



G.L. Bajaj Institute of Technology and Management
Information Technology – E Syllabus



DEPARTMENT OF INFORMATION TECHNOLOGY

E- SYLLABUS

FOR

B.TECH. INFORMATION TECHNOLOGY

EVEN SEMESTER

SESSION (2019--20)



G.L. Bajaj Institute of Technology and Management **Information Technology – E Syllabus**

ABOUT THE INSTITUTE

GL Bajaj Institute of Technology & Management is the 6th Institute established under the prestigious banner of Rajeev Memorial Academic Welfare Society (Registered Under Societies Registration Act 1860). The institute is approved by All India Council for Technical Education (AICTE), Ministry of HRD, Govt. of India and Affiliated to Dr. A.P.J. Abdul Kalam Technical University (Formerly UPTU Lucknow)

GL Bajaj Institute of Technology and Management is one of the qualities driven Educational Institute in the Greater Noida/Delhi-NCR Region. GL Bajaj stands out in its approach to assist and equip the students for their overall development, giving them a strong foundation for a successful future. The institute offers B.Tech, M.Tech, MBA, MCA.

This self-financed institute is governed by Rajeev Memorial Academic Welfare Society (Registered Under Societies Registration Act 1860). It is approved by All India Council for Technical Education (AICTE), Ministry of Human Resource Development, Government of India and affiliated to Dr. A.P.J. Abdul Kalam Technical University, Lucknow..

ABOUT THE DEPARTMENT

The Department of Information Technology at G.L. Bajaj Institute of Technology & Management was established in the year 2007 with a vision to develop competent IT professionals catering to the needs of Industry and society in a global perspective. The Department aims to foster students to attain professional excellence by providing exposure to new IT tools and technologies. Information Technology being the flagship branch of Engineering takes focus in scientific research, scientific programming, Application programming, and software engineering. The Department has well-equipped laboratories with state-of-the-art hardware and software resources, lecture halls, seminar halls, tutorial rooms and faculty sections. The Department has a blend of experienced and young faculty members who also work as mentors to the equally diligent and hardworking students.



G.L. Bajaj Institute of Technology and Management
Information Technology – E Syllabus

DEPARTMENT VISION & MISSION

VISION

To develop competent IT professionals catering to the needs of Industry and society in a global perspective.

MISSION

To attain academic & professional excellence with collective efforts of all stake holders through:

- M1** : Dissemination of basic concepts and analytical skills.
- M2** : Exposure to new tools in the area of Information technology.
- M3** : Effective interaction with industry for better employability.
- M4** : Inculcating values and professional ethics with social responsibility.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

Below are the different educational objective of program:

- **PEO-1**
To provide students a strong foundation in mathematical and IT fundamentals with emphasis on different programming languages/ platforms.
- **PEO-2**
To prepare students with a strong foundation in IT tools and analytical skills.
- **PEO-3**
To analyse, design and develop efficient and cost effective IT solutions for society.
- **PEO-4**
To become a successful professional in software industry with leadership quality and value.
- **PEO-5**
To provide a supportive academic environment and guidance for life-long learning.



G.L. Bajaj Institute of Technology and Management
Information Technology – E Syllabus

PROGRAM OUTCOMES (POs)

The graduate of the program will be able to:

PO 1 - Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO 2 - Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO 3 - Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO 4 - Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO 5 - Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO 6 - The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO 7 - Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO 8 - Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9 - Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 10 - Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO 11 - Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader.

PO 12 - Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.



G.L. Bajaj Institute of Technology and Management
Information Technology – E Syllabus

PROGRAM SPECIFIC OUTCOMES (PSOs)

Program Graduates will be able to:

PSO 1: Design and develop an application/product that efficiently utilizes system software and hardware to cover current user requirement in social and economic form.

PSO 2: Apply and acquire knowledge of computer network in implementation of secure data communication and reliable network system.

PSO 3: Design and implement knowledge based discovery, machine based learning by using the concept of DBMS, soft computing, neural network, image processing and pattern recognition etc.

PSO 4: Design and develop mobile based applications which use the concepts of latest application system development technologies.



G.L. Bajaj Institute of Technology and Management
Information Technology – E Syllabus

Syllabus for Second Year (EVEN Sem.)

Department of Information Technology



G.L. Bajaj Institute of Technology and Management
Information Technology – E Syllabus

STUDY EVALUATION SCHEME

SECOND YEAR
SEMESTER –IV

SEMESTER- IV													
Sl. No.	Subject Codes	Subject	Periods			Evaluation Scheme				End Semester		Total	Credit
			L	T	P	CT	TA	Total	PS	TE	PE		
1	KAS402/ KOE041-48	Maths IV/Engg. Science Course	3	1	0	30	20	50		100		150	4
2	KVE401/ KAS401	Universal Human Values/Technical Communication	3	0	0	30	20	50		100		150	3
			2	1	0								
3	KCS401	Operating Systems	3	0	0	30	20	50		100		150	3
4	KCS402	Theory of Automata and Formal Languages	3	1	0	30	20	50		100		150	4
5	KIT401	Web Designing	3	1	0	30	20	50		100		150	4
6	KCS451	Operating Systems Lab	0	0	2				25		25	50	1
7	KIT451	Web Designing Lab	0	0	2				25		25	50	1
8	KCS453	Python Language Programming Lab	0	0	2				25		25	50	1
9	KNC402/ KNC401	Python Programming/ Computer System Security	2	0	0	15	10	25		50			0
10		MOOCs (Essential for Hons. Degree)											
		Total										900	21

CT: Class Test

TA: Teacher Assessment

L/T/P: Lecture/ Tutorial/ Practical



G.L. Bajaj Institute of Technology and Management
Information Technology – E Syllabus

B.TECH. (COMPUTER SCIENCE AND ENGINEERING)
FOURTH SEMESTER (DETAILED SYLLABUS)

Operating systems (KCS401)		
Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course , the student will be able to understand		
CO 1	Understand the structure and functions of OS	K ₁ , K ₂
CO 2	Learn about Processes, Threads and Scheduling algorithms.	K ₁ , K ₂
CO 3	Understand the principles of concurrency and Deadlocks	K ₂
CO 4	Learn various memory management scheme	K ₂
CO 5	Study I/O management and File systems.	K ₂ ,K ₄
DETAILED SYLLABUS		3-0-0
Unit	Topic	Proposed Lecture
I	Introduction : Operating system and functions, Classification of Operating systems- Batch, Interactive, Time sharing, Real Time System, Multiprocessor Systems, Multiuser Systems, Multiprocess Systems, Multithreaded Systems, Operating System Structure- Layered structure, System Components, Operating System services, Reentrant Kernels, Monolithic and Microkernel Systems.	08
II	Concurrent Processes : Process Concept, Principle of Concurrency, Producer / Consumer Problem, Mutual Exclusion, Critical Section Problem, Dekker's solution, Peterson's solution, Semaphores, Test and Set operation; Classical Problem in Concurrency- Dining Philosopher Problem, Sleeping Barber Problem; Inter Process Communication models and Schemes, Process generation.	08
III	CPU Scheduling : Scheduling Concepts, Performance Criteria, Process States, Process Transition Diagram, Schedulers, Process Control Block (PCB), Process address space, Process identification information, Threads and their management, Scheduling Algorithms, Multiprocessor Scheduling. Deadlock : System model, Deadlock characterization, Prevention, Avoidance and detection, Recovery from deadlock.	08
IV	Memory Management : Basic bare machine, Resident monitor, Multiprogramming with fixed partitions, Multiprogramming with variable partitions, Protection schemes, Paging, Segmentation, Paged segmentation, Virtual memory concepts, Demand paging, Performance of demand paging, Page replacement algorithms, Thrashing, Cache memory organization, Locality of reference.	08
V	I/O Management and Disk Scheduling : I/O devices, and I/O subsystems, I/O buffering, Disk storage and disk scheduling, RAID. File System : File concept, File organization and access mechanism, File directories, and File sharing, File system implementation issues, File system protection and security.	08



