility study ; to be developed expert system.

II. Write the If-Then rules for the development of expert system.

III. Development of database and relations with proper data types.

IV. Write a program for forward chaining mechanism.

V. Write a program for backward chaining mechanism.

VI. Write a program for Hybrid chaining mechanism.

VII. Write a program for the connection establishment between front-end and back-end.

2. Study of different commercial expert system shells.

3. To Study JESS expert system

4. To Study RVD expert system

INTELLIGENT SYSTEMS AND ROBOTICS

(ELECTIVE–2 & 3)

INTELLIGENT INFORMATION RETRIEVAL			
Course Code:	**CS663**	**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 INFORMATION RETRIEVAL FUNDAMENTALS

Text based information retrieval, examples of information retrieval, need of maintain the global information base, use of information for planning, reliability of information storage, redundancy in information storage, report on 21st Century Intelligent Systems, role of intelligent systems in e-governance.

UNIT II INFORMATION RETRIEVAL MODELS

Information retrieval using the Boolean model, dictionary and postings, dictionary based approaches of information retrieval, lists, adhoc information retrieval method, Indexing, scoring and term weighting, random vs. sequential search methods, the content based information retrieval system, consistency of retrieved information, accuracy and precision of retrieved information.

UNITIII INTERNET BASED INFORMATION RETRIEVAL METHODS

Vector space retrieval, relevance feedback and query expansion, XML retrieval probabilistic information retrieval, language models for information retrieval, text classification and Naive Bayes, web search basics, web crawling and indexes, evaluating information retrieval methods, concept of precision and recall.

UNIT IV AGENT-BASED INFORMATION RETRIEVAL

Ontology-based web agents, searching for Information in unstructured knowledge domains, intelligent adaptive Information agents, designing of agent for information retrieval, incorporation of AI concepts for design of intelligent agent,

UNIT V INFORMATION RETRIEVAL TECHNIQUES

Intelligent systems for finding Genes in DNA, using Information content to evaluate semantic similarity in information taxonomy.

Text Books:

1. Machine Learning and Statistical Modeling Approaches to Image Retrieval, Chen, Li, and Wang, , Kluwer, 2004.
2. Information Representation and Retrieval in the Digital Age, ASIS, Chu, Heting, , 2003.

Reference Books:

1. The Modern Algebra of Information Retrieval, Dominich, Sandor, Springer 2008.
2. Feldman, R. and Sanger, J. The Text Mining Handbook: Advanced Approaches in Analyzing Unstructured Data. CambridgeU. Press, 2006.
3. The Subject Approach to Information, Foskett, A. C., London, Lib. Assoc. Publ, 1996.

PATTERN MATCHING			
Course Code:	**CS665**	**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 AND BAYESIAN DECISION THEORY

Introduction to pattern recognition, Systems, design cycles, learning and adaptation, Bayesian decision theory, minimum error-rate classification, classifiers, discriminate functions and decisions surfaces.

UNIT II MAXIMUM – LIKELIHOOD AND BAYESIAN PARAMETER ESTIMATION

Maximum – Likelihood estimation, Bayesian estimation, Bayesian parameter estimation, Gaussian case and general theory, problems of dimensionality, Hidden Markov models, rules for pattern matching, incremental forward chaining, matching with known facts, data complexity.

UNITIII NONPARAMETRIC TECHNIQUES

Density estimation, parazen windows, Kn – Nearest neighbor estimation, nearest neighbor node metric technique.

UNIT IV LINEAR DISCRIMINATE FUNCTIONS

Linear discriminate functions and decision surfaces, generalized linear discriminate functions, two category uniformly separate case, minimizing the perception criterion function, relaxation procedures, nonseperable behavior, minimum squared-error procedures, Ho–Kashyap Procedures, support vector machines, multicategory generalization.

UNIT V UNSUPERVISED LEARNING

Clustering mixture densities and identifiability, maximum, likelihood estimation, application to normal mixtures, unemperouses, Bayesian learning, Data descriptions and controls, criterion function for clustering, interface, optimization, hierarchical clustering, component analysis, low dimension representation and multidimensional scaling.

Text Books:

1. Pattern Classification Richard O. Duda, Peter E. Hart and David G. Stork," 2nd Edition, John Wiley, 2003.
2. Introduction to the theory of Neural Computation, John Hertz, Andres Krogh & Richard G. Palmer, Addison Wesley, 2004.

References:

1. "Learning from Data-Concepts, Theory and Methods, Cherkassky V., F. Kulier, John Wiley, New York, 1998.
2. Neurocomputing: Foundations of Research, MIT Press, CambridgeAnderson J.A., E. Rosenfield, MA, 1988.
3. Self-Organizing Maps, Kohonen T., 2nd Ed., Springer Verlag, Berlin, 1997.
   Pattern Recognition by Devrophi publication, 1996.

Evolutionary Computation			
Course Code:	**CS667**	**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–Fundamental Concepts and Dialects Metaheuristics; Requirements of metaheuristics in optimization problems; characteristics of problems suitable for applicability of metaheuristics; Evolutionary computing metaphor and Inspiration from biology; Applications, Pros, and cons of evolutionary computations; Components of evolutionary computation; example applications – eight queen problem, knapsack problem; various dialects of evolutionary computation.

UNIT-II–Genetic Algorithms Introduction; Canonical GA; Binary, integer, real-valued, and permutation representations and variation operators for them; Population Models; Parent Selection – Fitness proportionate selection, Rank based selection, implementing selection probabilities, tournament selection; Survivor strategy. Implementation issues, parameters' control and effect on GA dynamics.

