GUJARAT TECHNOLOGICAL UNIVERSITY

COMPUTER ENGINEERING (07), INFORMATION TECHNOLOGY (16) & INFORMATION & COMMUNICATION TECHNOLOGY (32)

OPERATING SYSTEM

SUBJECT CODE: 2140702

B.E. 4th SEMESTER

Type of course: Core

Prerequisite: Data structures(stack, queue, linked list, tree, graph), hashing, File structures, Any structured Programming Language (like C),

Rationale: As a core subject of Computer Engineering/Information Technology, this course enables to understand importance of Operating System, its functionalities to manage resources of Computer and Peripherals, program development and its execution. Student will be made aware of Process Management, Memory Management, File Management and I/O Management in detail, which will be useful to them for Large Application Development in engineering field with emphasis given to Linux type of Open Source Operating System.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
				Theory Marks			Practical Marks			
L	T	P	C	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.	Topics	Teaching Hrs.	Module Weightage
1	Introduction: Basics of Operating Systems: Definition – Generations of Operating systems – Types of Operating Systems, OS Service, System Calls, OS structure: Layered, Monolithic, Microkernel Operating Systems – Concept of Virtual Machine	5	10
2	Process Management **Processes:** Definition , Process Relationship , Process states , Process State transitions , Process Control Block ,Context switching – Threads – Concept of multithreads , Benefits of threads – Types of threads **Process Scheduling:** Definition , Scheduling objectives ,Types of Schedulers ,Scheduling criteria : CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time (Definition only) , Scheduling algorithms : Pre emptive and Non , pre emptive , FCFS – SJF – RR , Multiprocessor scheduling : Types , Performance evaluation of the scheduling.	8	14
3	Interprocess Communication Race Conditions, Critical Section, Mutual Exclusion, Hardware Solution, Strict Alternation , Peterson's Solution, The Producer Consumer Problem, Semaphores, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problem etc., Scheduling , Scheduling Algorithms.	6	12

4	**Deadlocks:** Definition,Deadlock characteristics , Deadlock Prevention , Deadlock Avoidance :banker's algorithm, Deadlock detection and Recovery.	4	9
5	**Memory Management** **Basic Memory Management:** Definition ,Logical and Physical address map , Memory allocation : Contiguous Memory allocation – Fixed and variable partition – Internal and External fragmentation and Compaction , Paging : Principle of operation – Page allocation – Hardware support for paging –,Protection and sharing – Disadvantages of paging. **Virtual Memory:** Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page fault , Working Set , Dirty page/Dirty bit – Demand paging (Concepts only) – Page Replacement policies : Optimal (OPT) , First in First Out (FIFO), Second Chance (SC), Not recently used (NRU) and Least Recently used (LRU)	8	15
6	I/O Management Principles of I/O Hardware: I/O devices, Device controllers , Direct memory access Principles of I/O Software: Goals of Interrupt handlers , Device drivers , Device independent I/O software , Secondary-Storage Structure: Disk structure ,Disk scheduling algorithm	4	8
7	File Management File concept, Aaccess methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous,linked, indexed), Free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table),efficiency & performance.	6	15
8	Security & Protection Security Environment, Design Principles Of Security, User Authentication, Protection Mechanism : Protection Domain, Access Control List	3	8
9	Unix/Linux Operating System Development Of Unix/Linux, Role & Function Of Kernel, System Calls, Elementary Linux command & Shell Programming, Directory Structure, System Administration Case study: Linux, Windows Operating System	4	9

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks				
R Level	U Level	A Level	N Level	E Level

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate 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. Operating System Concepts (8th Edition) by Silberschatz, Peter B. Galvin and Greg Gagne, Wiley-Indian Edition (2010).
2. Modern Operating Systems (Third Edition) by Andrew S Tanenbaum, Prentice Hall India (2008).
3. Principles of Operating Systems by Naresh chauhan, Oxford Press (2014).
4. Operating Systems by D.M. Dhamdhere, Tata McGraw Hill 2nd edition.

5. Operating Systems (5th Ed) – Internals and Design Principles by William Stallings, Prentice Hall India, 2000
6. UNIX Concepts and Applications(4th Edition)– by Sumitabha Das, Tata McGraw Hill.
7. Unix Shell Programming – by Yashwant Kanetkar, BPB publications.