G.L. Bajaj Institute of Technology and Management **Information Technology – E Syllabus**

Text books:

1. Silberschatz, Galvin and Gagne, “Operating Systems Concepts”, Wiley
2. Sibsankar Halder and Alex A Aravind, “Operating Systems”, Pearson Education
3. Harvey M Dietel, “ An Introduction to Operating System”, Pearson Education
4. D M Dhamdhere, “Operating Systems : A Concept based Approach”, 2nd Edition,
5. TMH 5. William Stallings, “Operating Systems: Internals and Design Principles ”, 6th Edition, Pearson Education





G.L. Bajaj Institute of Technology and Management
Information Technology – E Syllabus

Theory of Automata and Formal Languages (KCS402)		
Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course , the student will be able to understand		
CO 1	Analyse and design finite automata, pushdown automata, Turing machines, formal languages, and grammars	K ₄ , K ₆
CO 2	Analyse and design, Turing machines, formal languages, and grammars	K ₄ , K ₆
CO 3	Demonstrate the understanding of key notions, such as algorithm, computability, decidability, and complexity through problem solving	K ₁ , K ₅
CO 4	Prove the basic results of the Theory of Computation.	K ₂ ,K ₃
CO 5	State and explain the relevance of the Church-Turing thesis.	K ₁ , K ₅
DETAILED SYLLABUS		3-1-0
Unit	Topic	Proposed Lecture
I	Basic Concepts and Automata Theory: Introduction to Theory of Computation- Automata, Computability and Complexity, Alphabet, Symbol, String, Formal Languages, Deterministic Finite Automaton (DFA)- Definition, Representation, Acceptability of a String and Language, Non Deterministic Finite Automaton (NFA), Equivalence of DFA and NFA, NFA with ϵ -Transition, Equivalence of NFA's with and without ϵ -Transition, Finite Automata with output- Moore Machine, Mealy Machine, Equivalence of Moore and Mealy Machine, Minimization of Finite Automata, Myhill-Nerode Theorem, Simulation of DFA and NFA	08
II	Regular Expressions and Languages: Regular Expressions, Transition Graph, Kleen's Theorem, Finite Automata and Regular Expression- Arden's theorem, Algebraic Method Using Arden's Theorem, Regular and Non-Regular Languages- Closure properties of Regular Languages, Pigeonhole Principle, Pumping Lemma, Application of Pumping Lemma, Decidability- Decision properties, Finite Automata and Regular Languages, Regular Languages and Computers, Simulation of Transition Graph and Regular language.	08
III	Regular and Non-Regular Grammars: Context Free Grammar(CFG)-Definition, Derivations, Languages, Derivation Trees and Ambiguity, Regular Grammars-Right Linear and Left Linear grammars, Conversion of FA into CFG and Regular grammar into FA, Simplification of CFG, Normal Forms- Chomsky Normal Form(CNF), Greibach Normal Form (GNF), Chomsky Hierarchy, Programming problems based on the properties of CFGs.	08
IV	Push Down Automata and Properties of Context Free Languages: Nondeterministic Pushdown Automata (NPDA)- Definition, Moves, A Language Accepted by NPDA, Deterministic Pushdown Automata(DPDA) and Deterministic Context free Languages(DCFL), Pushdown Automata for Context Free Languages, Context Free grammars for Pushdown Automata, Two stack Pushdown Automata, Pumping Lemma for CFL, Closure properties of CFL, Decision Problems of CFL, Programming problems based on the properties of CFLs.	08



G.L. Bajaj Institute of Technology and Management
Information Technology – E Syllabus

V	Turing Machines and Recursive Function Theory : Basic Turing Machine Model, Representation of Turing Machines, Language Acceptability of Turing Machines, Techniques for Turing Machine Construction, Modifications of Turing Machine, Turing Machine as Computer of Integer Functions, Universal Turing machine, Linear Bounded Automata, Church's Thesis, Recursive and Recursively Enumerable language, Halting Problem, Post's Correspondance Problem, Introduction to Recursive Function Theory.	08
----------	--	-----------

Text books:

1. Introduction to Automata theory, Languages and Computation, J.E.Hopcraft, R.Motwani, and Ullman. 2nd edition, Pearson Education Asia
2. Introduction to languages and the theory of computation, J Martin, 3rd Edition, Tata McGraw Hill
3. Elements and Theory of Computation, C Papadimitrou and C. L. Lewis, PHI
4. Mathematical Foundation of Computer Science, Y.N.Singh, New Age Internationa





G.L. Bajaj Institute of Technology and Management

Information Technology – E Syllabus

Web Designing (KIT 401)		
	Course Outcome (CO)	Bloom's Knowledge Level (KL)
At the end of course , the student will be able to understand		
CO 1	Understand principle of Web page design and about types of websites	K ₃ , K ₄
CO 2	Visualize and Recognize the basic concept of HTML and application in web designing.	K ₁ , K ₂
CO 3	Recognize and apply the elements of Creating Style Sheet (CSS).	K ₂ , K ₄
CO 4	Understanding the basic concept of Java Script and its application.	K ₂ , K ₃
CO 5	Introduce basics concept of Web Hosting and apply the concept of SEO	K ₂ , K ₃
DETAILED SYLLABUS		3-0-0
Unit	Topic	Proposed Lecture
I	Introduction : Basic principles involved in developing a web site, Planning process , Domains and Hosting, Responsive Web Designing , Types of Websites (Static and Dynamic Websites), Web Standards and W3C recommendations, Introduction to HTML: What is HTML , HTML Documents, Basic structure of an HTML document , Creating an HTML document , Mark up Tags , Heading-Paragraphs , Line Breaks	08
II	Elements of HTML: HTML Tags., Working with Text , Working with Lists, Tables and Frames, Working with Hyperlinks, Images and Multimedia, Working with Forms and controls	08
III	Concept of CSS: Creating Style Sheet, CSS Properties , CSS Styling(Background, Text Format, Controlling Fonts) , Working with block elements and objects , Working with Lists and Tables , CSS Id and Class, Box Model(Introduction, Border properties, Padding Properties, Margin properties) CSS Advanced(Grouping, Dimension, Display, Positioning, Floating, Align, Pseudo class, Navigation Bar, Image Sprites, Attribute sector) , CSS Color , Creating page Layout and Site Designs.	08
IV	Introduction to Client Side Scripting , Introduction to Java Script , Javascript Types , Variables in JS, Operators in JS , Conditions Statements , Java Script Loops, JS Popup Boxes , JS Events , JS Arrays, Working with Arrays, JS Objects ,JS Functions , Using Java Script in Real time , Validation of Forms, Related Examples	08
V	Web Hosting: Web Hosting Basics , Types of Hosting Packages, Registering domains , Defining Name Servers , Using Control Panel, Creating Emails in Cpanel , Using FTP Client, Maintaining a Website Concepts of SEO : Basics of SEO, Importance of SEO, Onpage Optimization Basics	08
Text Books: <ol style="list-style-type: none"> 1. Steven M. Schafer, “HTML, XHTML, and CSS Bible, 5ed”, Wiley India 2. Ian Pouncey, Richard York, “Beginning CSS: Cascading Style Sheets for Web Design”, Wiley India 		



