PANDIT DEENDAYAL PETROLEUM UNIVERSITY, GANDHINAGAR
SCHOOL OF TECHNOLOGY

COURSE STRUCTURE FOR B TECH IN INFORMATION & COMMUNICATION TECHNOLOGY													
Semester V			**B Tech in Information & Communication Technology**										
Sr. No.	**Course/Lab Code**	**Course/Lab Name**	**Teaching Scheme**					**Examination Scheme**					
								Theory			**Practical**		**Total**
			L	**T**	**P**	**C**	**Hrs/Wk**	**CE**	**MS**	**ES**	**CE**	**ES**	**Marks**
1	18IC301T	RF Engineering	4	0	0	4	4	25	25	50	-	-	100
2	18IC301P	RF Engineering Lab	0	0	2	1	2	-	-	-	25	25	50
3	18CP301T	Operating Systems	4	0	0	4	4	25	25	50	-	-	100
4	18CP301P	Operating Systems Lab	0	0	2	1	2	-	-	-	25	25	50
5	18CP304	Software Engineering	3	0	0	3	3	25	25	50	-	-	100
6	17CP202T	Database Management Systems	3	1	0	4	4	25	25	50	-	-	100
7	17CP202P	Database Management Systems Lab	0	0	2	1	2	-	-	-	25	25	50
8	18CP306	Principles of Economics	3	0	0	3	3	25	25	50	-	-	100
		Total	17	1	6	21	24	-	-	-	-	-	650

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

Course Code: 18IC301T					Course Name: RF Engineering			
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: Physics, Communication Systems.

Learning Objective:

- To understand the basic RF components
- To understand behavior of wave in bounded and unbounded media.
- To understand the working of RF sources
- To understand the working and basics of antenna
- To understand the fundamentals of Radar technology
- To study the design of microstrip antenna.

UNIT 1 (20L)

Electromagnetics: Maxwell's equations, pointing theorem, uniform plane wave and reflection, plane wave propagation in free space and lossless & lossy media.

Transmission line: transmission line equation and solution, reflection and transmission coefficients, standing wave and standing wave ratio, line impedance, Smith chart, impedance matching.

Waveguide: Introduction, modes (TEM, TE_{mn}, TM_{mn}), excitation of modes in rectangular and cylindrical waveguides, field pattern, Rectangular waveguide: characteristics equation, guided wavelength, phase velocity, group velocity, Cylindrical waveguide: characteristics equation, guided wavelength, phase velocity, group velocity, TEM wave in Cylindrical waveguide, waveguide cavity: introduction, application.

S-parameters, waveguide Tees, bands, corners, twists, posts, irises, directional couplers, Faraday's rotation, circulator and isolator, microstrip line (construction, char.), strip line (construction, char.).

UNIT 2 (10L)

RF sources: Introduction to microwave, RF frequency bands, Drawback of conventional tubes, Tubes (2 cavity Klystron, Reflex klystron, Magnetron), semiconductor source (Tunnel diode, Gunn diode, IMPATT), Introduction to BJT at high frequency (power frequency limitation).

UNIT 3 (13L)

Antenna and Radar Basics: Radiation Mechanism and Current Distribution, Fundamental Parameters related to antenna (Radiation Pattern, Radiation Power Density, Directivity, Gain, Beam width, Antenna Efficiency, Bandwidth, Polarization, Radiation Efficiency, Antenna Factor), Far Field Radiation, , Duality theorem, reciprocity theorem.

Antenna Array: Two Element Array N-Element Linear Array with uniform amplitude and spacing, Broadside and End-Fire Array, N-Element Linear Array.

Microstrip antenna: Introduction to strip line and microstrip lines, Advantages and limitations, feeding techniques, introduction to rectangular microstrip antenna, RMSA and CMSA design, filters design using microstrip line.

Radar: Introduction (basic principle and types), radar range equation, maximum unambiguous range,

pulse radar and introduction to Doppler & MTI radar, blind speed.

UNIT 4 (9L)

Wave Propagation: Introduction, various modes of propagation, Virtual height, MUF and Skip distance, Multi-hop propagation, Space wave propagation.

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)

Lectures:52 Hrs.
Tutorials:0Hrs.
Approximate Total: 52Hrs.

