

PANDIT DEENDAYAL PETROLEUM UNIVERSITY GANDHINAGAR**SCHOOL OF TECHNOLOGY****COURSE STRUCTURE FOR B TECH IN INFORMATION & COMMUNICATION TECHNOLOGY**

Semester IV			B Tech in Information & Communication Technology										
Sr. No.	Course Code	Course Name	Teaching Scheme					Examination Scheme					
			L	T	P	C	Hrs/Wk	Theory			Practical		Total
								CE	MS	ES	CE	ES	Marks
1	CP 211T	Design & Analysis of Algorithms	3	1	0	4	4	25	25	50	-	-	100
2	CP 213T	Computer Networks	4	0	0	4	4	25	25	50	-	-	100
3	CP 214T	Computer Organization & Programming	3	1	0	4	4	25	25	50	-	-	100
4	18CP218T	Object Oriented Concepts & Programming	3	0	0	3	3	25	25	50	-	-	100
5	IC 211T	Communication Systems	4	0	0	4	4	25	25	50	-	-	100
6	CP213P	Computer Networks Lab	0	0	2	1	2	-	-	-	25	25	50
7	18CP218P	Object Oriented Concepts & Programming Lab	0	0	2	1	2	-	-	-	25	25	50
8	IC 211P	Communication Systems Lab	0	0	2	1	2	-	-	-	25	25	50
		TOTAL	17	2	6	22	25						650

CE- Continuous Evaluation, MS-Mid Semester; ES – End Semester Exam

Course Code: CP 211T					Course Name: Design & Analysis of Algorithms			
Teaching Scheme					Examination Scheme			
L	T	P	C	Hrs/ Wk	Theory			Total
					Continuous Evaluation	Mid Semester	End Semester	Marks
3	1	0	4	4	25	25	50	100
Prerequisites: Data and File Structures, Discrete Mathematics								
Learning objectives:								
<ul style="list-style-type: none"> To learn theory of algorithm design and various techniques To selectively apply the suitable algorithmic technique to real problems and carry out complexity/performance analysis 								
Unit wise allocation of course content								
UNIT 1 (10 L, 3T)								
Elementary Algorithmic: Efficiency of Algorithms, Average & worst-case analysis, Elementary Operation								
Analysis Techniques: Empirical, mathematical, Asymptotic analysis and related unconditional and conditional notations.								
Analysis of Algorithms: Analyzing control structures: sequencing, “For” loops, Recursive calls, “While” and “repeat” loops, using a barometer, Amortized analysis								
UNIT 2 (10 L, 4T)								
Solving Recurrences: Intelligent guesswork, Homogeneous recurrences, Inhomogeneous Recurrences, Change of variable, Range transformations, Master Theorem, Recurrence Tree								
Data Structures: Heaps, Binomial heaps, Disjoint set structures								
Greedy Algorithms: Graphs: Minimum spanning trees-Kruskal’s algorithm, Prim’s algorithm, Graphs: Shortest paths								
UNIT 3 (10 L, 3T)								
Divide-and-Conquer: Multiplying large integers, Binary search, sorting: sorting by merging, quick sort, finding the median, Matrix multiplication, Exponentiation								
Dynamic Programming: Making Change, The principle of optimality, The Knapsack Problem, Shortest path, Chained matrix multiplication, Approaches using recursion, Memory functions.								
UNIT 4 (9 L, 3T)								
Branch and Bound, Backtracking: Design of some classical problems using branch and bound and Backtracking approaches.								
Brief Overview of NP theory, dealing with higher bounds of computing problems through approximation algorithms.								
Student centering learning: (The student centering learning contents should be declared at the commencement of semester. It should be maximum 10% ; however exact contents is left to faculty)								

Lecture: 39 Hrs
Tutorial: 13 Hrs
Approximate Total: 52 Hrs

Texts and References:

1. Charles E. Leiserson, Thomas H. Cormen, Ronald L. Rivest, Clifford Stein - Introduction to Algorithms, PHI
2. Gilles Brassard & Paul Bratley, Fundamentals of Algorithmic, PHI
3. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekharan, Fundamentals of Computer Algorithms, Galgotia.