G.L. Bajaj Institute of Technology and Management **Information Technology – E Syllabus**

Operating System Lab (KCS451)

1. Study of hardware and software requirements of different operating systems (UNIX,LINUX,WINDOWS XP,WINDOWS7/8)
2. Execute various UNIX system calls for
 - i. Process management
 - ii. File management
 - iii. Input/output Systems calls
3. Implement CPU Scheduling Policies:
 - i. SJF
 - ii. Priority
 - iii. FCFS
 - iv. Multi-level Queue
4. Implement file storage allocation technique:
 - i. Contiguous(using array)
 - ii. Linked –list(using linked-list)
 - iii. Indirect allocation (indexing)
5. Implementation of contiguous allocation techniques:
 - i. Worst-Fit
 - ii. Best- Fit
 - iii. First- Fit
6. Calculation of external and internal fragmentation
 - i. Free space list of blocks from system
 - ii. List process file from the system
7. Implementation of compaction for the continually changing memory layout and calculate total movement of data
8. Implementation of resource allocation graph RAG)
9. Implementation of Banker’s algorithm
10. Conversion of resource allocation graph (RAG) to wait for graph (WFG) for each type of method used for storing graph.
11. Implement the solution for Bounded Buffer (producer-consumer)problem using inter process communication techniques-Semaphores
12. Implement the solutions for Readers-Writers problem using inter process communication technique -Semaphore



G.L. Bajaj Institute of Technology and Management **Information Technology – E Syllabus**

Web Designing Lab (KIT451)

1. To create a simple html file to demonstrate the use of different tags.
2. To create an html file to link to different html page which contains images, tables, and also link within a page.
3. To create an html page with different types of frames such as floating frame, navigation frame & mixed frame.
4. To create a registration form as mentioned below.
Procedure: Create an html page named as “registration.html”
 - a) set background colors
 - b) use table for alignment
 - c) provide font colors & size
5. To create an html file by applying the different styles using inline, external & internal style sheets.
6. To write a Javascript program to define a user defined function for sorting the values in an array.
7. To create an html page to explain the use of various predefined functions in a string and math object in java script.
8. To create an html page to explain the use of various predefined functions in a array & Date object in Javascript.
9. To create an html page to demonstrate exception handling in javascript
10. To display the calendar using javascript code by getting the year from the user.
11. To create a html registration form and to validate the form using javascript code.
12. To create a html file. To open new window from the current window using javascript.
13. To create an html page to change the background color for every click of a button using javascript.
14. To create an html page with 2 combo box populated with month & year, to display the calendar for the selected month & year from combo box using javascript.
15. To create a html page to display a new image & text when the mouse comes over the existing content in the page.

Python Language Programming Lab (KCS453)

1. To write a python program that takes in command line arguments as input and print the number of arguments.
2. To write a python program to perform Matrix Multiplication.
3. To write a python program to compute the GCD of two numbers.
4. To write a python program to find the most frequent words in a text file.
5. To write a python program find the square root of a number (Newton’s method).
6. To write a python program exponentiation (power of a number).
7. To write a python program find the maximum of a list of numbers.
8. To write a python program linear search.
9. To write a python program Binary search.



G.L. Bajaj Institute of Technology and Management Information Technology – E Syllabus

10. To write a python program selection sort.
11. To write a python program Insertion sort.
12. To write a python program merge sort.
13. To write a python program first n prime numbers.
14. To write a python program simulate bouncing ball in Pygame.





G.L. Bajaj Institute of Technology and Management
Information Technology – E Syllabus

Syllabus for Third Year (EVEN Sem.)

Department of Information Technology



G.L. Bajaj Institute of Technology and Management
Information Technology – E Syllabus

STUDY EVALUATION SCHEME

**THIRD YEAR
SEMESTER –VI**

SIXTH SEMESTER

Sl No.	Subject Code	Subject Name	L-T-P	Th/Lab (ESE) Marks	Sessional		Total	Credit
					Test	Assig/Att.		
1	RAS601	INDUSTRIAL MANAGEMENT	3---0---0	70	20	10	100	3
2	RAS602 / RUC601	CYBER SECURITY/ INDUSTRIAL SOCIOLOGY	3---0---0	70	20	10	100	3
3	RCS-601	Computer Networks	3---0---0	70	20	10	100	3
4	RCS-602	Compiler Design	3---1---0	70	20	10	100	4
5	RCS-603	Web Technology	3---0---0	70	20	10	100	3
6	IT-Elective-2	DEPTT ELECTIVE COURSE-2	3---1---0	70	20	10	100	4
7	RCS-651	Computer Networks Lab	0---0---2	50	-	50	100	1
8	RCS-652	Compiler Design Lab	0---0---2	50	-	50	100	1
9	RCS-653	Web Technology Lab	0---0---2	50	-	50	100	1
10	RCS-654	Data Warehousing & Data Mining Lab	0---0---2	50	-	50	100	1
	TOTAL						1000	24

IT-ELECTIVE-2: Information Technology Elective-2

RIT-E21: DESIGN AND DEVELOPMENT OF APPLICATIONS

RIT-E22: DATAWAREHOUSING & DATA MINING

RCS-E21: INTERNET OF THINGS

RCS-E22: NEURAL NETWORK



G.L. Bajaj Institute of Technology and Management
Information Technology – E Syllabus

B. Tech. (Information Technology)
SIXTH EMESTER (DETAILED SYLLABUS)

RCS-601: COMPUTER NETWORKS		3-0-0
Unit	Topic	Proposed Lecture
I	Introduction Concepts: Goals and Applications of Networks, Network structure and Architecture, The OSI reference model, services, Network Topology Design - Delay Analysis, Back Bone Design, Local Access Network Design, Physical Layer Transmission Media, Switching methods, ISDN, Terminal Handling	08
II	Medium Access Sub Layer: Medium Access Sub Layer - Channel Allocations, LAN Protocols - ALOHA protocols - Overview of IEEE standards - FDDI. Data Link Layer - Elementary Data Link Protocols, Sliding Window protocols, Error Handling.	08
III	Network Layer: Network Layer - Point - to Pont Networks, routing, Congestion control Internetworking -TCP / IP, IP packet, IP address, IPv6.	08
IV	Transport Layer: Transport Layer - Design issues, connection management, session Layer- Design issues, remote procedure call. Presentation Layer-Design issues, Data compression techniques, cryptography - TCP - Window Management.	08
V	Application Layer: Application Layer: File Transfer, Access and Management, Electronic mail, Virtual Terminals, Other application. Example Networks - Internet and Public Networks	08

References:

1. Forouzen, "Data Communication and Networking", TMH
2. A.S. Tanenbaum, Computer Networks, Pearson Education
3. W. Stallings, Data and Computer Communication, Macmillan Press
4. Gary R. Wright, W. Richard Stevens "TCP/IP Illustrated, Volume 2 The Implementation" Addison-Wesley
5. Michael A. Gallo and William M. Hancock "Computer communication and Networking Technology" Cengage Learning
6. Bhavneet Sidhu, An Integrated approach to Computer Networks, Khanna Publishing House
7. Anuranjan Misra, "Computer Networks", Acme Learning
8. G. Shanmugarathinam, "Essential of TCP/ IP", Firewall Media



G.L. Bajaj Institute of Technology and Management
Information Technology – E Syllabus

