University of Kalyani

Part-II Semester-1 & 2
Syllabus

for

Bachelor of Technology

on

Information Technology

Department of Engineering and Technological Studies

PART –II, 1ST SEMESTER (IT)

NO. OF THEORETICAL SUBJECT	: 05	CREDITS ON THEORETICAL SUBJECTS	: 14
NO. OF SESSIONAL SUBJECT	: 04	CREDITS ON SESSIONAL	: 9
		TOTAL SEMESTER CREDITS	: 23

A. THEORETICAL SUBJECTS							
Sl. No.	Subject Code	Subject Name	Contacts (Periods/Week)				Credits
			L	T	P	Total	
1.	IT301	Analog and Digital Circuits	3			3	3
2.	IT302	Data structure & Algorithms	3			3	3
3.	IT303	Microprocessors and Microcontrollers	3			3	3
4.	MA303	Mathematics-III	3			3	2
5.	HU302	Economics for Engineers	3			3	3
		Total of Theoretical Subjects				15	14
B. SESSIONAL SUBJECTS							
6.	IT391	Analog and Digital Circuits Lab			4	4	2
7.	IT392	Data structure & Algorithms Lab			4	4	2
8.	IT393	Microprocessors and Microcontrollers Lab			4	4	2
9.	IT394	IT Workshop (Python)	1		4	5	3
		Total of Sessional Subjects				17	9
		Total of Semester				32	23

Subject : ANALOG AND DIGITAL CIRCUITS
Paper Code : IT301 Subject Category: Theoretical
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30 Marks]
Contact Hours per week = 3L *Credits: 3*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl No.	Details of the lesson	Contact Hours
1.	Bipolar Junction Transistor;NPN -PNP -Operations-Early effect-Current equations – Input and Output characteristics of CE, CB, CC – h-parameter model, Ebers Moll Model.Biasing schemes for BJT amplifiers, Concept of Q-point, ac and dc load lines biasing stability, various configurationsand their features, small signal analysis, single stage and multi-stage transistor amplifier.	
2.	Feedback topologies: Voltage series, current series, voltage shunt, current shunt, effect of feedback on gain, bandwidth etc.	
3.	Oscillators: Barkhausen criterion, RC oscillators (phase shift), LC oscillators (Hartley, Colpitt), crystal oscillators, non-sinusoidal oscillators.	
4.	JFETs – Drain and Transfer characteristics,-Current equations-Pinch off voltage and its significance-MOSFET- Characteristics- Threshold voltage -Channel length modulation, D-MOSFET, E-MOSFET-Characteristics – Comparison of MOSFET with JFET, CMOS- Characteristics. Metal-Semiconductor Junction- MESFET.	
5.	Introduction to Binary codes and their applications-Revision of Boolean Algebra and Logic Gates: Boolean algebra and identities Complete Logic set-logic gates and truth tables- Universal logic gates-Algebraic Reduction and realization using logic gates	
6.	Combinational Logic Design: Specifying the Problem, Canonical Logic Forms, Extracting Canonical Forms, EX-OR Equivalence Operations, Logic Array, K-Maps: Two, Three and Four variable K-maps, NAND and NOR Logic Implementations.	
7.	Logic Components: Concept of Digital Components, Binary Adders, Subtraction and Multiplication, An Equality Detector and comparator, Line Decoder, encoders, Multiplexers and De-multiplexers.	
8.	Synchronous Sequential logic Design: sequential circuits, storage elements: Latches (SR, D), Storage elements: Flip-Flops inclusion of Master-Slave, characteristics equation and state diagram of each FFs and Conversion of Flip-Flops.	
9.	Binary Counters: Introduction, Principle and design of synchronous and asynchronous counters, Design of MOD-N counters, Ring counters. Decade counters, State Diagram of binary counters. Shift resistors: Principle of 4-bit shift registers. Shifting principle, Timing Diagram, SISO, SIPO, PISO and PIPO registers.	
10.	Memory and Programmable Logic: Types of Memories, Memory Decoding, error detection and correction), RAM and ROMs. Programmable Logic Array, Programmable Array Logic, Sequential Programmable Devices. IC	
11.	Logic Families: Properties DTL, RTL, TTL, I2L and CMOS and its gate level implementation. A/D converters and D/A converters.	