Texts and References:

1. Samuel Y. Liao, "*Microwave Devices and Circuits*", Pearson Education.
2. C. A. Balanis, "*Antenna theory: analysis and design*", John Wiley and sons.
3. M. L. Skolnik, "*Introduction to Radar Systems*", McGraw Hill.
4. K. D. Prasad, "*Antenna and wave Propagation*", SatyaPrakashan.
5. Annapurna Das and Sisir K. Das, *"Microwave engineering*", McGraw-Hill Higher Education.
6. P. Bhartia (Author),InderBahl, R. Garg, A. Ittipiboon, "*Microstrip antenna design handbook*", Artech House Publication.

Course Outcomes (COs):

At the end of this course students will be able to

1. Understand the concept of electromagnetics and Transmission Line
2. Understand the working and application of RF components and sources.
3. Understand the concept of radiation from antenna
4. Understand the concept of wave propagation in free space.
5. Understand the working of different Radars.
6. Understand the design of microstrip antenna.

Course Code: 18CP301T					**Course Name: Operating 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: Computer Programming

Learning objectives:

- To understand the OS role in the overall computer system, To study the operations performed by OS as a resource manager
- To understand the scheduling policies of OS, to understand the different memory management techniques
- To understand process concurrency and synchronization
- To understand the concepts of input/output, storage and file management
- To introduce system call interface for file and process management
- To study different OS and compare their features.

Unit wise allocation of course content

UNIT 1 (14 L)

Overview-Introduction-Operating system objectives, User view, System view, Operating system definition ,Computer System Organization, Computer System Architecture, OS Structure, OS Operations, Process Management, Memory Management, Storage Management, Protection and Security, Computing Environments. Operating System services, User and OS Interface, System Calls, Types of System Calls, System Programs, Operating System Design and Implementation, OS Structure.

Process and CPU Scheduling - Process concepts-The Process, Process State, Process Control Block, Threads, Process Scheduling-Scheduling Queues, Schedulers, Context Switch, Operations on Processes, System calls-fork(),exec(),wait(),exit(), Interprocess communication-ordinary pipes and named pipes in Unix.

UNIT 2 (12 L)

Process Scheduling-Basic concepts, Scheduling Criteria, Scheduling algorithms, Multiple- Processor Scheduling, Real-Time Scheduling, Thread scheduling, Linux scheduling and Windows scheduling. Process Synchronization, Background, The Critical Section Problem, Peterson's solution, Synchronization Hardware, Semaphores, Classic Problems of Synchronization.

Deadlocks - System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, and Recovery from Deadlock.

UNIT 3 (14 L)

Memory Management and Virtual Memory – Memory Management Strategies- Background, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of Page Table, IA-32 Segmentation, IA-32 Paging. Virtual Memory Management - Background, Demand Paging, Copy-on-Write, Page Replacement, Page Replacement Algorithms, Allocation of Frames, Thrashing.

UNIT 4 (12 L)

Storage Management-File System- Concept of a File, System calls for file operations - open(), read(), write(), close(), seek(), unlink(), Access methods, Directory and Disk Structure, File System Mounting, File Sharing, Protection. File System Implementation - File System Structure, File System Implementation,

Directory Implementation, Allocation methods, Free-space Management, Efficiency, and Performance. Mass Storage Structure – Overview of Mass Storage Structure, Disk Structure, Disk Attachment, Disk Scheduling, Disk Management, Swap space Management

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. Operating System Concepts , Abraham Silberschatz, Peter B. Galvin, Greg Gagne, Wiley.
2. Operating Systems – Internals and Design Principles, W. Stallings.
3. Unix Concepts and Applications by Sumitabha Das, TMH.
4. Modern Operating Systems, Andrew S Tanenbaum, PHI
5. Operating Systems: A concept-based Approach, D.M. Dhamdhere, TMH.
6. Principles of Operating Systems, B. L. Stuart, Cengage learning.
7. An Introduction to Operating Systems, P.C.P. Bhatt, PHI.
8. Principles of Operating systems, Naresh Chauhan, Oxford University Press.
9. Unix System Programming Using C++, Terrence Chan, PHI/Pearson.

Course Outcomes (COs):

At the end of this course students will be able to

1. Apply optimization techniques for the improvement of system performance.
2. Ability to design and solve synchronization problems.
3. Learn about minimization of turnaround time, waiting time and response time and also maximization of throughput by keeping CPU as busy as possible.
4. Learn to handle process optimally.
5. Learn to handle file management.
6. Ability to compare the different operating systems.