RCS-602: COMPILER DESIGN		3-1-0
Unit	Topic	Proposed Lecture
I	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. The syntactic specification of programming languages: Context free grammars, derivation and parse trees, capabilities of CFG.	08
II	Basic Parsing Techniques: 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.	08
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.	08
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.	08
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.	08
REFERENCES: <ol style="list-style-type: none">1. Aho, Sethi & Ullman, "Compilers: Principles, Techniques and Tools", Pearson Education2. V Raghvan, "Principles of Compiler Design", TMH3. Kenneth Loudon, "Compiler Construction", Cengage Learning.4. Charles Fischer and Ricard LeBlanc, "Crafting a Compiler with C", Pearson Education5. .K. Muneeswaran, Compiler Design, First Edition, Oxford University Press.6. J.P. Bennet, "Introduction to Compiler Techniques", Second Edition, Tata McGraw-Hill, 2003.7. Henk Alblas and Albert Nymeyer, "Practice and Principles of Compiler Building with C", PHI, 2001		



G.L. Bajaj Institute of Technology and Management
Information Technology – E Syllabus

RCS-603: WEB TECHNOLOGIES		3-0-0
Unit	Topic	Proposed Lecture
I	Introduction: Introduction and Web Development Strategies, History of Web and Internet, Protocols governing Web, Writing Web Projects, Connecting to Internet, Introduction to Internet services and tools, Introduction to client-server computing. Core Java: Introduction, Operator, Data type, Variable, Arrays, Methods & Classes, Inheritance, Package and Interface, Exception Handling, Multithread programming, I/O, Java Applet, String handling, Event handling, Introduction to AWT, AWT controls, Layout managers	08
II	Web Page Designing: HTML: list, table, images, frames, forms, CSS, Document type definition, XML: DTD, XML schemes, Object Models, presenting and using XML, Using XML Processors: DOM and SAX, Dynamic HTML	08
III	Scripting: Java script: Introduction, documents, forms, statements, functions, objects; introduction to AJAX, Networking: Internet Addressing, InetAddress, Factory Methods, Instance Methods, TCP/IP Client Sockets, URL, URL Connection, TCP/IP Server Sockets, Datagrams.	08
IV	Enterprise Java Bean: Preparing a Class to be a JavaBeans, Creating a JavaBeans, JavaBeans Properties, Types of beans, State full Session bean, Stateless Session bean, Entity bean Java Database Connectivity (JDBC): Merging Data from Multiple Tables: Joining, Manipulating Databases with JDBC, Prepared Statements, Transaction Processing, Stored Procedures.	08
V	Servlets: Servlet Overview and Architecture, Interface Servlet and the Servlet Life Cycle, Handling HTTP get Requests, Handling HTTP post Requests, Redirecting Requests to Other Resources, Session Tracking, Cookies, Session Tracking with HttpSession JavaServer Pages (JSP): Introduction, JavaServer Pages Overview, A First JavaServer Page Example, Implicit Objects, Scripting, Standard Actions, Directives, Custom Tag Libraries..	08
References: <ol style="list-style-type: none"> 1. Burdman, Jessica, "Collaborative Web Development" Addison Wesley 2. Xavier, C, "Web Technology and Design", New Age International 3. Ivan Bayross," HTML, DHTML, Java Script, Perl & CGI", BPB Publication 4. Bhavne, "Programming with Java", Pearson Education 5. Herbert Schildt, "The Complete Reference:Java", TMH. 6. Hans Bergsten, "Java Server Pages", SPD O'Reilly 7. Tanveer Alam, Internet and Java Programming, Khanna Publishing House 8. Margaret Levine Young, "The Complete Reference Internet", TMH 9. Naughton, Schildt, "The Complete Reference JAVA2", TMH 10. Balagurusamy E, "Programming in JAVA", TMH 11. . Ramesh Bangia, "Internet and Web Design", New Age International 12. Ivan Bayross," HTML, DHTML, Java Script, Perl & CGI", BPB Publication 13. Deitel, "Java for programmers", Pearson Education 		



G.L. Bajaj Institute of Technology and Management
Information Technology – E Syllabus

14. Chris Bates, “Web Programming Building Internet Applications”, 2nd Edition, WILEY, Dreamtech
15. Joel Sklar , “Principals of web Design” Vikash and Thomas Learning Horstmann, “CoreJava”, Addison Wesley





G.L. Bajaj Institute of Technology and Management
Information Technology – E Syllabus

IT-ELECTIVE-2: Information Technology Elective-2

RIT-E21: DESIGN AND DEVELOPMENT OF APPLICATIONS		3-0-0
Unit	Topic	Proposed Lecture
I	INTRODUCTION: Introduction to mobile applications – Embedded systems - Market and business drivers for mobile applications – Publishing and delivery of mobile applications – Requirements gathering and validation for mobile applications	08
II	BASIC DESIGN: Introduction – Basics of embedded systems design – Embedded OS - Design constraints for mobile applications, both hardware and software related – Architecting mobile applications – User interfaces for mobile applications – touch events and gestures – Achieving quality constraints – performance, usability, security, availability and modifiability.	08
III	ADVANCED DESIGN: Designing applications with multimedia and web access capabilities – Integration with GPS and social media networking applications – Accessing applications hosted in a cloud computing environment – Design patterns for mobile applications.	08
IV	TECHNOLOGY I – ANDROID: Introduction – Establishing the development environment – Android architecture – Activities and views – Interacting with UI – Persisting data using SQLite – Packaging and deployment – Interaction with server side applications – Using Google Maps, GPS and Wi-Fi – Integration with social media applications.	08
V	TECHNOLOGY II –iOS: Introduction to Objective C – iOS features – UI implementation – Touch frameworks – Data persistence using Core Data and SQLite – Location aware applications using Core Location and Map Kit – Integrating calendar and address book with social media application – Using Wi-Fi - iPhone marketplace. Swift: Introduction to Swift, features of swift.	08
References: <ol style="list-style-type: none">1. Charlie Collins, Michael Galpin and Matthias Kappler, “Android in Practice”, DreamTech, 20122. AnubhavPradhan , Anil V Despande Composing Mobile Apps,Learn ,explore,apply3. James Dovey and Ash Furrow, “Beginning Objective C”, Apress, 20124. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 20125. David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, “Beginning iOS6 .Development: Exploring the iOS SDK”, Apress, 2013.		



G.L. Bajaj Institute of Technology and Management
Information Technology – E Syllabus

RIT-E22: DATA WAREHOUSING & DATA MINING		3-0-0
Unit	Topic	Proposed Lecture
I	Data Warehousing: Overview, Definition, Data Warehousing Components, Building a Data Warehouse, Warehouse Database, Mapping the Data Warehouse to a Multiprocessor Architecture, Difference between Database System and Data Warehouse, Multi Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept	08
II	Data Warehouse Process and Technology: Warehousing Strategy, Warehouse /management and Support Processes, Warehouse Planning and Implementation, Hardware and Operating Systems for Data Warehousing, Client/Server Computing Model & Data Warehousing. Parallel Processors & Cluster Systems, Distributed DBMS implementations, Warehousing Software, Warehouse Schema Design,	08
III	Data Mining: Overview, Motivation, Definition & Functionalities, Data Processing, Form of Data Pre-processing, Data Cleaning: Missing Values, Noisy Data, (Binning, Clustering, Regression, Computer and Human inspection), Inconsistent Data, Data Integration and Transformation. Data Reduction:-Data Cube Aggregation, Dimensionality reduction, Data Compression, Numerosity Reduction, Discretization and Concept hierarchy generation, Decision Tree.	08
IV	Classification: Definition, Data Generalization, Analytical Characterization, Analysis of attribute relevance, Mining Class comparisons, Statistical measures in large Databases, Statistical-Based Algorithms, Distance-Based Algorithms, Decision Tree-Based Algorithms. Clustering: Introduction, Similarity and Distance Measures, Hierarchical and Partitioned Algorithms. Hierarchical Clustering- CURE and Chameleon. Density Based Methods-DBSCAN, OPTICS. Grid Based Methods- STING, CLIQUE. Model Based Method –Statistical Approach, Association rules: Introduction, Large Itemsets, Basic Algorithms, Parallel and Distributed Algorithms, Neural Network approach.	08
V	Data Visualization and Overall Perspective: Aggregation, Historical information, Query Facility, OLAP function and Tools. OLAP Servers, ROLAP, MOLAP, HOLAP, Data Mining interface, Security, Backup and Recovery, Tuning Data Warehouse, Testing Data Warehouse. Warehousing applications and Recent Trends: Types of Warehousing Applications, Web Mining, Spatial Mining and Temporal Mining	08

