GUJARAT TECHNOLOGICAL UNIVERSITY

ANALYSIS AND DESIGN OF ALGORITHMS
SUBJECT CODE: 2150703
B.E. 5thSEMESTER

Type of course: NA

Prerequisite: Programming (C or C++)**,** Data and file structure

Rationale: Obtaining efficient algorithms is very important in modern computer engineering as the world wants applications to be time and space and energy efficient. This course enables to understand and analyze efficient algorithms for various applications.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks			Practical Marks			
				ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
4	0	2	6	70	20	10	20	10	20	150

Content:

Sr No	Course content	Total Hrs	%Weightage
1	**Basics of Algorithms and Mathematics:** What is an algorithm?, Mathematics for Algorithmic Sets, Functions and Relations, Vectors and Matrices, Linear Inequalities and Linear Equations.	02	2
2	**Analysis of Algorithm:** The efficient algorithm, Average, Best and worst case analysis, Amortized analysis , Asymptotic Notations, Analyzing control statement, Loop invariant and the correctness of the algorithm, Sorting Algorithms and analysis: Bubble sort, Selection sort, Insertion sort, Shell sort Heap sort, Sorting in linear time : Bucket sort, Radix sort and Counting sort	08	10
3	**Divide and Conquer Algorithm:** Introduction, Recurrence and different methods to solve recurrence, Multiplying large Integers Problem, Problem Solving using divide and conquer algorithm - Binary Search, Max-Min problem, Sorting (Merge Sort, Quick Sort), Matrix Multiplication, Exponential.	06	15
4	**Dynamic Programming:** Introduction, The Principle of Optimality, Problem Solving using Dynamic Programming – Calculating the Binomial Coefficient, Making Change Problem, Assembly Line-Scheduling, Knapsack problem, All Points Shortest path, Matrix chain multiplication, Longest Common Subsequence.	05	20
5	**Greedy Algorithm** General Characteristics of greedy algorithms, Problem solving using	05	20

	Greedy Algorithm - Activity selection problem, Elements of Greedy Strategy, Minimum Spanning trees (Kruskal's algorithm, Prim's algorithm), Graphs: Shortest paths, The Knapsack Problem, Job Scheduling Problem, Huffman code.		
6	**Exploring Graphs:** An introduction using graphs and games, Undirected Graph, Directed Graph, Traversing Graphs, Depth First Search, Breath First Search, Topological sort, Connected components,	**04**	**10**
7	**Backtracking and Branch and Bound:** Introduction, The Eight queens problem , Knapsack problem, Travelling Salesman problem, Minimax principle	**03**	**5**
8	**String Matching:** Introduction, The naive string matching algorithm, The Rabin-Karp algorithm, String Matching with finite automata, The Knuth-Morris-Pratt algorithm.	**03**	**8**
9	**Introduction to NP-Completeness:** The class P and NP, Polynomial reduction, NP- Completeness Problem, NP-Hard Problems. Travelling Salesman problem, Hamiltonian problem, Approximation algorithms	**05**	**10**

Suggested Specification table with Marks (Theory):70

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	**30**	**10**	**10**	**5**	**5**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, PHI.
2. Fundamental of Algorithms by Gills Brassard, Paul Bratley, PHI.
3. Introduction to Design and Analysis of Algorithms, Anany Levitin, Pearson.
4. Foundations of Algorithms, Shailesh R Sathe, Penram
5. Design and Analysis of Algorithms, Dave and Dave, Pearson.

Course Outcome:
After learning the course the students should be able to:

1. Analyze the asymptotic performance of algorithms.
2. Derive and solve recurrences describing the performance of divide-and-conquer algorithms.
3. Find optimal solution by applying various methods.
4. Apply pattern matching algorithms to find particular pattern.
5. Differentiate polynomial and nonpolynomial problems.