Lab Code 18CP301P					**Lab Name: Operating Systems Lab**		
Teaching Scheme					**Examination Scheme**		
					Practical		**Total**
L	**T**	**P**	**C**	**Hrs/Wk**	**Continuous Evaluation**	**End Semester Exam**	**Marks**
0	0	2	1	2	25	25	50

Prerequisites: Computer Programming

Course objectives:

1. To write programs in Linux environment using system calls.
2. To implement the scheduling algorithms.
3. To implement page replacement algorithms
4. To implement file allocation methods.
5. To understand and implement IPC mechanism using named and unnamed pipes.
6. To develop solutions for synchronization problems using semaphores.

List of Experiments:

1. Basic Shell commands and Scripting.
2. Write C programs to simulate the following CPU scheduling algorithms:
   a) Round Robin b) SJF
3. Write C programs to simulate the following CPU scheduling algorithms:
   a) FCFS b) Priority
4. Write C programs to simulate the following File organization techniques:
   a) Single level directory b) Two level c) Hierarchical
5. Write C programs to simulate the following File allocation methods:
   a) Contiguous b) Linked c)Indexed
6. Write a C program to copy the contents of one file to another using system calls.
7. Write a C program to simulate Bankers Algorithm for Dead Lock Avoidance
8. Write a C program to simulate Bankers Algorithm for Dead Lock Prevention
9. Write C programs to simulate the following page replacement algorithms:
   a) FIFO b) LRU c) LFU
10. Write C programs to simulate the following techniques of memory management:
    a) Paging b) Segmentation
11. Write a C program to implement the ls | sort command. (Use unnamed Pipe)
12. Write a C program to solve the Dining- Philosopher problem using semaphores.
13. Write C programs to implement IPC between two unrelated processes using named pipe.

Details of Assessment Instruments under LW Practical Component:

- Experiments during lab sessions and record-keeping of lab work (Term Work)
- Assignments / Mini project / Quiz / Practical Test

Course Outcomes (COs):

At the end of this course students will be able to

1. Ability to develop application programs using system calls in Unix.
2. Ability to implement inter-process communication between two processes.
3. Ability to design and solve synchronization problems.
4. Ability to simulate and implement operating system concepts such as scheduling,
5. Deadlock management, file management, and memory management.
6. Learn I/O management and process management.

Course Code: 18CP304					Course Name: Software Engineering			
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: Nil

Learning objectives:

- To understanding of software process models such as waterfall and evolutionary models.
- To understanding of software requirements and SRS document.
- To understanding of different software architectural styles.
- To understanding of software testing approaches such as unit testing and integration testing.
- To understanding on quality control and how to ensure good quality software.

Unit wise allocation of course content

UNIT 1 (10 L)

Introduction to Software Engineering: The evolving role of software, Changing Nature of Software, legacy software, Software myths. A Generic view of process: Software engineering- A layered technology, a process framework, The Capability Maturity Model Integration (CMMI), Process patterns, process assessment, personal and team process models. Process models: The waterfall model, Incremental process models, Evolutionary process models, Specialized process models, The Unified process.

UNIT 2 (10 L)

Software Requirements: Functional and non-functional requirements, User requirements, System requirements, Interface specification, the software requirements document. Requirements engineering process: Feasibility studies, Requirements elicitation and analysis, Requirements validation, Requirements management. System models: Context Models, Behavioral models, Data models, Object models, structured methods.

UNIT 3 (15 L)

Design Engineering: Design process and Design quality, Design concepts, the design model, pattern based software design. Creating an architectural design: software architecture, Data design, Architectural styles and patterns, Architectural Design, assessing alternative architectural designs, mapping data flow
into a software architecture. Modeling component-level design: Designing class-based components, conducting component-level design, object constraint language, designing conventional components. Performing User interface design: Golden rules, User interface analysis, and design, interface analysis, interface design steps, Design evaluation. Introduction to Agile Software Design

UNIT 4 (17 L)

Testing Strategies: A strategic approach to software testing, test strategies for conventional software, Black-Box and White-Box testing, Validation testing, System testing, the art of Debugging. Product metrics: Software Quality, Frame work for Product metrics, Metrics for Analysis Model, Metrics for Design Model, Metrics for source code, Metrics for testing, Metrics for maintenance. Metrics for Process and Products: Software Measurement, Metrics for software quality. **Risk management:** Reactive vs Proactive Risk strategies, software risks, Risk identification, Risk projection, Risk refinement, RMMM, RMMM Plan.

Quality Management: Quality concepts, Software quality assurance, Software Reviews, Formal technical reviews, Statistical Software quality Assurance, Software reliability, The ISO 9000 quality standards.