Course Outcome:

After learning the course the students should be able to:

1. Operating System Concepts (8th Edition) by Silberschatz, Peter B. Galvin and Greg Gagne, Wiley-Indian Edition (2010).
2. Modern Operating Systems (Third Edition) by Andrew S Tanenbaum, Prentice Hall India (2008).
3. Principles of Operating Systems by Naresh chauhan, Oxford Press (2014).
4. Operating Systems by D.M. Dhamdhere, Tata McGraw Hill 2nd edition.
5. Operating Systems (5th Ed) – Internals and Design Principles by William Stallings, Prentice Hall India, 2000
6. UNIX Concepts and Applications(4th Edition)– by Sumitabha Das, Tata McGraw Hill.
7. Unix Shell Programming – by Yashwant Kanetkar, BPB publications.

List of Experiments:

There should be minimum 10 programs/shell scripts.

Practical List:

1. Study of Basic commands of Linux/UNIX.
2. Study of Advance commands and filters of Linux/UNIX.
3. Write a shell script to generate marksheet of a student. Take 3 subjects, calculate and display total marks, percentage and Class obtained by the student.
4. Write a shell script to find factorial of given number n.
5. Write a shell script which will accept a number b and display first n prime numbers as output.
6. Write a shell script which will generate first n fibonnacci numbers like: 1, 1, 2, 3, 5, 13,…
7. Write a menu driven shell script which will print the following menu and execute the given task.
8. MENU
9. Display calendar of current month
10. Display today's date and time
11. Display usernames those are currently logged in the system
12. Display your name at given x, y position
13. Display your terminal number
14. Exit
15. Write a shell script to read n numbers as command arguments and sort them in descending order.
16. Write a shell script to display all executable files, directories and zero sized files from current directory.
17. Write a shell script to check entered string is palindrome or not.
18. Shell programming using filters (including grep, egrep, fgrep)
19. Study of Unix Shell and Environment Variables.
20. Write a shell script to validate the entered date. (eg. Date format is : dd-mm-yyyy).
21. Write an awk program using function, which convert each word in a given text into capital.
22. Write a program for process creation using C. (Use of gcc compiler).

Assignment – It should consist of theoretical and analytical questions covering the whole syllabus.

Design based Problems (DP)/Open Ended Problem:

Major Equipments: Desktop, Laptop

List of Open Source Software/learning website:

- www.nptel.ac.in

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

COMPUTER ENGINEERING (07), INFORMATION TECHNOLOGY (16) & INFORMATION & COMMUNICATION TECHNOLOGY (32)

OBJECT ORIENTED PROGRAMMING WITH C++

SUBJECT CODE: 2140705

B.E. 4th SEMESTER

Type of course: Core Course

Prerequisite: Programming Fundamentals

Rationale: The object oriented approach for software development has become the de-facto standard for the industry to develop the product based or customized software based on customer demand. The software libraries developed for various fields also follows the phenomena of object oriented development. The subject covers the basic concepts of the object oriented paradigm and popular object oriented programming language C++. The subject covers the basics of C++, objects and classes, Inheritance, Polymorphism, I/O and file management, and advance topics including templates, exceptions and STL (Standard Template Library).

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	4	8	70	20	10	20	10	20	150

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1	**Concepts of OOP :** Introduction OOP, Procedural Vs. Object Oriented Programming, Principles of OOP, Benefits and applications of OOP	4	8%
2	**C++ Basics** : Overview, Program structure, namespace, identifiers, variables, constants, enum, operators, typecasting, control structures	6	10%
3	**C++ Functions :** Simple functions, Call and Return by reference, Inline functions, Macro Vs. Inline functions, Overloading of functions, default arguments, friend functions, virtual functions	6	12%
4	**Objects and Classes :** Basics of object and class in C++, Private and public members, static data and function members, constructors and their types, destructors, operator overloading, type conversion	8	15%
5	**Inheritance :** Concept of Inheritance, types of inheritance: single, multiple, multilevel, hierarchical, hybrid, protected members, overriding, virtual base class	8	15%
6	**Polymorphism :** Pointers in C++, Pointes and Objects, this pointer, virtual and pure virtual functions, Implementing polymorphism	6	10%
7	**I/O and File Management :** Concept of streams, cin and cout objects, C++ stream classes, Unformatted and formatted I/O, manipulators, File stream, C++ File stream classes, File management functions, File modes, Binary and random Files	8	15%
8	**Templates, Exceptions and STL :** What is template? function templates and class templates, Introduction to exception, try-catch-throw, multiple catch, catch all, rethrowing exception, implementing	8	15%

	user defined exceptions, Overview and use of Standard Template Library		

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks				
R Level	U Level	A Level	N Level	E Level
14	24	24	4	4