6. Explain the major graph algorithms and their analyses. Employ graphs to model engineering problems, when appropriate.

List of Experiments:

1. Implementation and Time analysis of sorting algorithms.
   Bubble sort, Selection sort, Insertion sort, Merge sort and Quicksort
2. Implementation and Time analysis of linear and binary search algorithm.
3. Implementation of max-heap sort algorithm
4. Implementation and Time analysis of factorial program using iterative and recursive method
5. Implementation of a knapsack problem using dynamic programming.
6. Implementation of chain matrix multiplication using dynamic programming.
7. Implementation of making a change problem using dynamic programming
8. Implementation of a knapsack problem using greedy algorithm
9. Implementation of Graph and Searching (DFS and BFS).
10. Implement prim's algorithm
11. Implement kruskal's algorithm.
12. Implement LCS problem.

Design based Problems (DP)/Open Ended Problem:
1. From the given string find maximum size possible palindrome sequence
2. Explore the application of Knapsack in human resource selection and courier loading system using dynamic programming and greedy algorithm
3. BRTS route design, considering traffic, traffic on road, and benefits

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.

GUJARAT TECHNOLOGICAL UNIVERSITY

CYBER SECURITY
SUBJECT CODE: 2150002
B.E. 5th SEMESTER

Type of course: NA

Prerequisite: Basic fundamental knowledge of computers, Internet and network

Rationale: NA.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks			Practical Marks			
				ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
0	1	2	3	0	0	0	50	30	20	100

Content:

Sr. No.	Topics	Weightage %
1	**Systems Vulnerability Scanning** Overview of vulnerability scanning, Open Port / Service Identification, Banner / Version Check, Traffic Probe, Vulnerability Probe, Vulnerability Examples, OpenVAS, Metasploit. Networks Vulnerability Scanning - Netcat, Socat, understanding Port and Services tools - Datapipe, Fpipe, WinRelay, Network Reconnaissance – Nmap, THC-Amap and System tools. Network Sniffers and Injection tools – Tcpdump and Windump, Wireshark, Ettercap, Hping Kismet	25
2	**Network Defense tools** Firewalls and Packet Filters: Firewall Basics, Packet Filter Vs Firewall, How a Firewall Protects a Network, Packet Characteristic to Filter, Stateless Vs Stateful Firewalls, Network Address Translation (NAT) and Port Forwarding, the basic of Virtual Private Networks, Linux Firewall, Windows Firewall, Snort: Introduction Detection System	25
3	**Web Application Tools** Scanning for web vulnerabilities tools: Nikto, W3af, HTTP utilities - Curl, OpenSSL and Stunnel, Application Inspection tools – Zed Attack Proxy, Sqlmap. DVWA, Webgoat, Password Cracking and Brute-Force Tools – John the Ripper, L0htcrack, Pwdump, HTC-Hydra	25
4	**Introduction to Cyber Crime and law** Cyber Crimes, Types of Cybercrime, Hacking, Attack vectors, Cyberspace and Criminal Behavior, Clarification of Terms, Traditional Problems Associated with Computer Crime, Introduction to Incident Response, Digital Forensics, Computer Language, Network Language, Realms of the Cyber world, A Brief History of the Internet, Recognizing and Defining Computer Crime, Contemporary Crimes, Computers as Targets, Contaminants and Destruction of Data, Indian IT ACT 2000.	10
5	**Introduction to Cyber Crime Investigation** Firewalls and Packet Filters, password Cracking, Keyloggers and Spyware, Virus and Warms, Trojan and backdoors, Steganography, DOS and DDOS attack, SQL injection, Buffer Overflow, Attack on wireless Networks	15

Reference Books:
1. Anti-Hacker Tool Kit (Indian Edition) by Mike Shema, Publication Mc Graw Hill.
2. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Nina Godbole and Sunit Belpure, Publication Wiley

Course Outcome:

After learning the course the students should be able to: student should understand cyber-attack, types of cybercrimes, cyber laws and also how to protect them self and ultimately society from such attacks

List of Experiments:

1. TCP scanning using NMAP
2. Port scanning using NMAP
3. TCP / UDP connectivity using Netcat
4. Network vulnerability using OpenVAS
5. Web application testing using DVWA
6. Manual SQL injection using DVWA
7. XSS using DVWA
8. Automated SQL injection with SqlMap

Design based Problems (DP)/Open Ended Problem:

GUJARAT TECHNOLOGICAL UNIVERSITY

DISASTER MANAGEMENT
SUBJECT CODE: 2150003
B.E. 5th SEMESTER

Type of course: Applied Mechanics

Prerequisite: NA

Rationale: This subject is conceptual applications of principles of management to mitigate various disasters.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks			Practical Marks			
				ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
3	0	0	3	70	20	10	0	0	0	100

ESE-End Semester Exam, PA-Progressive Assessment, E-External, M-Mid semester, V-Viva (External) , I-Internal

Sr. No.	Topics	Teaching Hrs.	Weightage %
1	**Understanding Disasters** Understanding the Concepts and definitions of Disaster, Hazard, Vulnerability, Risk, Capacity – Disaster and Development, and disaster management	4	10
2	**Types, Trends, Causes, Consequences and Control of Disasters** Geological Disasters (earthquakes, landslides, tsunami, mining); Hydro-Meteorological Disasters (floods, cyclones, lightning, thunder-storms, hail storms, avalanches, droughts, cold and heat waves); Biological Disasters (epidemics, pest attacks, forest fire); Technological Disasters (chemical, industrial, radiological, nuclear) and Man-made Disasters (building collapse, rural and urban fire, road and rail accidents, nuclear, radiological, chemicals and biological disasters); Global Disaster Trends – Emerging Risks of Disasters – Climate Change and Urban Disasters	8	20
3	**Disaster Management Cycle and Framework** Disaster Management Cycle – Paradigm Shift in Disaster Management Pre-Disaster – Risk Assessment and Analysis, Risk Mapping, zonation and Microzonation, Prevention and Mitigation of Disasters, Early Warning System; Preparedness, Capacity Development; Awareness During Disaster – Evacuation – Disaster Communication – Search and Rescue – Emergency Operation Centre – Incident Command System – Relief and Rehabilitation – Post-disaster – Damage and Needs Assessment, Restoration of Critical Infrastructure – Early Recovery – Reconstruction and Redevelopment; IDNDR, Yokohama Strategy, Hyogo Framework of Action	8	20
4	**Disaster Management in India** Disaster Profile of India – Mega Disasters of India and Lessons Learnt Disaster Management Act 2005 – Institutional and Financial Mechanism National Policy on Disaster Management, National Guidelines and Plans on Disaster Management; Role of Government (local, state and national),Non-Government and Inter-Governmental Agencies	10	20
5	**Applications of Science and Technology for Disaster Management & Mitigation** Geo-informatics in Disaster Management (RS, GIS, GPS and RS) Disaster Communication System (Early Warning and Its Dissemination)	12	30

Land Use Planning and Development Regulations		
Disaster Safe Designs and Constructions		
Structural and Non Structural Mitigation of Disasters		
S&T Institutions for Disaster Management in India		

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	**50**	**30**	**10**	**0**	**0**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1 Coppola D P, 2007. Introduction to International Disaster Management, Elsevier Science (B/H), London.
2. Manual on natural disaster management in India, M C Gupta, NIDM, New Delhi
3. An overview on natural & man-made disasters and their reduction, R K Bhandani, CSIR, New Delhi
4. World Disasters Report, 2009. International Federation of Red Cross and Red Crescent, Switzerland
5. Encyclopedia of disaster management, Vol I, II and IIIL Disaster management policy and administration, S L Goyal, Deep & Deep, New Delhi, 2006
6. Encyclopedia of Disasters – Environmental Catastrophes and Human Tragedies, Vol. 1 & 2,Angus M. Gunn, Greenwood Press, 2008
7 Disasters in India Studies of grim reality, Anu Kapur & others, 2005, 283 pages, Rawat Publishers, Jaipur
8. Management of Natural Disasters in developing countries, H.N. Srivastava & G.D. Gupta, Daya Publishers, Delhi, 2006, 201 pages
9. Natural Disasters, David Alexander, Kluwer Academic London, 1999, 632 pages
10 Disaster Management Act 2005, Publisher by Govt. of India
11 Publications of National Disaster Management Authority (NDMA) on Various Templates and Guidelines for Disaster Management
12 NIDM Publications
13 High Power Committee Report, 2001, J.C. Pant
14 Disaster Mitigation in Asia & Pacific, Asian Development Bank
15 National Disaster Management Policy, 2009, GoI
16 Disaster Preparedness Kit, American Red Cross
17 Bryant Edwards (2005): Natural Hazards, Cambridge University Press, U.K.
18 Carter, W. Nick, 1991: Disaster Management, Asian Development Bank, Manila.
19 Sahni, Pardeep et.al. (eds.) 2002, Disaster Mitigation Experiences and Reflections, Prentice Hall of India, New Delhi.
20 Roy, P.S. (2000): Space Technology for Disaster management: A Remote Sensing & GIS Perspective, Indian Institute of Remote Sensing (NRSA) Dehradun.
21 Sharma, R.K. & Sharma, G. (2005) (ed) Natural Disaster, APH Publishing Corporation, New Delhi.
22 Kasperson, J.X., R.E. Kasperson, and B.L. Turner III (Eds.), 1995, Regions at Risk: Comparisons of Threatened Environments, United Nations University Press, Tokyo
23 Singh Satendra (2003): Disaster Management in the Hills, Concept Publishing Company, New Delhi.
24 Taori, K (2005) Disaster Management through Panchayati Raj, Concept Publishing Company, New Delhi.