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. Software engineering A practitioner's Approach, Roger S Pressman, McGraw Hill International Edition.
2. Fundamentals of Software Engineering, Rajib Mall, PHI
3. Software Engineering, Ian Sommerville, Pearson education.
4. Software Engineering, A Precise Approach, Pankaj Jalote, Wiley India.
5. Software Engineering : A Primer, Waman S Jawadekar, Tata McGraw-Hill.
6. Software Engineering, Principles and Practices, Deepak Jain, Oxford University Press.
7. Software Engineering1: Abstraction and modeling, Diner Bjorner.
8. Software Engineering2: Specification of systems and languages, Diner Bjorner.
9. Software Engineering Foundations, Yingxu Wang, Auerbach Publications.
10. Software Engineering Principles and Practice, Hans Van Vliet, John Wiley & Sons Ltd.
11. Software Engineering 3: Domains, Requirements, and Software Design, D. Bjorner.
12. Introduction to Software Engineering, R. J. Leach, CRC Press.

Course Outcomes (COs):

At the end of this course students will be able to

Course Outcomes:

1. Identify the minimum requirements for the development of application.
2. Develop, maintain, efficient, reliable and cost effective software solutions
3. Do critical thinking
4. Evaluate assumptions and arguments in SDLC.
5. Understand the importance of software testing and maintenance.
6. Understand Risk management during software development process.
7.

Course Code: 17CP 202T					Course Name: Database Management Systems			
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: Nil

Learning objectives:

- To learn fundamental concepts of Database management system
- To study various Database design models and normalization concepts
- To apply the above concepts to optimal Database design for various applications and carryout data retrieval and manipulation using SQL

Unit wise allocation of course content

UNIT 1 (10 L, 3T)

Introduction: Database system applications; Purpose of Database Systems, View of Data, Data models, Approaches to building a database, Database management system(DBMS), Three levels of the architecture, Challenges in building a DBMS, Various components of a DBMS architecture.

Database Models:

ER-Model: Basic concepts, Design process, constraints, Keys, Design issues, E-R diagrams, weak entity sets, extended E-R features – generalization, specialization, aggregation, reduction to E-R database schema.

Relational Data Model: Concept of relations, Schema-instance distinction. Structure of relational databases, Domains, Relations, Relational algebra – fundamental operators and syntax; All set Operators.

UNIT 2 (10 L, 4T)

Relational algebra query & operators: Selection, Projection, Cross product, Various types of joins, Division, Example queries, Tuple relation calculus, Domain relational calculus, Converting the database specification in E/R notation to the relational schema.

SQL: Appropriate tool for DBMS, Basics of SQL, DDL, DML, DCL, structure creation, alteration, defining constraints, Primary key, foreign key, unique, not null, check, IN operator, Functions - aggregate functions, Built-in functions numeric, date, string functions, set operations, sub-queries, correlated sub-queries, Use of group by, having, order by, join and its types, Exist, Any, All , view and its types. Transaction control commands, Commit, Rollback, Save point. Embedded SQL, PL SQL Concepts, Cursors, Stored Procedures, Stored Function, Database Triggers.

UNIT 3 (10 L, 3T)

Dependencies and Normal Forms: Importance of a good schema design, Problems encountered with bad schema designs, Motivation for normal forms, dependency theory - functional dependencies, Armstrong's axioms for FD's, Closure of a set of FD's, Minimal covers, Definitions of 1NF, 2NF, 3NF and BCNF, Decompositions and desirable properties of them, Algorithms for 3NF and BCNF normalization, Multi-valued dependencies and 4NF, Join dependencies and definition of 5NF.

UNIT 4 (9 L, 3T)

Transaction Processing and Error Recovery: Concepts of transaction processing, ACID properties, Concurrency control, Locking based protocols for CC, Error recovery and logging, Undo, Redo, Undo-redo logging and recovery methods; Backup Methods.

Query Processing & Query Optimization: Overview, measures of query cost, selection operation,

sorting, join, evaluation of expressions, transformation of relational expressions, estimating statistics of expression results, evaluation plans, and materialized views.
Security: Discretionary and Mandatory Access Control; Audit Trails; Multi-Level Security; Statistical Databases; Data Encryption.
Introduction to NOSQL Databases.