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate 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. Object Oriented Programming With C++, E Balagurusamy, TMH
2. C++ Programming, Black Book, Steven Holzner, dreamtech
3. Object Oriented Programming in Turbo C++, Robert Lafore, Galgotia
4. Object Oriented Programming with ANSI and Turbo C++, Ashok Kamthane, Pearson
5. The Compete Reference C++, Herbert Schlitz, TMH
6. C++ and Object Oriented Programming Paradigm, PHI
7. C++ : How to Program, 9th Edition, Deitel and Deitel, PHI
8. Object Oriented Programming with C++, Saurav Sahay, Oxford

Course Outcome:

After learning the course the students should be able to:

- Describe the important concepts of object oriented programming like object and class, Encapsulation, inheritance and polymorphism
- Write the skeleton of C++ program.
- Write the simple C++ programs using the variables, operators, control structures, functions and I/O objects cin and cout
- Write the simple object oriented programs in C++ using objects and classes.
- Use features of C++ like type conversion, inheritance, polymorphism, I/O streams and files to develop programs for real life problems.
- Use advance features like temples and exception to make programs supporting reusability and sophistication.
- Use standard template library for faster development.
- Develop the applications using object oriented programming with C++.

List of Experiments:

Practical list should be based on the topics covered. Following guideline is to be kept in mind while framing the list:

- At least 25 programs are to be assigned
- Programs should cover particular feature from syntactic concepts together with OOP feature and definition based on real life problem.
- Practical list should cover entire syllabus.

Design based Problems (DP)/Open Ended Problem:

1. Develop an object oriented application to perform all the basic operations like insert, delete, search on binary tree.
2. Develop an object oriented application to compute the Income-tax for the salaried person.
3. Develop an object oriented system "Visiting Card Management" which allows user to add, delete and update and search the visiting card details.
4. Develop an object oriented system "Student Attendance Management" for recording and analyzing the student attendance.
5. Develop a library for performing various Matrix operations. Use templates to make them generalized for any data type.

Major Equipment:

- Latest Desktop PCs with any C++ compiler

List of Open Source Software/learning website:

- Open source software dev C++
- www.nptel.ac.in
- www.learncpp.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

COMPUTER ENGINEERING (07), INFORMATION TECHNOLOGY (16) & INFORMATION & COMMUNICATION TECHNOLOGY (32)

NUMERICAL AND STATISTICAL METHODS FOR COMPUTER ENGINEERING

SUBJECT CODE: 2140706

B.E. 4th SEMESTER

Type of course: Foundation

Prerequisite: Differentiation, Integration, Matrix operation, Various Mathematical Series, FundamentalMathematics

Rationale: To know about various types of Errors, Calculate the error correction and get actualroot of the equation. Understand different methods of solution of the equations and compare them. Student will be made aware of different numerical and statistical methods which are used in engineering field, with emphasis on how to prepare program for different methods.

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	2	5	70	20	10	20	10	20	150

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1	Mathematical modeling andengineering problem Solving.Approximations and errors. Significant figures, accuracy and precision,Errors, round-off and truncation errors, error propagation.	4	10
2	Roots of Equations: Mathematical background, Bisection, RegulaFalsi, NR method, Secant ,Successive approximation method, Budan's Theorem, Barristow's method, case studies.	6	15
3	Systems of linear algebraic equations: Mathematical background, Gauss elimination; pitfalls and techniques for improvement, matrix inversion and Gauss-Seidel methods, ill- conditional Equations, Predictor-Corrector methods, case studies.	8	20
4	Curve Fitting: Mathematical background, Least squares linear and polynomial regression, Lagrange interpolating Polynomials. Splineinterpolation, Case studies.	6	15
5	Numerical Integration: Newton-Cotes integration formulas; trapezoidalrule and Simpson's rules: Interpolation, case studies.	5	10
6	Ordinary differential equations: Euler's method, Runge-Kutta methods. General methods for boundary value problems, Case studies.	5	10
7	**Statistical Methods:** Frequency distributions, Data analysis, Expectations and moments, Co-relation and regression, Trend analysis, Seasonal effects, Cyclical Fluctuation, Moving average, MSE, Predictions. Non-parametric statistics. Computer-based resampling techniques. Confidence intervals and statistical significance.	8	20