Course Outcomes (COs):

At the end of this course students will be able to

1. Understand need of complexity analysis of the algorithm
2. Learn and apply various methods for solving recurrence relations
3. Design and implement greedy algorithms for solving various problems
4. Design and implement dynamic programming algorithms for solving various problems
5. Design and implement branch and bound techniques for solving various problems
6. Apply algorithmic techniques to design optimal solutions

Course Code: 18CP218T					Course Name: Object Oriented Concepts & Programming			
Teaching Scheme					Examination Scheme			
L	T	P	C	Hrs/ Wk	Theory			Total
					Continuous Evaluation	Mid Semester	End Semester	Marks
3	0	0	3	3	25	25	50	100
Prerequisites: Programming Fundamentals								
Learning objectives:								
<ul style="list-style-type: none"> To improve the analytical skills of Object Oriented programming To learn theory and concepts of Object Oriented programming for solving and critical analysis. To apply the object oriented design and programming skills in realistic applications using Java programming language. 								
Unit wise allocation of course content								
UNIT 1 (09 L)								
Object Oriented Concepts: Object-Oriented Programming vs. Non-Object-Oriented Programming, Classes, Objects, Abstraction, Inheritance, Polymorphism, Encapsulation, Associations, Aggregation and Composition, etc.								
Introduction to Java :								
Basics of Java programming, Data types, Variables, Operators, Control structures including selection, Looping, Java methods, Overloading, Math class, Arrays in java.								
UNIT 2 (10 L)								
Objects and Classes :								
Basics of objects and classes in java, Constructors, Finalizer, Visibility modifiers, Methods and objects, Inbuilt classes like String, Character, StringBuffer, File, this reference.								
Inheritance and Polymorphism :								
Inheritance in java, Super and sub class, Overriding, Object class, Polymorphism, Dynamic binding, Generic programming, Casting objects, Instance of operator, Abstract class, Interface in java, Package in java, UTIL package.								
UNIT 3 (10 L)								
I/O programming :								
Text and Binary I/O, Binary I/O classes, Object I/O, Random Access Files.								
Exception Handling:								
Exception handling with try-catch-finally.								
Multithreading in java :								
Thread life cycle and methods, Runnable interface, Thread synchronization, Collections in java.								
UNIT 4 (10 L)								
Event and GUI programming :								
Event handling in java, Event types, Mouse and key events, GUI Basics, Panels, Frames, Layout Managers: Flow Layout, Border Layout, Grid Layout, GUI components like Buttons, Check Boxes, Radio Buttons, Labels, Text Fields, Text Areas, Combo Boxes, Lists, Scroll Bars, Sliders, Windows,								

Menus, Dialog Box, Applet and its life cycle.

Student centering learning: (The student centering learning contents should be declared at the commencement of semester. It should be maximum 10% ; however exact contents is left to faculty)

Lecture: 39 Hrs

Approximate Total: 39 Hrs

Texts and References:

1. The Complete Reference, Java 2 (Fourth Edition), Herbert Schild, TMH.
2. Introduction to Java Programming (Comprehensive Version), Daniel Liang, Pearson.
3. Programming in Java, Sachin Malhotra & Saurabh Chaudhary, Oxford University Press.
4. Murach's Beginning Java 2, Doug Lowe, Joel Murach and Andrea Steelman, SPD.
5. Core Java Volume-I Fundamentals, Horstmann & Cornell, Pearson Education.
6. Java Programming, D. S. Malik, Cengage Learning.
7. Balaguruswamy, Programming with Java – A primer, Tata McGraw Hill

Course Outcomes (COs):

At the end of this course students will be able to

1. Differentiate between object oriented programming and procedural programming paradigm
2. Understand concepts of object oriented programming like encapsulation, inheritance, polymorphism, etc.
3. Design and Implement solutions using object oriented programming concepts
4. Show competence in the use of the Java programming language in the development of small to medium-sized application programs that demonstrate professionally acceptable coding and performance standard
5. Understand the basic principles of the object-oriented programming
6. Demonstrate an introductory understanding of graphical user interfaces, multithreaded programming, and event-driven programming.