Recommended Books:

1.	Modern Digital Electronics: R P Jain, McGraw Hill, 2003.
2.	*Digital Design - With an Introduction to Verilog HDL: Mano, Pearson Education, 2008.*
3.	*Digital Circuits and Design. Salivahanan, Vikas Publishing House Pvt Limited.*
4.	*R. S. Sedha,A Text Book of Applied Electronics. S. Chand Limited. 2008*

5.	*S. C. Gupta, D. C.Kulshreshtha, N. N. Bhargava. Basic Electronics and Linear Circuits. Tata McGraw-Hill, 2013.*
6.	D. Chattopadhyay, P. C. Rakshit. Electronics Fundamentals and Applications: New Age International (P) Limited, 2008.

Subject : DATA STRUCTURE & ALGORITHMS
PaperCode: IT302 Subject Category: Theoretical
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30 Marks]
Contact Hours per week = 3L *Credits: 3*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl. No.	Details of the lesson	Contact hours
1.	Definitions of Data and Information, Basic Data types and Abstract data Types (ADT) definition and objectives, Definition of Data Structure and classifications of data structure with example. Importance of algorithms and data structures in programming. Definition and criteria of algorithm.	*2L*
2.	Iteration and recursion. Problem solving using iteration and recursion with some implementations. Advantages and disadvantages of iteration and recursion.	*1L*
3.	Static and Dynamic Linear and circular Data Structures with objectives – Array, Stack, Queue, Deque, Linear and doubly linked list. Multiple stacks and queues. Applications - Expressions and Evaluation, polynomial addition and multiplication, Sparse Matrices and operations.	*10L*
4.	Non-linear Data Structures: Trees – Tree terminologies, Binary Trees, Binary Search Tree (BST), Implementations, Traversals – recursive and non-recursive Generation of BST from any tree or forest, Full & complete binary tree and relation between different degree of nodes in BST. Threaded Binary Tree, Height balanced Tree (AVL tree), B-tree, B + -tree, Applications of Binary Tree.	*10L*
5.	Searching - Sequential Search, Indexed Sequential Search, Binary Search, Fibonacci search, Hash Table and Hashing, Hash Function. Sorting - Introduction, Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort and Radix Sort, Performance and Comparison analysis of different sorting techniques.	*8L*
6.	Graphs – Basic Definitions, Representations, Breadth-first and Depth-first Search, Spanning Tree, Prims and Kruskal Algorithms.	*5L*

Recommended Books:

1.	"Fundamentals of Data Structures", Ellis Horowitz and Sartaj Sahni, Galgotia Book source.
2.	"Data structure and program design in C", Robert L Kruse, Bruce P. leung, Clovis I. Tondon, Pearson
3.	"An introduction to Data Structures with Applications", Jean-Paul Tremblay and Paul G. Sorenson", Mc-Graw Hill Edition
4.	*"Data Structures", Seymour Lipschutz, Mc-Graw Hill Edition*