Course Outcome:

After learning the course the students should be able to:

(a) Understand disasters, disaster preparedness and mitigation measures

(b) Understand role of IT, remote sensing, GIS and GPS in risk reduction

(c) Understand disaster management acts and guidelines along with role of various stack-holders during disasters

List of Open Source Software/learning website:
www.GIS. Development.net
www.iirs.nrsa.org
http://quake.usgs.gov
www.nidmindia.nic.in

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GUJARAT TECHNOLOGICAL UNIVERSITY

COMPUTER ENGINEERING
MICROPROCESSOR AND INTERFACING
SUBJECT CODE: 2150707
B.E. 5TH SEMESTER

Type of course: Core course

Prerequisite: Fundamentals of Digital Logic Design and Computer Organization

Rationale: The modern digital systems including computer systems are designed with microprocessor as central device connected to memory and I/O devices. The subject introduces the students with basics of microprocessor, microprocessor architecture and programming, interfacing microprocessor with memory and various I/O (Input/Output) devices and introduction to the advance processors including RISC based processors.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks			Practical Marks			
				ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
4	0	2	6	70	20	10	20	10	20	150

Content:

Sr. No.	Content	Total HRS	% Weight age
1	Introduction to Microprocessor, Components of a Microprocessor: Registers, ALU and control & timing, System bus (data, address and control bus), Microprocessor systems with bus organization	4	8%
2	Microprocessor Architecture and Operations, Memory, I/O devices, Memory and I/O operations	4	7%
3	8085 Microprocessor Architecture, Address, Data And Control Buses, 8085 Pin Functions, Demultiplexing of Buses, Generation Of Control Signals, Instruction Cycle, Machine Cycles, T-States, Memory Interfacing	6	10%
4	Assembly Language Programming Basics, Classification of Instructions, Addressing Modes, 8085 Instruction Set, Instruction And Data Formats, Writing, Assembling & Executing A Program, Debugging The Programs	6	10%
5	Writing 8085 assembly language programs with decision, making and looping using data transfer, arithmetic, logical and branch instructions	6	10%
6	Stack & Subroutines, Developing Counters and Time Delay Routines, Code Conversion, BCD Arithmetic and 16-Bit Data operations	6	10%
7	Interfacing Concepts, Ports, Interfacing Of I/O Devices, Interrupts In 8085, Programmable Interrupt Controller 8259A, Programmable Peripheral Interface 8255A	8	15%
8	Advanced Microprocessors : 8086 logical block diagram and segments, 80286: Architecture, Registers	8	20%

	(Real/Protected mode), Privilege levels, descriptor cache, Memory access in GDT and LDT, multitasking, addressing modes, flag register 80386: Architecture, Register organization, Memory access in protected mode, Paging 80486 : Only the technical features Pentium : Architecture and its versions			
9	SUN SPARC Microprocessor: Architecture, Register file, data types and instruction format	2	5%
10	ARM Processor: Architecture features, Logical block diagram of ARM7 architecture	2	5%