Lab Code 18CP218P					Lab Name: Object Oriented Concepts & Programming Lab		
Teaching Scheme					Examination Scheme		
L	T	P	C	Hrs/Wk	Practical		Total
					Continuous evaluation	End semester exam	Marks
0	0	2	1	2	25	25	50
<p>Prerequisites: Computer Programming</p> <p>Course objectives:</p> <ul style="list-style-type: none"> To learn theory and concepts of Object Oriented programming To learn theory and concepts of Object Oriented concepts To apply the object oriented design and programming skills in realistic applications <p>List of Experiments:</p> <ol style="list-style-type: none"> Set up and get familiar with Java programming environment; Study language features of Java (variables, data types, declarations, loop and branch constructs, etc.) Class and Objects: study and implement classes based application using Java Inheritance: study and implement various types of inheritance in Java. Polymorphism: study and implement various types of Polymorphism in Java; Study and implement Abstract class and Interfaces in Java; Study and implement Exception handling in Java Study and implement multi-threaded application in Java Program to demonstrate I/O Operations. GUI programming using Java Applet, Events and AWT 							
<p>Course Outcomes (COs):</p> <p>At the end of this course students will be able to</p> <ol style="list-style-type: none"> Differentiate between object oriented programming and procedural programming paradigm Understand concepts of object oriented programming like encapsulation, inheritance, polymorphism, etc. Design and Implement solutions using object oriented programming concepts Design and Implement multi threaded applications Design and implement GUI based applications Carry out continuous testing of object oriented application 							

Course Code: CP 213T					Course Name: Computer Networks			
Teaching Scheme					Examination Scheme			
L	T	P	C	Hrs/ Wk	Theory			Total
					Continuous Evaluation	Mid Semester	End Semester	Marks
4	0	0	4	4	25	25	50	100

Prerequisites: Discrete Mathematics, Data and File Structures

Learning objectives:

- To understand the communication network design
- understand state-of-the-art in network protocols, architectures,
- To learn the design and implementation of network applications

Unit wise allocation of course content

UNIT 1 (10 L)

Introduction: Nuts and Bolts, Performance parameters: throughput, delay, etc., Layered Architecture (OSI and TCP/IP)

Applications: Network application Design, Socket Programming, Client-server applications, Echo and Chat applications, FTP,DNS, Peer to Peer file sharing application

UNIT 2 (16 L)

Data link layer: Introduction, Media access protocols (ALOHA, CSMA based) , Ethernet 802.3, Token ring 802.5, Reliability Issue: sliding window

Internetworking and Routing: Best effort Service, Virtual Circuits, IP Addressing,

UNIT 3 (9 L)

Internetworking and Routing: Routing Issues, Distance Vector and Link State routing, Intra and Inter Autonomous System Routing (OSPF, RIP, BGP), Broadcast and Multicast Routing Issues

UNIT 4 (17 L)

Transport Layer: End to end delivery issues, Reliable data transfers, Congestion Control, Traffic engineering and Quality of service, TCP, UDP

Advanced Topics: QoS over IP, IPV6, Infrastructure-less networks: wireless ad hoc and sensor networks, and Internet of Things (IoT)

Student centering learning: (The student centering learning contents should be declared at the commencement of semester. It should be maximum 10% ; however exact contents is left to faculty)

Lecture: 52 Hrs

Tutorial: 0 Hrs

Approximate Total: 52 Hrs

Texts and References:

1. James Kurose and Keith Rose, “*Computer Networking: A Top Down Approach*”, Pearson Education
2. Larry L Peterson and Bruce S Davie, “*Computer Networks: A Systems Approach*”, Elsevier
3. Andrew S Tanenbaum, “*Computer Networks*”, Pearson Education
4. Behrouz A Forouzan, “*Data Communication and Networking*”, McGraw Hill