References:

1. Alex Berson, Stephen J. Smith “Data Warehousing, Data-Mining & OLAP”, TMH
2. Mark Humphries, Michael W. Hawkins, Michelle C. Dy, “ Data Warehousing: Architecture and Implementation”, Pearson
3. I Singh, Data Mining and Warehousing, Khanna Publishing House
4. Margaret H. Dunham, S. Sridhar, ”Data Mining: Introductory and Advanced Topics” Pearson Education
5. Arun K. Pujari, “Data Mining Techniques” Universities Press
6. Pieter Adriaans, Dolf Zantinge, “Data-Mining”, Pearson Education



G.L. Bajaj Institute of Technology and Management
Information Technology – E Syllabus

RCS-E21: INTERNET OF THINGS		3-0-0
Unit	Topic	Proposed Lecture
I	Internet of Things (IoT): Vision, Definition, Conceptual Framework, Architectural view, technology behind IoT, Sources of the IoT, M2M Communication, IoT Examples . Design Principles for Connected Devices: IoT/M2M systems layers and design standardization, communication technologies, data enrichment and consolidation, ease of designing and affordability.	08
II	Hardware for IoT: Sensors, Digital sensors, actuators, radio frequency identification (RFID) technology, wireless sensor networks, participatory sensing technology. Embedded Platforms for IoT: Embedded computing basics, Overview of IOT supported Hardware platforms such as Arduino, NetArduino, Raspberry pi, Beagle Bone, Intel Galileo boards and ARM cortex.	08
III	Network & Communication aspects in IoT: Wireless Medium access issues, MAC protocol survey, Survey routing protocols, Sensor deployment & Node discovery, Data aggregation & dissemination	08
IV	Programming the Arduino: Arduino Platform Boards Anatomy, Arduino IDE, coding, using emulator, using libraries, additions in arduino, programming the arduino for IoT.	08
V	Challenges in IoT Design challenges: Development Challenges, Security Challenges, Other challenges IoT Applications : Smart Metering, E-health, City Automation, Automotive Applications, home automation, smart cards, Communicating data with H/W units, mobiles, tablets, Designing of smart street lights in smart city.	08
References: <ol style="list-style-type: none">1. Olivier Hersent, David Boswarthick, Omar Elloumi “The Internet of Things key applications and protocols”, Willey2. Jeeva Jose, Internet of Things, Khanna Publishing House3. Michael Miller “The Internet of Things” by Pearson4. Raj Kamal “INTERNET OF THINGS”, McGraw-Hill, 1ST Edition, 20165. Arshdeep Bahga, Vijay Madisetti “ Internet of Things(A hands on approach)” 1ST edition, VPI publications, 20146. Adrian McEwen, Hakin Cassimally “Designing the Internet of Things” Wiley India		



G.L. Bajaj Institute of Technology and Management
Information Technology – E Syllabus

RCS-E22: NEURAL NETWORK		3-0-0
Unit	Topic	Proposed Lecture
I	Neuro Computing and Neuroscience: Historical notes, human Brain, neuron Mode I, Knowledge representation, AI and NN. Learning process: Supervised and unsupervised learning, Error correction learning, competitive learning, adaptation, statistical nature of the learning process.	08
II	Data Processing Scaling: Normalization, Transformation (FT/FFT), principal component analysis, regression, co-variance matrix, Eigen values & Eigen vectors. Basic Models of Artificial neurons, activation Functions, aggregation function, single neuron computation, multilayer perceptron, least mean square algorithm, gradient descent rule, nonlinearly separable problems and bench mark problems in NN.	08
III	Multilayered Network Architecture: Back propagation algorithm, heuristics for making BP-algorithm performs better. Accelerated learning BP (like recursive least square, quick prop, RPROP algorithm), approximation properties of RBF networks and comparison with multilayer perceptron.	08
IV	Recurrent Network and Temporal Feed-Forward Network: Implementation with BP, self organizing map and SOM algorithm, properties of feature map and computer simulation. Principal component and Independent component analysis, application to image and signal processing	08
V	Complex Valued NN and Complex Valued BP: Analyticity of Activation function, application in 2D information processing. Complexity analysis of network models. Soft computing, Neuro-Fuzzy-genetic algorithm Integration	08
References: 1. J.A. Anderson, An Introduction to Neural Networks, MIT 2. Hagen Demuth Beale, Neural Network Design, Cengage Learning 3. Munesh Chandra Trivedi, NN Jani, Artificial Neural Network Technology, Khanna Publishing House 4. Laurene V. Fausett, "Fundamentals of Neural Networks : Architectures, Algorithms and Applications", Pearson India 5. Kosko, Neural Network and Fuzzy Sets, PHI 5. Hagan, Neural Network Design w/CD, Cengage Learning		



G.L. Bajaj Institute of Technology and Management

Information Technology – E Syllabus

RCS-651: COMPUTER NETWORKS LAB

1. To learn handling and configuration of networking hardware like RJ-45 connector, CAT-6 cable, crimping tool, etc.
2. Configuration of router, hub, switch etc. (using real devices or simulators)
3. Running and using services/commands like ping, traceroute, nslookup, arp, telnet, ftp, etc.
4. Network packet analysis using tools like Wireshark, tcpdump, etc.
5. Network simulation using tools like Cisco Packet Tracer, NetSim, OMNeT++, NS2, NS3, etc.
6. Socket programming using UDP and TCP (e.g., simple DNS, data & time client/server, echo client/server, iterative & concurrent servers)
7. Programming using raw sockets
8. Programming using RPC

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

RCS-652: COMPILER DESIGN LAB

1. Implementation of LEXICAL ANALYZER for IF STATEMENT
2. Implementation of LEXICAL ANALYZER for ARITHMETIC EXPRESSION
3. Construction of NFA from REGULAR EXPRESSION
4. Construction of DFA from NFA
5. Implementation of SHIFT REDUCE PARSING ALGORITHM
6. Implementation of OPERATOR PRECEDENCE PARSER
7. Implementation of RECURSIVE DESCENT PARSER
8. Implementation of CODE OPTIMIZATION TECHNIQUES
9. Implementation of CODE GENERATOR

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.