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks				
R Level	U Level	A Level	N Level	E Level

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate 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) Numerical Methods for engineers. S C Chapra and R P Canale .McGrow Hill International Edition
2) Numerical Methods for Scientific & Engineering Computation, M. K. Jain, S.R.K.
3) Introduction to Numerical Analysis - By S. S. Sastry., PHI .
4) Numerical Methods, J B Dixit, Laxmi Publications, New Delhi
5) Statistics and Numerical Methods, Dr Manish Goyal, Laxmi Publications, New Delhi
6) Numerical Methods in Science & Engineering Prog.- By Dr. B. S. Grawal, Khanna Pub., New Delhi.
7) Computer Oriented Numerical Methods, R. S. Salaria.,Khanna Publisher.
8) Miller & Freund's Probability and Statistics for Engineers – By Richard A Johnson., PHI

Course Outcome:

After learning the course the students should be able to:

1. Solve system of linear equations.
2. Understand various methods of modeling.
3. Apply Mathematical Modeling and for Engineering Problem Solving.
4. Solve Mathematical Equations by various methods.
5. Find Best Curve fitting for given data.
6. Apply Numerical Integration.
7. Solve Differential Equations.
8. Understand Statistical Methods for Data Analysis and sampling techniques.
9. Write programs for various numerical and statistical methods

List of Experiments and Open Ended Problems:

Practicals/Programs based on methods covered in the syllabus. There should be minimum 10 programs, out of which 2 should be from statistical portion.

The student should be encouraged to create a menu driven project consisting of various methods studied in the syllabus.

Practical List:

1. Develop a C program to find a root of a non-linear equation using **Bisection method**.
2. Develop a C program to find a root of a non-linear equation using **False Position method.**
3. Develop a C program to find a root of a non-linear equation using **Secant method.**
4. Develop C program to find a root of a non-linear equation using **Newton-Raphson method.**
5. Develop a C program to find a root of a non-linear equation using **Barirstow's method**
6. Develop a C program to implement Simpsons 1/3rd Rule.
7. Develop a C program to solve linear equation using **Gauss Elimination method.**
8. Develop a C program to solve linear equation using **Gauss Seidel method**.
9. Develop a C program to compute the Gauss Jacobi Interactive methods
10. Develop a C program to compute the interpolation value using **Newton's Forward Difference formula.**

11. Develop a C program to compute the interpolation value using **Newton's Backward Difference formula**.
12. Develop a C program to compute derivatives of a tabulated function at a specified value using the Newton interpolation approach.
13. Develop a C program to implement Simpsons 3/8th Rule.
14. Develop a C program to implement Runge- Kutta 2nd order method.
15. Develop a C program to implement fitting of straight line.
16. Write a program to find mean for direct series.
17. Write a program to find median for direct series.
18. Write a program to calculate different percentiles.
19. Write a program to calculate mode for discrete distribution.
20. Write a program to calculate harmonic and geometric means for any distribution.
21. Write a program to calculate probability using binomial distribution and Poisson distribution.

Assignment – It should consist of minimum 10 different problems to be solved covering the whole syllabus.

Major Equipments: Desktop, Laptop

List of Open Source Software/learning website:

1) **www.nptel.ac.in**

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

COMPUTER ENGINEERING (07), INFORMATION TECHNOLOGY (16) & INFORMATION & COMMUNICATION TECHNOLOGY (32)

COMPUTER ORGANIZATION

SUBJECT CODE: 2140707

B.E. 4th SEMESTER

Type of Course: NA

Prerequisite: Basic Understanding of Computer System

Rationale: NA

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
				Theory Marks			Practical Marks			
L	T	P	C	ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
4	1	0	5	70	20	10	30	0	20	150