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. A Silberschatz, H F Korth and S Sudarshan, "*Database System Concepts*", McGRAW Hill.
2. C. J. Date, A. Kennan, and S. Swamynathan, "*An Introduction to Database Systems*", Person Education
3. RamezElmasri and Shamkant B Navathe, "*Fundamentals of Database Systems*", Addison Wesley
4. Ivan Bayross, "*SQL, PL/SQL the Programming Language of Oracle*", BPB Publication.
5. Ramkrishnan, Raghu, "*Database Management Systems*", Mc-Graw Hill

Course Outcomes (COs):

At the end of this course students will be able to
1. Understand concepts of database and database management systems
2. Construct an Entity-Relationship (E-R) model from specifications and transform in to relational data model
3. Install and configure a relational database management system and formulate queries to access the database
4. Design normalized database
5. Understand principles of database transaction management, database recovery, and security
6. Develop a database management system application

Lab Code 17CP202P					Lab Name: Database Management 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

Prerequisites: Nil

Course objectives:

- To learn fundamental concepts of database management system
- To study various Database design models and normalization concepts
- To apply the above concepts to optimal database design for various applications and carryout data retrieval and manipulation using SQL

List of Experiments:

1. Installation of relational database management system e.g MYSQL
2. Introduction to SQL, DDL, DML, DCL, database and table creation, alteration, defining constraints, primary key, foreign key, unique, not null, check, IN operator
3. Study and use of inbuilt SQL functions - aggregate functions, Built-in functions numeric, date, string functions
4. Study, write and use the set operations, sub-queries, correlated sub-queries in SQL
5. Study and use of group by, having, order by features of SQL
6. Study different types of join operations, Exist, Any, All and relevant features of SQL
7. Study and implement different types of Views
8. Study and use of Transaction control commands, Commit, Rollback, Save point features of SQL.
9. Study and apply Database Normalization techniques
10. Introduction to Embedded SQL, PL SQL Concepts
11. Study and Implementation of Cursors, Stored Procedures, Stored Function, Triggers.
12. Analysis of query cost, creating indices and evaluating their effect on query evaluation plans and cost

Details of Assessment Instruments under LW Practical Component:

- Experiments during lab sessions and record-keeping of lab work (Term Work)
- Assignments / Mini project / Quiz / Practical Test

Course Outcomes (COs):

At the end of this course students will be able to

1. Understand concepts of database and database management systems
2. Construct an Entity-Relationship (E-R) model from specifications and transform in to relational data model
3. Install and configure a relational database management system and formulate queries to access the database
4. Design normalized database
5. Understand principles of database transaction management, database recovery, and security
6. Develop a database management system application

Course Code: 18CP306					**Course Name: Principles of Economics**			
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: Nil

Learning objectives:

1. Enable them to make day to day decision making.
2. Students will learn how markets establish price, production, wage and employment levels, and the likely consequences of government attempts to alter market outcomes.
3. Enable students to better understand and evaluate economic issues and events presented by Government and policymakers.
4. To build logical abilities and reasoning of the students so as to understand the real-world phenomena and mechanism tactfully.

Unit wise allocation of course content

UNIT 1 (9L)
Meaning of Economics, **The Economic Problem:** Scarcity and Choice; Allocation; Problem of Economics; Role of Assumptions; Meaning and differences of Micro and Macro Economics----

UNIT 2 (10 L)
Derivation of Demand and Supply Curve: Equilibrium; Externality; Elasticity; Factors affecting Demand and Supply; Market Equilibrium; Government Interventions in Market
Market Structures: Perfect and Imperfect competition, Assumptions, Price and output determination in perfect completion, monopoly, monopolistic competition and oligopoly,

UNIT 3 (10 L)
Nature and Scope of Macro Economics: Circular Flow of Product and Income**;** Four Sector Economy Model; Business Cycle ; National Income : Exchange Rates

UNIT 4 (10 L)
Macroeconomic policies: Monetary and Fiscal policy- Budget
International Trade: Gains from trade, Trade Barriers

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: 0 Hrs
Approximate Total: 39 Hrs

Texts and References:

1. Principles of Economics, Gregory Mankiw, Cengage Learning.
2. Principles of Economics, Karl E Case, Ray C Fair and Sharon Oster, Pearson Press.
3. Economics by Paul A Samuelson (Author), William D Nordhaus (Author)

Course Outcomes (COs):

At the end of this course students will be able to

1. Argue with reason about the state of economy and factors leading to the same
2. Make rational decisions based on choice
3. Understand the reasons behind changes in National economy and Micro economy
4. Apply economics knowledge to day to day events
5. Understand business cycle.
6. Understand Monetary and Fiscal policy