G.L. Bajaj Institute of Technology and Management

Information Technology – E Syllabus

RCS-653 Web Technology Lab

It is expected that student will apply concept of Java and Advance Java in Lab :

1. Write HTML/Java scripts to display your CV in navigator, your Institute website, Department Website and Tutorial website for specific subject
 2. Design HTML form for keeping student record and validate it using Java script.
 3. Write an HTML program to design an entry form of student details and send it to store at database server like SQL, Oracle or MS Access.
 4. Write programs using Java script for Web Page to display browsers information.
 5. Write a Java applet to display the Application Program screen i.e. calculator and other.
 6. Writing program in XML for creation of DTD, which specifies set of rules. Create a style sheet in CSS/ XSL & display the document in internet explorer.
 7. Program to illustrate JDBC connectivity. Program for maintaining database by sending queries. Design and implement a simple servlet book query with the help of JDBC & SQL. Create MS Access Database, Create on ODBC link, Compile & execute JAVA JDVC Socket.
 8. Install TOMCAT web server and APACHE. Access the above developed static web pages for books web site, using these servers by putting the web pages developed .
 9. Assume four users user1, user2, user3 and user4 having the passwords pwd1, pwd2, pwd3 and pwd4 respectively. Write a servlet for doing the following. Create a Cookie and add these four user id's and passwords to this Cookie. 2. Read the user id and passwords entered in the Login form and authenticate with the values available in the cookies.
 10. Install a database (Mysql or Oracle). Create a table which should contain at least the following fields: name, password, email-id, phone number Write a java program/servlet/JSP to connect to that database and extract data from the tables and display them. Insert the details of the users who register with the web site, whenever a new user clicks the submit button in the registration page.
1. Write a JSP which insert the details of the 3 or 4 users who register with the web site by using registration form. Authenticate the user when he submits the login form using the user name and password from the database
 2. Design and implement a simple shopping cart example with session tracking API.



G.L. Bajaj Institute of Technology and Management **Information Technology – E Syllabus**

RCS-654: Data Warehousing & Data Mining Lab

It is expected that student should implement concept of Data Mining and Warehousing. The open source Data Mining Tools like Rapid Miner, Weka etc. can be used to implement the concept of Data Mining and Warehousing. Some examples are as follows (Subject Teacher may add more):

1. Implementation of OLAP operations
2. Implementation of Varying Arrays
3. Implementation of Nested Tables
4. Demonstration of any ETL tool
5. Write a program of Apriori algorithm using any programming language.
6. Create data-set in .arff file format. Demonstration of preprocessing on WEKA data-set.
7. Demonstration of Association rule process on data-set contact lenses.arff /supermarket (or any other data set) using apriori algorithm.
8. Demonstration of classification rule process on WEKA data-set using j48 algorithm.
9. Demonstration of classification rule process on WEKA data-set using Naive Bayes algorithm.
10. Demonstration of clustering rule process on data-set iris.arff using simple k-means.



G.L. Bajaj Institute of Technology and Management
Information Technology – E Syllabus

Syllabus for FOURTH Year (EVEN Sem.)

Department of Information Technology



G.L. Bajaj Institute of Technology and Management
Information Technology – E Syllabus

STUDY EVALUATION SCHEME

Fourth YEAR
SEMESTER –VIII

Sl. No.	Subject Code	Subject Name	L-T-P	Th/Lab Marks	Sessional		Total	Credit
				ESE	CT	TA		
1	Open Elective-2	Open Elective Course-2	3--0--0	70	20	10	100	3
2	IT Elective-5	Deptt Elective Course-5	3--1--0	70	20	10	100	4
3	IT Elective-6	Deptt Elective Course-6	3--0--0	70	20	10	100	3
4	RIT851	Seminar	0--0--3			100	100	2
5	RIT852	Project	0--0--12	350		250	600	12
	TOTAL			560	60	380	1000	24

IT-ELECTIVE-5

1. RCS080 Machine Learning (Mapping with MOOCS: https://onlinecourses.nptel.ac.in/noc17_cs17/preview
https://onlinecourses.nptel.ac.in/noc17_cs26/preview)
2. RCS081 Game Programming
3. RCS082 Image Processing (Mapping with MOOCS: https://onlinecourses.nptel.ac.in/noc18_ee40/preview
<https://nptel.ac.in/courses/106105032/>)
4. RCS083 Parallel and Distributed Computing (Mapping with MOOCS: <https://nptel.ac.in/courses/106102114/>,
<https://nptel.ac.in/courses/106104024/>)

IT-ELECTIVE-6

1. RCS085 Speech Natural language processing (Mapping with MOOCS: <https://nptel.ac.in/courses/106101007/>
<https://nptel.ac.in/courses/106105158/>)
2. RCS086 Deep Learning (Mapping with MOOCS: https://onlinecourses.nptel.ac.in/noc18_cs41/preview)
3. RCS087 Data Compression
4. RCS088 Quantum Computing (Mapping with MOOCS: https://onlinecourses.nptel.ac.in/noc18_cy07/)



G.L. Bajaj Institute of Technology and Management
Information Technology – E Syllabus

MACHINE LEARNING		
DETAILED SYLLABUS		3-1-0
Unit	Topic	Proposed Lecture
I	INTRODUCTION – Well defined learning problems, Designing a Learning System, Issues in Machine Learning; THE CONCEPT LEARNING TASK - General-to-specific ordering of hypotheses, Find-S, List then eliminate algorithm, Candidate elimination algorithm, Inductive bias	08
II	DECISION TREE LEARNING - Decision tree learning algorithm-Inductive bias- Issues in Decision tree learning; ARTIFICIAL NEURAL NETWORKS – Perceptrons, Gradient descent and the Delta rule, Adaline, Multilayer networks, Derivation of backpropagation rule Backpropagation Algorithm Convergence, Generalization;	08
III	Evaluating Hypotheses: Estimating Hypotheses Accuracy, Basics of sampling Theory, Comparing Learning Algorithms; Bayesian Learning: Bayes theorem, Concept learning, Bayes Optimal Classifier, Naïve Bayes classifier, Bayesian belief networks, EM algorithm;	08
IV	Computational Learning Theory: Sample Complexity for Finite Hypothesis spaces, Sample Complexity for Infinite Hypothesis spaces, The Mistake Bound Model of Learning; INSTANCE-BASED LEARNING – k-Nearest Neighbour Learning, Locally Weighted Regression, Radial basis function networks, Case-based learning	08
V	Genetic Algorithms: an illustrative example, Hypothesis space search, Genetic Programming, Models of Evolution and Learning; Learning first order rules-sequential covering algorithms-General to specific beam search-FOIL; REINFORCEMENT LEARNING - The Learning Task, Q Learning.	08
Text books: <ol style="list-style-type: none">1. Tom M. Mitchell, —Machine Learning, McGraw-Hill Education (India) Private Limited, 2013.2. Ethem Alpaydin, —Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press 2004.3. Stephen Marsland, —Machine Learning: An Algorithmic Perspective, CRC Press, 2009.4. Bishop, C., Pattern Recognition and Machine Learning, Berlin: Springer-Verlag.		



G.L. Bajaj Institute of Technology and Management
Information Technology – E Syllabus

GAME PROGRAMMING		
DETAILED SYLLABUS		3-1-0
Unit	Topic	Proposed Lecture
I	3D GRAPHICS FOR GAME PROGRAMMING : 3D Transformations, Quaternions, 3D Modeling And Rendering, Ray Tracing, Shader Models, Lighting, Color, Texturing, Camera And Projections, Culling And Clipping, Character Animation, Physics-Based Simulation, Scene Graphs.	08
II	GAME ENGINE DESIGN: Game Engine Architecture, Engine Support Systems, Resources And File Systems, Game Loop And Real-Time Simulation, Human Interface Devices, Collision And Rigid Body Dynamics, Game Profiling.	08
III	GAME PROGRAMMING : Application Layer, Game Logic, Game Views, Managing Memory, Controlling The Main Loop, Loading And Caching Game Data, User Interface Management, Game Event Management.	08
IV	GAMING PLATFORMS AND FRAMEWORKS: 2D And 3D Game Development Using Flash, DirectX, Java, Python, Game Engines – DX Studio, Unity.	08
V	GAME DEVELOPMENT: Developing 2D And 3D Interactive Games Using DirectX Or Python – Isometric And Tile Based Games, Puzzle Games, Single Player Games, Multi Player Games.	08

Text books:

1. Mike Mc Shaffrfy And David Graham, “Game Coding Complete”, Fourth Edition, Cengage Learning, PTR, 2012.
2. Jason Gregory, “Game Engine Architecture”, CRC Press / A K Peters, 2009.
3. David H. Eberly, “3D Game Engine Design, Second Edition: A Practical Approach To Real-Time Computer Graphics” 2nd Editions, Morgan Kaufmann, 2006.
4. Ernest Adams And Andrew Rollings, “Fundamentals Of Game Design”, 2nd Edition Prentice Hall / New Riders, 2009.
5. Eric Lengyel, “Mathematics For 3D Game Programming And Computer Graphics”, 3rd Edition, Course Technology PTR, 2011.
6. Jesse Schell, The Art Of Game Design: A Book Of Lenses, 1st Edition, CRC Press, 2008.