5. William Stallings, "*Data and Computer Communication*", Pearson Education

Course Outcomes (COs):

At the end of this course students will be able to

1. Understand functionality of layered network architecture
2. Illustrate various types of network topologies, network devices and their functions within a network Solve computational problems in the domain of computer networks
3. Use network simulator tool(s) for testing and analysis of different computer network scenarios
4. Configure various network services to meet specific needs
5. Understand different computer network protocols and implement computer network application addressing specific requirements (scalability, security, etc.)

Lab Code CP 213P					Lab Name: Computer Networks Lab		
Teaching Scheme					Examination Scheme		
L	T	P	C	Hrs/Wk	Practical		Total
					Continuous evaluation	End semester exam	Marks
0	0	2	1	2	25	25	50
<p>Prerequisites: Data and File Structures, Discrete Mathematics</p> <p>Course objectives:</p> <ul style="list-style-type: none"> To understand the communication network design understand state-of-the-art in network protocols, architectures, To learn the design and implementation of network applications <p>List of Experiments:</p> <ol style="list-style-type: none"> To study and prepare LAN cables (cross and straight), to configure LAN and perform Static Routing Introduction to Socket Programming- Design and Implement client-server elements of a few network applications e.g. Echo client and server, Time client and server, Online Quiz and Buzzer Application, etc Configure DHCP in a small LAN and understand its functionality using Wireshark/ Packet Tracer Configure DNS in a small LAN and understand its functionality using Wireshark/ Packet Tracer Understand functionality of HTTP using Wireshark/ Packet Tracer Understand functionality of TCP and UDP using Wireshark/ Packet Tracer Configure virtual LAN and understand its functionality using Wireshark/ Packet Tracer Configure OSPF and BGP in a small LAN Configure and install NS2/NS3 and simulate communication between two nodes Simulation of TCP/UDP connections and performance analysis 							
<p>Course Outcomes (COs):</p> <p>At the end of this course students will be able to</p> <ol style="list-style-type: none"> Understand functionality of layered network architecture Illustrate various types of network topologies, network devices and their functions within a network Solve computational problems in the domain of computer networks Use network simulator tool(s) for testing and analysis of different computer network scenarios Configure various network services to meet specific needs Understand different computer network protocols and implement computer network application addressing specific requirements (scalability, security, etc.) 							

Course Code: CP 214T					Course Name: Computer Organization & Programming			
Teaching Scheme					Examination Scheme			
L	T	P	C	Hrs/Wk	Theory			Total
					Continuous Evaluation	Mid Semester	End Semester	Marks
3	1	0	4	4	25	25	50	100

Prerequisites: Digital Logic Design

Learning objectives:

- To understand architecture of digital computer and its operations
- To learn design of various functional units of a digital computer
- To learn techniques for interfacing for memory & input/output devices with a digital computer

Unit wise allocation of course content

UNIT 1 (12 L, 4 T)

Basic Structure of Computers: Block Diagram of General Purpose Computers; Detailed Understanding of Each Functional Unit; Data Transfer Across Bus; Simple Bus Structures With Registers and Memory; Details of Address; Control and Data Bus with Interfacing

Instruction Set: Instruction format; Addressing Modes. Instruction Set of A Simple Real World Microprocessor Covering Data Transfer; Arithmetic; Logical; Control; Subroutine; Stack; Basic I/O and Interrupt Operations

UNIT 2 (12 L, 4 T)

Central Processor Unit Design: Single Bus Architecture; Detailed Design of Execution Unit Using Hardwired Control as well as Microprogrammed Control; Horizontal and Vertical Microinstructions; Concept of Nano-programming; Introduction to RISC and CISC Architectures.