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
12	20	24	6	4	4

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. Microprocessor Architecture, Programming, and Applications with the 8085, Ramesh S. Gaonkar Pub: Penram International.
2. Microprocessors and Interfacing, N. Senthil Kumar, M. Saravanan, S. Jeevanathan, S. K. Shah, Oxford
3. Advanced Microprocessors, Daniel Tabak, McGrawHill
4. Microprocessor & Interfacing - Douglas Hall, TMH
5. 8086 Programming and Advance Processor Architecture, Savaliya M. T., WileyIndia
6. The 8088 and 8086 Microprocessors, Triebel & Singh, Pearson Education

Course Outcome:

After learning the course the students should be able to:

- List and specify the various features of microprocessor, memory and I/O devices including concepts of system bus.
- Identify the various elements of 8085 microprocessor architecture, its bus organization including control signals.
- List the pin functions of the 8085 microprocessor.
- Describe the 8085 processor addressing modes, instruction classification and function of each instruction and write the assembly language programs using 8085 instructions.
- Explain the concepts of memory and I/O interfacing with 8085 processor with Programmable devices.
- List and describe the features of advance microprocessors.

List of Experiments:

Practical list should be prepared based on the content of the subject and following guidelines should be useful.

- 8085 assembly language programmes covering all the instructions.
- Interfacing practicals using I/O instructions

Following list gives some programming examples. Teacher can prepare their own list in same manner keeping above guidelines and syllabus in mind.

1. Write an 8085 assembly language program for exchanging two 8-bit numbers stored in memory locations 2050h and 2051h.
2. Write an 8085 assembly language program to add two 8-bit numbers stored in memory locations 2050h and 2051h. Store result in location 2052h.
3. Write an 8085 assembly language program to add two 16-bit numbers stored in memory.
4. Write an 8085 assembly language program to add two decimal numbers using DAA instruction.
5. Write an 8085 assembly language program to find the minimum from two 8-bit numbers.
6. Write an 8085 assembly language program to get the minimum from block of N 8-bit numbers.
7. Write an 8085 assembly language program to add block of 8-bit numbers.
8. Write an 8085 assembly language program to find the number of 1's binary representation of given 8-bit number.
9. Write an 8085 assembly language program to count the length of string ended with 0dh starting from location 2050h.
10. Write an 8085 assembly language program to covert given hex digit to its equivalent ASCII number.
11. Write an 8085 assembly language program to compute even parity and insert it as MSB in 8-bit number.
12. Write a subroutine to exchange two 8-bit numbers. Use it to reverse an array of 8-bit numbers.

Design based Problems (DP)/Open Ended Problem:

1. Develop an 8085 Assembly language program to implement the Booth's algorithm to multiply two 8-bit numbers.
2. Develop an 8085 Assembly language program to implement division of two 8-bit numbers.
3. Design a program for Digital Clock with format HH:MM:SS (Address and data field) using inbuild routines of monitor program of your system.
4. Compare the microprocessor and microcontrollers from hardware and software point of view.
5. Prepare a detail report on evaluating overall performance of a microprocessor chip.

Major Equipment:

- 8085 based microprocessor kit
- Modern desktop PC with open source 8085 Simulator

List of Open Source Software/learning website:

- Open source simulator for 8085 processor
- www.nptel.ac.in
- www.intel.com
- **www.cpu-world.com**

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.

GUJARAT TECHNOLOGICAL UNIVERSITY

OBJECT ORIENTED PROGRAMMING USING JAVA
SUBJECT CODE: 2150704
B.E. 5thSEMESTER

Type of course: Core

Prerequisite: none

Rationale: Java is a general-purpose computer programming language that is a class-based, object-oriented. It is intended to let application developers "write once, run anywhere" meaning that compiled Java code can run on all platforms that support Java without the need for recompilation. UML (Unified Modeling Language) is a modeling language used by software developers. UML can be used for modeling a system independent of a platform language. UML is a graphical language for visualizing, specifying, documenting information of software systems. UML is a standard way to write a system model that covers conceptual ideas.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks			Practical Marks			
				ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
4	0	2	6	70	20	10	20	10	20	150