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1	Computer Data Representation Basic computer data types, Complements, Fixed point representation, Register Transfer and Micro-operations: Floating point representation, Register Transfer language, Register Transfer, Bus and Memory Transfers (Tree-State Bus Buffers, Memory Transfer), Arithmetic Micro-Operations, Logic Micro-Operations, Shift Micro-Operations, Arithmetic logical shift unit	6	10
2	Basic Computer Organization and Design Instruction codes, Computer registers, computer instructions, Timing and Control, Instruction cycle, Memory-Reference Instructions, Input-output and interrupt, Complete computer description, Design of Basic computer, design of Accumulator Unit.	4	10
3	Programming The Basic Computer Introduction, Machine Language, Assembly Language, assembler, Program loops, Programming Arithmetic and logic operations, subroutines, I-O Programming.	4	10
4	Micro programmed Control: Control Memory, Address sequencing, Micro program Example, design of control Unit	3	5
5	Central Processing Unit Introduction, General Register Organization, Stack Organization, Instruction format, Addressing Modes, data transfer and manipulation,Program Control, Reduced Instruction Set Computer (RISC)	4	15
6	Pipeline And Vector Processing Flynn's taxonomy, Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction, Pipeline, RISC Pipeline, Vector Processing, Array Processors	3	10

7	Computer Arithmetic Introduction, Addition and subtraction, Multiplication Algorithms (Booth Multiplication Algorithm), Division Algorithms, Floating Point Arithmetic operations, Decimal Arithmetic Unit.	4	10
8	Input-Output Organization Input-Output Interface, Asynchronous Data Transfer, Modes Of Transfer, Priority Interrupt, DMA, Input-Output Processor (IOP), CPUIOP Communication, Serial communication.	4	10
9	Memory Organization Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory.	2	10
10	Multipreocessors Characteristics of Multiprocessors, Interconnection Structures, Inter-processor Arbitration, Inter-processor Communication and Synchronization, Cache Coherence, Shared Memory Multiprocessors.	4	10

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks				
R Level	U Level	A Level	N Level	E Level

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate 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. M. Morris Mano, Computer System Architecture, Pearson
2. Andrew S. Tanenbaum and Todd Austin, Structured Computer Organization, Sixth Edition, PHI
3. M. Murdocca & V. Heuring, Computer Architecture & Organization, WILEY
4. John Hayes, Computer Architecture and Organization, McGrawHill

Course Outcomes:

After successful completion of the course students should be able to:

1. To apply knowledge of the processor's internal registers and operations by use of a
2. PC based microprocessor simulator.
3. To write assembly language programs and download the machine code that will
4. provide solutions real-world control problems.
5. To eliminate or remove stall by altering order of instructions
6. To write programs using the capabilities of the stack, the program counter, the status register and show how these are used to execute a machine code program.

List of Tutorial:

1) A digital computer has a common bus system for 16 registers of 32 bits each. The bus is constructed with multiplexers.
   How many selection inputs are there in each multiplexer ?
   What size of multiplexers are needed ?
   How many multiplexers are there in the bus ?

2) The following transfer statements specify a memory. Explain the memory operation in each case.
   R2 ←M[AR]
   M[AR]←R3
   R5←M[R5]

3) The adder-subtractor circuit of Fig 4.7 has the following values for input mode M and data inputs A and B. In each case, determine the values of the outputs : S_3, S_2, S_1, S_0 and C_4.

	M	A	B
a.	0	0111	0110
b.	0	1000	1001
c.	1	1100	1000
d.	1	0101	1010
e.	1	0000	0001

4) Design a 4-bit combinational circuit decrementer using four full-adder circuits.

5) Design a digital circuit that performs the four logic operations of exclusive-OR, exclusive-NOR, NOR, and NAND. Use two selection variables. Show the logic diagram of one typical stage.

6) Register A holds the 8bit binary 11011001. Determine the B operand and the logic microoperation to be performed in order to change the value in A to :
   f. 01101101
   g. 11111101

7) The 8bit registers AR, BR, CR and DR initially have the following values :
   AR = 11110010
   BR = 11111111
   CR = 10111001
   DR = 11101010

8) Determine the 8bit values in each register after the execution of the following sequence of microoperations.

AR ←AR + BR
CR ←CR Λ DR, BR ← BR + 1
AR ← AR – CR

9) An output program resides in memory starting from address 2300. It is executed after the computer recognizes an interrupt when FGO becomes a 1 (while IEN = 1).
   a. What instruction must be placed at address 1 ?
   b. What must be the last two instruction of the output program ?

10) Write an assembly level program for the following pseudocode.
   SUM = 0
   SUM = SUM + A + B
   DIF = DIF – C
   SUM = SUM + DIF

11) Write a program loop using a pointer and a counter to clear the contents of hex locations 500 to 5FF with 0.

12) Write an ALP to add two Double-Precision numbers.

13) Write a program that evaluates the logic ex-or of two logic operands.