Arithmetic Processor Design: Addition; Subtraction; Multiplication and Division Algorithms in Signed Binary Arithmetic for Fixed and Floating Point Representations and Related Design Standards and Issues

UNIT 3 (12 L, 4 T)

Memory and Input-Output Organisation: Types of Memory; Memory Hierarchies; Organisation of Static and Dynamic Semiconductor Memories; Associative Memory Organization; Cache Organisation. Device Interfacing and Selection; Memory and I/O Mapped I/Os; Modes of Data Transfer-Programmed; Interrupt and DMA Driven I/O-Interrupt Types and Priority Schemes; Synchronous and Asynchronous Data Transfer

UNIT 4 (3 L, 1 T)

Pipeline And Vector Processing: Flynn's taxonomy; Parallel Processing; Pipelining; Arithmetic Pipeline; Instruction; Pipeline; RISC Pipeline; Vector Processing; Array Processors, Assembly Language Programming

Student centering learning: (The student centering learning contents should be declared at the commencement of semester. It should be maximum 10% ; however exact contents is left to faculty)

Lecture: 39 Hrs

Tutorial: 13 hrs

Approximate Total: 52 Hrs

Texts and References:

1. M. Morris Mano, "Computer System Architecture", Pearson Education
2. Yale N. Patt, Sanjay J. Patel, "Introduction to Computing Systems" McGraw Hill
3. Hamacher, Vranesic, Zaky, "Computer Organization", McGraw Hill
4. Andrew S. Tanenbaum and Todd Austin, "Structured Computer Organization", Pearson Education
5. N D Jotwani, "Computer system organization", McGraw Hill
6. R.S.Gaonkar, "Microprocessor Architecture, Programming and Applications with 8085A", Penram International
7. Douglas Hall, Microprocessors and Interfacing, TMH

Course Outcomes (COs):

At the end of this course students will be able to

1. Understand the organization of the control unit, arithmetic and logical unit, memory unit and I/O unit
2. Apply knowledge of the processor's internal registers and operations by use of a PC based microprocessor simulator
3. Implement assembly language programs to provide solutions of given problems
4. Design a basic central processing unit
5. Design interfacing of memory and I/O modules with CPU
6. Compare performance of different types of computer architectures

Course Code: IC 211T					Course Name: Communication Systems			
Teaching Scheme					Examination Scheme			
L	T	P	C	Hrs/ Wk	Theory			Total
					Continuous Evaluation	Mid Semester	End Semester	Marks
4	0	0	4	4	25	25	50	100

Prerequisites: Signals and Systems

Learning objectives:

- To impart knowledge of basic analog and digital communication techniques.
- To facilitate the understanding of the baseband and carrier communications.
- To facilitate the understanding of noise and performance of communication systems in presence of noise.

Unit wise allocation of course content

UNIT 1 (12 L)

ANALOG MODULATION AND DEMODULATION:

Communication system, Modulation and detection, Amplitude Modulation and Demodulation – AM, DSBSC, SSB, VSB, QAM, Angle Modulation and Demodulation, Wideband and narrowband FM, AM and FM Detectors, Use of limiter in FM detection, Noise suppression in FM: Pre-emphasis and de-emphasis.

UNIT 2 (12 L)

RADIO RECEIVER CHARACTERISTICS:

Series and Parallel tuned circuits, Functions of radio receivers, working of super heterodyne radio receivers, tuning ranges, tracking, sensitivity and gain, image rejection, spurious responses, Adjacent channel selectivity, Automatic gain control, Electronically tuned and IC receivers, AM and FM Transmitters and Receivers, FM stereo broadcast, Capture effect and threshold in angle modulation, Comparison of AM and FM.

UNIT 3 (14 L)

DIGITAL BASEBAND COMMUNICATION TECHNIQUES:

Review of Analog and digital Messages, Low pass sampling, Sampling of Bandpass signals, Aliasing, Interpolation, PAM, PPM and PWM, PCM: Quantization, Uniform and non-uniform quantization, Quantization noise, Companding laws, DPCM, DM ADM, and SDM, Time division multiplexing (TDM), Time division duplexing, Data transmission techniques – Line coding, Parallel and serial transmission.