UNIT-III–Theoretical Foundation of Genetic Algorithms Schemas and hyperplane sampling; Schemata theorem, limitations and building block hypothesis; Two-armed bandit problem; Deceiving a GA; Minimal deceptive problem; Royal Roads functions; SAHC; NAHC; RMHC; Hitchhiking; Exact Mathematical Models of SGA; Statistical-Mechanics Approaches.

UNIT-IV–Problem Solving Using EC Evolving computer programs – evolving LISP programs, evolving cellular automata; Data analysis and prediction – predicting dynamical system, predicting protein structure; Evolving Neural Networks – evolving weights, architecture(Direct encoding and Grammatical encoding), and learning rules; Baldwin effect and evolutionary reinforced learning.

UNIT-V– Parallel Implementation and Other Dialects of EC Parallel implementation of GA; Genetic Programming; Evolutionary Programming; Evolutionary Strategies; Learning Classifier Systems; Memetic Algorithms; Introduction to MOGA.

Reference Books:

1. An Introduction to Genetic Algorithms, Milanie Mitchell, MIT Press.
2. Genetic Algorithms, David E. Goldberg, Pearson Education.
3. Handbook of Genetic Algorithms, Lowrence Davis, Van Nostrand ReinholdMulti-Objective Optimization using Evolutionary Algorithms, Kalyanmoy Deb, Wiley

MULTIMEDIA AND COMPUTER GRAPHICS			
Course Code:	**CS 671 3**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**45**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:		**End Sem Exam Hours:**	**3**

UNIT- I

Introduction, Applications areas, Components of Interactive Computer Graphics System. Overview of Input devices, Output devices, raster scan CRT displays, random scan CRT displays. DDA and Bresenham's Line Drawing Algorithms, Bresenham's and Mid Point Circle Drawing Algorithms. Homogeneous Coordinate Systemfor 2D and 3D, Various 2D, 3D Transformations (Translation, Scaling, Rotation, Shear).

UNIT- II

Clipping Algorithms, Sutherland-Cohen line Clipping Algorithm Bezier Curves, B-Spline Curves. Parallel Projection, Perspective Projection, Illumination Model for diffused Reflection, Ambient light, Specular ReflectionModel, Reflection Vector.

UNIT- III

Shading Models, Flat shading, Gourard Shading, Phong Model. Visible surface detection, Back Face Detection,Depth Buffer (Z-Buffer, A-Buffer) Method. Overview of multimedia: Classification, basic concepts ofsound/audio MIDI: devices, messages, software. , Authoring tools, Video and Animation: controlling animation,display and transmission of animation

UNIT- IV

Data Compression: storage space, coding requirements, Basic compression techniques: run length code, Huffmancode, Lempel-Ziv JPEG: Image preparation, Lossy sequential DCT, expanded lossy DCT, Lossless mode,Hierarchical mode. MPEG, Media synchronization, Media Integration, Production Standards.

Text Books:

1. Introduction to Theory of Neural Computation, John Hertz, Andres Krogh & Richard G. Palmer, Addison Wesley, 2004.
2. A New Approach to Speech Processing, Russel S, and Norvig Prentice hall publication, 2003.

References:

1. Evolutionary speech processing by Sampson G, Mc. Graw Hill publication, 2004.
2.The Speech Translation, A New Perspective, Schank, R.C 2003.
3. "Mathematical Methods for Neural Network Analysis and Design", Golden R.M., MIT Press, Cambridge, MA, 1996.
4. Information Retrieval, Salton, Mc Graw Hill 1983.

FUZZY SET THEORY			
Course Code:	**CS6693**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**45**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:		**End Sem Exam Hours:**	**3**

UNIT-I Introduction to Fuzzy Sets

Overview of crisp sets; crispness, vagueness, fuzziness and uncertainty; Fuzzy-sets – basic types and basic concepts; α-cuts, strong α-cuts, Representation of fuzzy sets; extension of fuzzy sets.

UNIT-II - Fuzzy Set Operations and Fuzzy Arithmatic

Fuzzy Complement; Fuzzy interaction, t-norms; Fuzzy unions, t-conorms; Combination of operations; Aggregation operation; Fuzzy numbers; Linguistic variables; Arithmatic operations on intervals; Arithmatic Operations on Fuzzy numbers;

UNIT-III - Fuzzy Relations and Fuzzy Logic

Crisp vs Fuzy relations; Projections and Cylindrical extansions; binary fuzzy relations; Binary relations on a single set; Fuzzy equivalence relations; Fuzzy Compatibility Relations; Fuzzy ordering Relations; Fuzzy Morphisms.Multivalued logics; Fuzzy propositions; Fuzzy quantifiers; Linguistic Hedges.

UNIT-IV - Possibility Theory and Uncertainity-Based Information

Fuzzy measures; Evidence Theory; Possibility Theory; Fuzzy Sets and Possibility Theory; Possibility Theory vs probability Theory.Information and uncertainty; Nonspecificity of Crisp Sets; Nonspecificity of Fuzzy Sets; Fuzziness of Fuzzy sets.

UNIT-V Fuzzy Systems and Applications

Membership Functions; Features of the Membership Functions; Fuzzification; Defuzzification to crisp sets; λ-cuts for Fuzzy Relations; Defuzzification to Scalars;Fuzzy inference systems; Mamdani's fuzzy models; Sugeno's fuzzy models; Tsukamoto's fuzzy models; other variants; Applications

Reference Books:

1. Fuzzy Sets and Fuzzy Logic: Theory and Applications – George J. Klir and Bo Yuan; PHI
2. Fuzzy Set Theory and Its Applications – H.J. Zimmermann; Kluwer Academic Publishers
3. Fuzzy Logic with Engineering Applications – T. J. Ross; Wiley