14) Write a program for the arithmetic shift-left operation. Branch to OVF if an overflow occurs.

15) For the given program below :
    1. Explain in words what the program accomplishes when it is executed. What is the value of location CTR when the computer halts ?
    2. List the address symbol table obtained during the first pass of the assembler.

```
        ORG 100
        CLE
        CLA
        STA CTR
        LDA WRD
        SZA
        BUN ROT
        BUN STP
ROT,    CIL
        SZE
        BUN AGN
        BUN ROT
AGN,    CLE
        ISZ CTR
        SZA
        BUN ROT
STP,    HLT
CTR,    HEX 0
WRD,    HEX 62C1
```

16) Write a subroutine to subtract two numbers. In the calling program, the BSA instruction is followed by the subtrahend and minuend. The difference is returned to the main program in the third location following the BSA instruction.

17) Convert the following into reverse polish notation.
    1) A+B*[C*D+E*(F+G)]
    2) A*[B+C*(D+E)] / [F+G*(H+I)]

18) Explain Stack and evaluate the following expression using stack
    (3+4)*[10(2+6)+8]

List of Open Source Software/learning website:

- NPTEL Lecture Series
- http://www.intel.com/pressroom/kits/quickreffam.htm
- web.stanford.edu/class/ee282/

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

COMPUTER ENGINEERING (07), INFORMATION TECHNOLOGY (16) & INFORMATION & COMMUNICATION TECHNOLOGY (32)

COMPUTER NETWORKS

SUBJECT CODE: 2140709

B.E. 4th SEMESTER

Type of course: Bachelor of Engineering

Prerequisite: data structure and operating system.

Rationale: To understand the basic concepts of computer network and firm foundation for understanding how data communication occurring using computer network. It is based around the OSI Reference Model which deals with the major issues and related protocol studies in the various layers (Physical, Data Link, Network, Transport, Session, Presentation and Application) of the model. This course provides the student with fundamental knowledge of the various aspects of computer networking and enables students to appreciate recent developments in the area. The course will be driven from the engineering perspective.

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.	Topics	Teaching Hrs.	Module Weightage
1	Introduction to computer networks and Internet; Understanding of network and Internet, The network edge, The network core, Understanding of Delay, Loss and Throughput in the packet-switching network, protocols layers and their service model, History of the computer network	07	17
2	Application Layer: Principles of computer applications, Web and HTTP, E-mail, DNS, Socket programming with TCP and UDP	07	18
3	Transport Layer: Introduction and transport layer services, Multiplexing and Demultiplexing, Connection less transport (UDP), Principles of reliable data transfer, Connection oriented transport (TCP), Congestion control.	10	25
4	Network Layer: Introduction, Virtual and Datagram networks, study of router, IP protocol and addressing in the Internet, Routing algorithms, Broadcast and Multicast routing	10	25
5	The Link layer and Local area networks: Introduction and link layer services, error-detection and correction techniques, Multiple access protocols, addressing, Ethernet, switches.	06	15

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks				
R Level	U Level	A Level	N Level	E Level
14	28	20	4	4

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate 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. Computer Networking- A Top-Down approach, 5th edition, Kurose and Ross, Pearson
2. Computer Networks- A Top-Down approach, Behrouz Forouzan, McGraw Hill
3. Computer Networks (4th edition), Andrew Tanenbaum, Prentice Hall
4. Computer Networking and the Internet (5th edition),Fred Halsall, Addison Wesley
5. Data Communications and Networking (4th edition), Behrouz Forouzan, McGraw Hill
6. TCP/IP Protocol Suite (3rd edition), Behrouz Forouzan, McGraw Hill

Course Outcomes:

After successful completion of the course students should be able to:

1. analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies;
2. specify and identify deficiencies in existing protocols, and then go onto formulate new and better protocols;
3. analyze, specify and design the topological and routing strategies for an IP based networking infrastructure
4. Have a working knowledge of datagram and internet socket programming

List of Experiments:

Experiments will be based on the topics taught in the theory

Open ended problems:

1. Solve the travelling salesman problem (TSP) with optimal and shortest routing algorithm.
2. Compatibility issues of IPv6 with existing IPv4.
3. Adaptability of the wired networking protocols in wireless network environments.

Major Equipments:

1. Computer systems
2. LAN trainer kit

List of Open Source Software/learning website:

1. Wireshark packet analyzer, Boson network simulator
2. Netsim
3. NS2

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.