DIGITAL CARRIER COMMUNICATION TECHNIQUES:

Digital Carrier Modulation and Demodulation Techniques: ASK, QAM, FSK, PSK, QPSK, M-ary PSK, DPSK, MSK, GMSK, Coherent and non-coherent detection, Carrier synchronization, Frequency Division Multiplexing (FDM), Frequency division duplexing, Modem concepts and methods.

UNIT 4 (14 L)

NOISE IN COMMUNICATION SYSTEMS

Channel effect, Signal transmission and distortion over a communication channel, Signal energy and energy spectral density, Signal power and power spectral density. Noise Types, Signal to noise ratio (SNR), Noise factor and noise figure, Equivalent input noise generators, Noise temperature, Narrow band noise, PSD of in-phase and quadrature noise, Noise performance in AM, FM, Digital baseband and carrier communication systems, Concept of optimum threshold detection, matched filter, correlation receiver, optimum binary receiver, bit error rate (BER).

Student centering learning: (The student centering learning contents should be declared at the commencement of semester. It should be maximum 10% ; however exact contents is left to faculty)

Lecture: 52 Hrs

Approximate Total: 52 Hrs

Texts and References:

1. B.P.Lathi, Zhi Ding “Modern Digital and Analog Communication Systems”, Oxford University Press.
2. S. Haykin, “Communication Systems”, John Wiley.
3. J. G. Proakis, M. Salehi, “Fundamentals of Communication Systems”, Pearson Education.
4. Frenzel. “Principles of Electronic Communication Systems”, Tata Mc-Graw Hill.
5. Dennis Roddy and John Coolen, “Electronic Communications”, PHI.
6. Wayne Tomasi “Electronic Communications Systems”, Pearson education India.
7. B.Sklar, “Digital Communications Fundamentals and Applications”, Pearson Education.
8. Amitabh Bhattacharya, “Digital Communication”, TMH.
9. Behrouz A Forouzan, “Data Communication and Networking”, McGraw Hill.

Course Outcomes (COs):

At the end of this course students will be able to

1. Understand different modulation and demodulation schemes.
2. Understand difference between analog and digital communication
3. Understand the difference between baseband and carrier communication
4. Understand the effect of noise on performance of communication systems
5. Design a small scale communication system
6. Understand the complexity of communication systems

Lab Code IC 211P					Lab Name: Communication Systems Lab		
Teaching Scheme					Examination Scheme		
L	T	P	C	Hrs/Wk	Practical		Total
					Continuous evaluation	End semester exam	Marks
0	0	2	1	2	25	25	50
<p>Prerequisites: Signals and Systems</p> <p>Course objectives:</p> <ul style="list-style-type: none"> To impart knowledge of basic analog and digital communication techniques. To facilitate the understanding of the baseband and carrier communications. To facilitate the understanding of noise and performance of communication systems in presence of noise. <p>List of Experiments:</p> <ol style="list-style-type: none"> Experiment on different AM techniques: DSB and SSB Transmitter and Receiver Experiment on synchronous detector Experiment on FM Transmitter and Receiver Experiment on FDM technique Experiment on Sampling and reconstruction Experiment on PAM, PPM and PWM techniques Experiment on PCM, DPCM, DM, ADM and SDM techniques Experiment on various ASK, FSK and PSK techniques Experiment on TDM technique Experiment on Companding techniques Simulation of various analog and digital modulation and demodulation techniques Simulation of effect of noise in communication systems Study of AM and FM Radio Systems in India Study of Community Radio Services Design of Small Radio Transmitter and Receiver 							
<p>Course Outcomes (COs):</p> <p>At the end of this course students will be able to</p> <ol style="list-style-type: none"> Understand different modulation and demodulation schemes. Understand difference between analog and digital communication Understand the difference between baseband and carrier communication Understand the effect of noise on performance of communication systems Design a small scale communication system Understand the complexity of communication systems 							