Content:

Sr. No.	Content	Total Hrs	Weightage (Out of 100%)
1	**Basics of Java:** Features of Java, Byte Code and Java Virtual Machine, JDK, Data types, Operator, Control Statements – If , else, nested if, if-else ladders, Switch, while, do-while, for, for-each, break, continue.	2	5
2	**Array and String:** Single and Multidimensional Array, String class, StringBuffer class, Operations on string, Command line argument, Use of Wrapper Class.	2	5
3	**Classes, Objects and Methods:** Class, Object, Object reference, Constructor, Constructor Overloading, Method Overloading, Recursion, Passing and Returning object form Method, new operator, this and static keyword, finalize() method, Access control, modifiers, Nested class, Inner class, Anonymous inner class, Abstract class.	6	15
4	**Inheritance and Interfaces:** Use of Inheritance, Inheriting Data members and Methods, constructor in inheritance, Multilevel Inheritance – method overriding Handle multilevel constructors – super keyword,Stop Inheritance - Final keywords, Creation and Implementation of an interface, Interface reference, instanceof operator, Interface inheritance, Dynamic method dispatch ,Understanding of Java Object Class,Comparison between Abstract Class and interface, Understanding of System.out.println –	6	10

	statement.		
5	**Package:** Use of Package, CLASSPATH, Import statement, Static import, Access control	2	3
6	**Exception Handling:** Exception and Error, Use of try, catch, throw, throws and finally, Built in Exception, Custom exception, Throwable Class.	5	10
7	**Multithreaded Programming:** Use of Multithread programming, Thread class and Runnable interface , Thread priority, Thread synchronization, Thread communication, Deadlock	4	5
8	**IO Programming:** Introduction to Stream, Byte Stream, Character stream, Readers and Writers, File Class, File InputStream, File Output Stream, InputStreamReader, OutputStreamWriter, FileReader, FileWriter, Buffered Reader	5	10
9	**Collection Classes :** List, AbstractList, ArrayList, LinkedList, Enumeration, Vector, Properties, Introuduction to Java.util package	1	2
10	**Networking with java.net** InetAddress class,Socket class, DatagramSocket class, DatagramPacket class	2	5
11	Introduction to Object orientation, Modeling as a Design Technique Modeling Concepts ,abstraction, The three models, Class Model, State model and Interaction model.	1	2
12	Class Modeling Object and class concepts, link and association, Generalization and Inheritance	3	5
13	Advanced class Modeling Advanced Object and class concepts, Association Ends, N-ary associations, aggregation, abstract classes, multiple inheritance, Metadata, Constraints, Derived data, Packages.	3	5
14	State modeling **E**vents, states, Transition and conditions, state diagram, state diagram behavior	2	8
15	Interaction Modeling Use case Models, sequence models, activity models	4	10

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	45	10	5	-	-

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1) Java Fundamentals A comprehensive introduction By Herbert Schildt, Dale Skrien, McGraw Hill Education.
2) Programming with Java A Primer – E.Balaguruswamy,Mc Grawhill
3) The Complete Reference, Java 2 (Fourth Edition),Herbert Schild, - TMH.
4) Core Java Volume-I Fundamentals Horstmann & Cornell, - Pearson Education. - Eight Edition
5) Object Oriented Modeling and Design with UML
   Michael Blaha and James Rambaugh – PEARSON second edition
6) UML Distilled: A Brief Guide to the Standard Object Modeling Language (3rd Edition) by Martin Fowler

Course Outcome:

After learning the course the students should be able to:

    i.   Undertand object oriented programming concepts and implement in java.
   ii.   Comprehend building blocks of OOPs language, inheritance, package and interfaces.
  iii.   Identify exception handling methods.
  iv.   Implement multithreading in object oriented programs.
   v.   Prepare UML diagrams for software system

List of Experiments:

1. Write a program to convert rupees to dollar. 60 rupees=1 dollar.
2. Write a program that calculate percentage marks of the student if marks of 6 subjects are given.
3. Write a program to enter two numbers and perform mathematical operations on them.
4. Write a program to find length of string and print second half of the string.
5. Write a program to accept a line and check how many consonants and vowels are there in line.
6. Write a program to count the number of words that start with capital letters.
7. Write a program to find that given number or string is palindrome or not.
8. Create a class which ask the user to enter a sentence, and it should display count of each vowel type in the sentence. The program should continue till user enters a word "quit". Display the total count of each vowel for all sentences.
9. Write an interactive program to print a string entrered in a pyramid form. For instance, the string "stream" has to be displayed as follows:

```
           S
         S t
        S  t  r
        S  t  r  e
        S  t  r  e  a
        S  t  r  e  a  m
```

10. Write an interactive program to print a diamond shape. For example, if user enters the number 3, the diamond will be as follows:

```
          *
        * *
       * * *
        * *
         *
```

11. Create a class called Student. Write a student manager program to manipulate the student information from files by using FileInputStream and FileOutputStream
12. Refine the student manager program to manipulate the student information from files by using the BufferedReader and BufferedWriter

13. Refine the student manager program to manipulate the student information from files by using the DataInputStream and DataOutputStream. Assume suitable data
14. Prepare a class diagram for given group of classes using multiplicity, generalization, association concepts. And add at least 5-7 attributes and 3-5 operations for particular class Page, Shape, Point, Line, Arc, Ellipse, Rectangle, Circle
15. Prepare a class diagram for given group of classes using multiplicity,   generalization, association concepts. And add at least 5-7 attributes and 3-5 operations for particular class. City, Airport, Airline, Pilot, Flight, Plane, Seat, Passenger
16. Categorize the following relationships into generalization, aggregation or association.
    [A] A country has a capital city
    [B] A dining philosopher uses a fork
    [C] A file is an ordinary file or a directory file
    [D] Files contains records
    [E] A polygon is composed of an ordered set of points
    [F] A drawing object is text, a geometrical object, or a group
    [G] A person uses a computer language on a object
    [H] Modems and keyboards are input/output devices
    [I] Classes may have several attributes
    [J] A person plays for a team in a certain year
    [K] A route connects two cities
    [L] A student takes a course from a professor
17. Prepare a state diagram for an interactive diagram editor for selecting and dragging objects
18. Prepare a use case diagram and sequence diagram for a computer email system
19. Prepare an activity diagram for computing a restaurant bill, there should be charge for each delivered item. The total amount should be subject to tax and service charge of 18% for group of six and more. For smaller groups there should be a blank entry. Any coupons or gift certificates submitted by the customer should be subtracted
20. Prepare a sequence diagram for issuing a book in the library management system

Design based Problems (DP)/Open Ended Problem:

1) Remove duplicate lines from a large text or given document.

2) Write a program to compute if one string is a rotation of another. For example, pit is rotation of tip as pit has same character as tip.

Major Equipment:

Computer ,Laptop

List of Open Source Software/learning website:

    i.   Java Development Kit:
        http://www.oracle.com/technetwork/java/javase/downloads/index.html
    ii.   http://docs.oracle.com/javase/specs/jls/se7/html/index.html
    iii.   http://docs.oracle.com/javase/tutorial/java/index.html
    iv.   http://www.javatpoint.com/
    v.   http://www.tutorialspoint.com/java/
    vi.   http://www.learnjavaonline.org/
    vii.   http://www.c4learn.com/javaprogramming/
    viii.   http://www.learn-java-tutorial.com/
    ix.   http://www.tutorialspoint.com/uml/
    x.   http://www.uml.org/

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.

GUJARAT TECHNOLOGICAL UNIVERSITY

SYSTEM PROGRAMMING
SUBJECT CODE: 2150708
B.E. 5thSEMESTER

Type of course: System Programming

Prerequisite: Data Structures and Operating Systems

Rationale: NA

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks			Practical Marks			
				ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
4	0	2	6	70	20	10	20	10	20	150