G.L. Bajaj Institute of Technology and Management
Information Technology – E Syllabus

IMAGE PROCESSING		
DETAILED SYLLABUS		3-1-0
Unit	Topic	Proposed Lecture
I	DIGITAL IMAGE FUNDAMENTALS: Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels – Color image fundamentals – RGB, HSI models, Two-dimensional mathematical preliminaries, 2D transforms – DFT, DCT.	08
II	IMAGE ENHANCEMENT : Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering– Smoothing and Sharpening Spatial Filtering, Frequency Domain: Introduction to Fourier Transform– Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters, Homomorphic filtering, Color image enhancement.	08
III	IMAGE RESTORATION : Image Restoration – degradation model, Properties, Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering	08
IV	IMAGE SEGMENTATION: Edge detection, Edge linking via Hough transform – Thresholding – Region based segmentation – Region growing – Region splitting and merging – Morphological processing- erosion and dilation, Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed segmentation algorithm.	08
V	IMAGE COMPRESSION AND RECOGNITION: Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG standard, MPEG. Boundary representation, Boundary description, Fourier Descriptor, Regional Descriptors – Topological feature, Texture – Patterns and Pattern classes – Recognition based on matching.	08
Text books: <ol style="list-style-type: none">1. Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing Pearson, Third Edition, 20102. Anil K. Jain, Fundamentals of Digital Image Processing Pearson, 2002.3. Kenneth R. Castleman, Digital Image Processing Pearson, 2006.4. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, Digital Image Processing using MATLAB Pearson Education, Inc., 2011.5. D.E. Dudgeon and RM. Mersereau, Multidimensional Digital Signal Processing Prentice Hall Professional Technical Reference, 1990.6. William K. Pratt, Digital Image Processing John Wiley, New York, 20027. Milan Sonka et al Image processing, analysis and machine vision Brookes/Cole, Vikas Publishing House, 2nd edition, 1999		



G.L. Bajaj Institute of Technology and Management
Information Technology – E Syllabus

PARALLEL AND DISTRIBUTED COMPUTING		
DETAILED SYLLABUS		3-1-0
Unit	Topic	Proposed Lecture
I	Introduction: Scope , issues, applications and challenges of Parallel and Distributed Computing Parallel Programming Platforms: Implicit Parallelism: Trends in Microprocessor Architectures, Dichotomy of Parallel Computing Platforms, Physical Organization, Communication Costs in Parallel Machines, Routing Mechanisms for Interconnection Networks, GPU, co-processing. Principles of Parallel Algorithm Design: Decomposition Techniques, Characteristics of Tasks and Interactions, Mapping Techniques for Load Balancing.	08
II	CUDA programming model: Overview of CUDA, Isolating data to be used by parallelized code, API function to allocate memory on parallel computing device, to transfer data, Concepts of Threads, Blocks, Grids, Developing a kernel function to be executed by individual threads, Execution of kernel function by parallel threads, transferring data back to host processor with API function.	08
III	Analytical Modeling of Parallel Programs: Sources of Overhead in Parallel Programs, Performance Metrics for Parallel Systems, The Effect of Granularity on Performance, Scalability of Parallel Systems, Minimum Execution Time and Minimum Cost-Optimal Execution Time	08
IV	Dense Matrix Algorithms: Matrix-Vector Multiplication, Matrix-Matrix Multiplication, Issues in Sorting on Parallel Computers, Bubble Sort and Variants, Quick Sort, Other Sorting Algorithms Graph Algorithms: Minimum Spanning Tree: Prim's Algorithm, Single-Source Shortest Paths: Dijkstra's Algorithm, All-Pairs Shortest Paths, Transitive Closure, Connected Components, Algorithms for Sparse Graph	08
V	Search Algorithms for Discrete Optimization Problems: Sequential Search Algorithms, Parallel Depth-First Search, Parallel Best-First Search, Speedup Anomalies in Parallel Search Algorithms	08
Text books: 1. A Grama, A Gupta, G Karypis, V Kumar. Introduction to Parallel Computing (2nd ed.). Addison Wesley, 2003. 2. C Lin, L Snyder. Principles of Parallel Programming. USA: Addison-Wesley Publishing Company, 2008. 3. J Jeffers, J Reinders. Intel Xeon Phi Coprocessor High-Performance Programming. Morgan Kaufmann Publishing and Elsevier, 2013. 4. T Mattson, B Sanders, B Massingill. Patterns for Parallel Programming. Addison-Wesley Professional, 2004.		



G.L. Bajaj Institute of Technology and Management
Information Technology – E Syllabus

SPEECH AND NATURAL LANGUAGE PROCESSING		
DETAILED SYLLABUS		3-0-0
Unit	Topic	Proposed Lecture
I	<p>INTRODUCTION : Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM – Regular Expressions, Finite-State Automata – English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance</p> <p>WORD LEVEL ANALYSIS Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part-of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models.</p>	08
II	<p>SYNTACTIC ANALYSIS Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow parsing – Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs – Feature structures, Unification of feature structures.</p>	08
III	<p>SEMANTICS AND PRAGMATICS Requirements for representation, First-Order Logic, Description Logics – Syntax-Driven Semantic analysis, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, selectional restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods.</p>	08
IV	<p>BASIC CONCEPTS of Speech Processing : Speech Fundamentals: Articulatory Phonetics – Production And Classification Of Speech Sounds; Acoustic Phonetics – Acoustics Of Speech Production; Review Of Digital Signal Processing Concepts; Short-Time Fourier Transform, Filter-Bank And LPC Methods.</p>	08



G.L. Bajaj Institute of Technology and Management
Information Technology – E Syllabus

V	<p>SPEECH ANALYSIS:</p> <p>Features, Feature Extraction And Pattern Comparison Techniques: Speech Distortion Measures– Mathematical And Perceptual – Log–Spectral Distance, Cepstral Distances, Weighted Cepstral Distances And Filtering, Likelihood Distortions, Spectral Distortion Using A Warped Frequency Scale, LPC, PLP And MFCC Coefficients, Time Alignment And Normalization – Dynamic Time Warping, Multiple Time – Alignment Paths.</p> <p>UNIT III : SPEECH MODELING :</p> <p>Hidden Markov Models: Markov Processes, HMMs – Evaluation, Optimal State Sequence – Viterbi Search, Baum-Welch Parameter Re-Estimation, Implementation Issues.</p>	08
----------	--	-----------

Text books:

1. Daniel Jurafsky, James H. Martin—Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014.
2. Steven Bird, Ewan Klein and Edward Loper, —Natural Language Processing with Python, First Edition, OReilly Media, 2009.
3. Lawrence Rabiner And Biing-Hwang Juang, “Fundamentals Of Speech Recognition”, Pearson Education, 2003.
Daniel Jurafsky And James H Martin, “Speech And Language Processing – An Introduction To Natural Language Processing, Computational Linguistics, And Speech Recognition”, Pearson Education, 2002.
4. Frederick Jelinek, “Statistical Methods Of Speech Recognition”, MIT Press, 1997.
5. Breck Baldwin, —Language Processing with Java and LingPipe Cookbook, Atlantic Publisher, 2015. Richard M Reese, —Natural Language Processing with Java, OReilly Media, 2015.
6. Nitin Indurkha and Fred J. Damerau, —Handbook of Natural Language Processing, Second Edition, Chapman and Hall/CRC Press, 2010.
7. Tanveer Siddiqui, U.S. Tiwary, —Natural Language Processing and Information Retrieval, Oxford University Press, 2008.
8. Press, 2008.



G.L. Bajaj Institute of Technology and Management
Information Technology – E Syllabus

DEEP LEARNING

DETAILED SYLLABUS

3-0-0

Unit	Topic	Proposed Lecture
I	INTRODUCTION : Introduction to machine learning- Linear models (SVMs and Perceptrons, logistic regression)- Intro to Neural Nets: What a shallow network computes- Training a network: loss functions, back propagation and stochastic gradient descent- Neural networks as universal function approximates	08
II	DEEP NETWORKS : History of Deep Learning- A Probabilistic Theory of Deep Learning- Backpropagation and regularization, batch normalization- VC Dimension and Neural Nets-Deep Vs Shallow Networks-Convolutional Networks- Generative Adversarial Networks (GAN), Semi-supervised Learning	08
III	DIMENSIONALITY REDUCTION 9 Linear (PCA, LDA) and manifolds, metric learning - Auto encoders and dimensionality reduction in networks - Introduction to Convnet - Architectures – AlexNet, VGG, Inception, ResNet - Training a Convnet: weights initialization, batch normalization, hyperparameter optimization	08
IV	OPTIMIZATION AND GENERALIZATION : Optimization in deep learning– Non-convex optimization for deep networks- Stochastic Optimization Generalization in neural networks- Spatial Transformer Networks- Recurrent networks, LSTM - Recurrent Neural Network Language Models- Word-Level RNNs & Deep Reinforcement Learning - Computational & Artificial Neuroscience	08
V	CASE STUDY AND APPLICATIONS : Imagenet- Detection-Audio WaveNet-Natural Language Processing Word2Vec - Joint Detection-Bioinformatics- Face Recognition- Scene Understanding- Gathering Image Captions	08

Text books:

1. Cosma Rohilla Shalizi, Advanced Data Analysis from an Elementary Point of View, 2015.
2. Deng & Yu, Deep Learning: Methods and Applications, Now Publishers, 2013.
3. Ian Goodfellow, Yoshua Bengio, Aaron Courville, Deep Learning, MIT Press, 2016.
4. Michael Nielsen, Neural Networks and Deep Learning, Determination Press, 2015.



G.L. Bajaj Institute of Technology and Management
Information Technology – E Syllabus

DATA COMPRESSION		
DETAILED SYLLABUS		3-0-0
Unit	Topic	Proposed Lecture
I	Compression Techniques: Loss less compression, Lossy Compression, Measures of performance, Modeling and coding, Mathematical Preliminaries for Lossless compression: A brief introduction to information theory, Models: Physical models, Probability models, Markov models, composite source model, Coding: uniquely decodable codes, Prefix codes.	08
II	The Huffman coding algorithm: Minimum variance Huffman codes, Adaptive Huffman coding: Update procedure, Encoding procedure, Decoding procedure. Golomb codes, Rice codes, Tunstall codes, Applications of Hoffman coding: Loss less image compression, Text compression, Audio Compression.	08
III	Coding a sequence, Generating a binary code, Comparison of Binary and Huffman coding, Applications: Bi-level image compression-The JBIG standard, JBIG2, Image compression. Dictionary Techniques: Introduction, Static Dictionary: Diagram Coding, Adaptive Dictionary. The LZ77 Approach, The LZ78 Approach, Applications: File Compression-UNIX compress, Image Compression: The Graphics Interchange Format (GIF), Compression over Modems: V.42 bits, Predictive Coding: Prediction with Partial match (ppm): The basic algorithm, The ESCAPE SYMBOL, length of context, The Exclusion Principle, The Burrows-Wheeler Transform: Move-to-front coding, CALIC, JPEG-LS, Multi-resolution Approaches, Facsimile Encoding, Dynamic Markov Compression.	08
IV	Distortion criteria, Models, Scalar Quantization: The Quantization problem, Uniform Quantizer, Adaptive Quantization, Non uniform Quantization.	08
V	Advantages of Vector Quantization over Scalar Quantization, The Linde-Buzo-Gray Algorithm, Tree structured Vector Quantizers. Structured Vector Quantizers.	08
<p>Text books:</p> <ol style="list-style-type: none"> 1. Khalid Sayood, Introduction to Data Compression, Morgan Kaufmann Publishers 2. Elements of Data Compression, Drozdek, Cengage Learning 3. Introduction to Data Compression, Second Edition, Khalid Sayood, The Morgan Kaufmann Series 4. Data Compression: The Complete Reference 4th Edition by David Salomon, Springer 5. Text Compression 1st Edition by Timothy C. Bell Prentice Hall 		



G.L. Bajaj Institute of Technology and Management
Information Technology – E Syllabus

QUANTUM COMPUTING		
DETAILED SYLLABUS		3-0-0
Unit	Topic	Proposed Lecture
I	Fundamental Concepts: Global Perspectives, Quantum Bits, Quantum Computation, Quantum Algorithms, Quantum Information, Postulates of Quantum Mechanisms.	08
II	Quantum Computation: Quantum Circuits – Quantum algorithms, Single Orbit operations, Control Operations, Measurement, Universal Quantum Gates, Simulation of Quantum Systems, Quantum Fourier transform, Phase estimation, Applications, Quantum search algorithms – Quantum counting – Speeding up the solution of NP – complete problems – Quantum Search for an unstructured database.	08
III	Quantum Computers: Guiding Principles, Conditions for Quantum Computation, Harmonic Oscillator Quantum Computer, Optical Photon Quantum Computer – Optical cavity Quantum electrodynamics, Ion traps, Nuclear Magnetic resonance	08
IV	Quantum Information: Quantum noise and Quantum Operations – Classical Noise and Markov Processes, Quantum Operations, Examples of Quantum noise and Quantum Operations – Applications of Quantum operations, Limitations of the Quantum operations formalism, Distance Measures for Quantum information.	08
V	Quantum Error Correction: Introduction, Shor code, Theory of Quantum Error –Correction, Constructing Quantum Codes, Stabilizer codes, Fault – Tolerant Quantum Computation, Entropy and information – Shannon Entropy, Basic properties of Entropy, Von Neumann, Strong Sub Additivity, Data Compression, Entanglement as a physical resource .	08

Text books:

1. Micheal A. Nielsen. & Issac L. Chiang, “Quantum Computation and Quantum Information”, Cambridge University Press, Fint South Asian edition, 2002.
2. Eleanor G. Rieffel , Wolfgang H. Polak , “Quantum Computing - A Gentle Introduction” (Scientific and Engineering Computation) Paperback – Import,
- 3 Oct 2014 3. Computing since Democritus by Scott Aaronson
4. Computer Science: An Introduction by N. David Mermin
5. Yanofsky's and Mannucci, Quantum Computing for Computer Scientists.