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	Overview of System Software Introduction, Software, Software Hierarchy, Systems Programming, Machine Structure, Interfaces, Address Space, Computer Languages, Tools, Life Cycle of a Source Program, Different Views on the Meaning of a Program, System Software Development, Recent Trends in Software Development, Levels of System Software	06	10%
2	Overview of Language Processors Programming Languages and Language Processors, Language Processing Activities, Program Execution, Fundamental of Language Processing, Symbol Tables Data Structures for Language Processing: Search Data structures, Allocation Data Structures.	06	15%
3	Assemblers Elements of Assembly Language Programming, Design of the Assembler, Assembler Design Criteria, Types of Assemblers, Two-Pass Assemblers, One-Pass Assemblers, Single pass Assembler for Intel x86 , Algorithm of Single Pass Assembler, Multi-Pass Assemblers, Advanced Assembly Process, Variants of Assemblers Design of two pass assembler,	06	15%
4	Macro and Macro Processors Introduction, Macro Definition and Call, Macro Expansion, Nested Macro Calls, Advanced Macro Facilities, Design Of a Macro Pre-processor, Design of a Macro Assembler, Functions of a Macro Processor, Basic Tasks of a Macro Processor, Design Issues of Macro Processors, Features, Macro Processor Design Options, Two-Pass Macro Processors, One-Pass Macro Processors	08	20%
5	Linkers and Loaders	06	20%

	Introduction, Relocation of Linking Concept, Design of a Linker, Self-Relocating Programs, Linking in MSDOS, Linking of Overlay Structured Programs, Dynamic Linking, Loaders, Different Loading Schemes, Sequential and Direct Loaders, Compile-and-Go Loaders, General Loader Schemes, Absolute Loaders, Relocating Loaders, Practical Relocating Loaders, Linking Loaders, Relocating Linking Loaders, Linkers v/s Loaders			
6	Scanning and Parsing Programming Language Grammars, Classification of Grammar, Ambiguity in Grammatic Specification, Scanning, Parsing, Top Down Parsing, Bottom up Parsing, Language Processor Development Tools, LEX, YACC	06	10%	
7	Compilers Causes of Large Semantic Gap, Binding and Binding Times, Data Structure used in Compiling, Scope Rules, Memory Allocation, Compilation of Expression, Compilation of Control Structure, Code Optimization	04	5%	
8	Interpreters & Debuggers Benefits of Interpretation, Overview of Interpretation, The Java Language Environment, Java Virtual Machine, Types of Errors, Debugging Procedures, Classification of Debuggers, Dynamic/Interactive Debugger	04	5%	

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
7	30	33	-	-	-

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1) System Programming by D M Dhamdhere McGraw Hill Publication
2) System Programming by Srimanta Pal OXFORD Publication
3) System Programming and Compiler Construction by R.K. Maurya & A. Godbole.
4) System Software – An Introduction to Systems Programming by Leland L. Beck, 3rd Edition, Pearson Education Asia, 2000
5) System Software by Santanu Chattopadhyay, Prentice-Hall India,2007

Course Outcome:

After learning the course the students should be able to:

1. To understand the execution process of HLL programs.
2. To understand the working of scanners and parsers.

3. To understand the basic design of various system software.
4. To implement various system software.

List of Experiments and Design based Problems (DP)/Open Ended Problem:

(Pl. Note: List of Experiments should be as per theory covered in the class, below mentioned practical are just for the reference purpose)

1. Write a program to implement the lexical analyzer.
2. Write a Lexical Analyzer (using lex utility for UNIX).
3. Write a program to left factor the given grammar.
4. Write a program to remove the Left Recursion from a given grammar.
5. Aim: Implement Recursive Descendent Parsing for the given Grammar.
   E -> T + E / T
   T -> F * T / F
   F -> (E) / i
6. Implement Predictive Parser for the given grammar.
   E -> T + E / T
   T -> F * T / F
   F -> (E) / i
7. Write a SAL program in text file and generate SYMTAB and LITTAB
8. Use macro features of C language
9. Write a program which generates Quadruple Table for the given postfix String
10. Write a C program to parse a given string using Predictive parsing for given grammar.
    type → simple | ↑id | array [simple] of type
    simple → integer | char | num dotdot num

List of Open Source Software/learning website:

- www.cs.jhu.edu/~scott/pl/lectures/parsing.html
- www.en.wikipedia.org/wiki/System_programming

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