Subject : MICROPROCESSORS AND MICROCONTROLLERS
PaperCode: IT303 Subject Category: Theoretical
Full Marks: 100 [End Semester Examination: 70 Marks + Internal Assessment: 30 Marks]
Contact Hours per week = 3L *Credits: 3*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl No.	Details of the lesson	Contact Hours
1.	**Introduction to 8 bit and 16 bit Microprocessors-H/W Architecture** Introduction to microprocessor, computer and its organization, Programming system; Address bus, data bus and control bus, Tristate bus; clock generation; Connecting Microprocessor to I/O devices; Data transfer schemes; Architectural advancements of microprocessors. Introductory System design using microprocessors; 8085 and 8086 – Hardware Architecture; External memory addressing; Bus cycles; some important Companion Chips; Memory Interfacing; Minimum mode system configuration, Interrupt processing.	*9L*
2.	**Microprocessor Programming and Peripheral Interfacing:** Operand types, operand addressing, instruction Set-Data transfer group, Arithmetic group, Logical group. Generation of I/O ports; Programmable Peripheral Interface (PPI) - Intel 8255; Programmable Interrupt Controller 8259; USART 8251 Keyboard and Display Interface; Keyboard and Display Controller (8279).	*9L*
3.	**8051 microcontroller- H/W architecture instruction set and programming:** Introduction to 8051 Micro-Controllers, Architecture; Memory Organization; Special Function register; Port Operation; Memory Interfacing, I/O Interfacing; Programming 8051 resources, interrupts; Programmer's model of 8051; Operand types, Operand addressing; Data transfer instructions, Arithmetic instructions, Logic instructions, Control transfer instructions; Programming. 8051 Timers/Counters - Modes and Applications. Serial Data Transfer – SFR of serial port, working, Programming the 8051 to transfer data serially.	*9L*
4.	**Introduction to Advanced Microcontrollers**. MSP430 Architecture and pin functions, Memory, Clock Generator, CPU Registers, Addressing modes, Instruction set and emulated Instruction set. Development Environment. Aspects of C for embedded system, Introduction to MSP 430 starter kit, parallel ports.	*9L*

Recommended Books

1.	Microprocessor Architecture, Programming and application with 8085, R.S. Gaonkar, PRI Penram International publishing PVT. Ltd.
2.	The 8051 Microcontroller and Embedded Systems, Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D.M C Kinlay, Pearson Education
3.	Douglas Hall, Microprocessors Interfacing, Tata McGraw Hill.
4.	Fundamentals of Microprocessors and Microcontrollers—B Ram—Dhanpat Rai Publications
5.	The 8051 Microcontrollers: Architecture Programming and Applications, K Uma Rao & Andhe Pallavi, Pearson, 2011
6.	MSP430 Microcontroller Basics John H. Davis, Elsevier
7.	Programmable Microcontrollers with Applications: MSP430 LaunchPad with CCS and Grace, Cem Unsalan, H. Deniz Gurhan, McGraw Hill India.
8.	The 8051 and MSP430 Microcontrollers - Architecture, Programming and Applications, K. Uma Rao, Andhe Pallavi, Wiley

Subject : MATHEMATICS-III
PaperCode : MA303 Subject Category: Theoretical
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30 Marks]
Contact Hours per week = 3L *Credits: 2*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl. No.	Details of the lesson	Contact hours
1.	**Basic Probability:** Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the multinomial distribution, Poisson approximation to the binomial distribution, infinite sequences of Bernoulli trials, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Correlation coefficient, Chebyshev's Inequality.	*8L*
2.	**Continuous Probability Distributions:** Continuous random varibales and their properties, distribution functions and densities, normal, exponential and gamma densities.	*4L*
3.	**Bivariate Distributions:** Bivariate distributions and their properties, distribution of sums and quotients, conditional densities, Bayes' rule.	*4L*
4.	**Basic Statistics:** Measures of Central tendency: Moments, skewness and Kurtosis - Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions, Correlation and regression – Rank correlation.	*8L*
5.	**Applied Statistics:** Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.	*8L*
6.	**Small samples:** Test for single mean, difference of means and correlation coefficients, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes.	*4L*

Recommended Books

1.	Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2.	P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003 (Reprint).
3.	S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.
4.	W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley, 1968.
5.	N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
6.	B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
7.	Veerarajan T., Engineering Mathematics (for semester III), Tata McGraw-Hill, New Delhi, 2010.

Subject : ECONOMICS FOR ENGINEERS
PaperCode : HU302 Subject Category: Theoretical
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30 Marks]
Contact Hours per week = 3L *Credits: 3*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl. No.	Details of the lesson	Contact hours

1.	Economic Decisions Making – Overview, Problems, Role, Decision making process. Engineering Costs & Estimation – Fixed, Variable, Marginal & Average Costs, Sunk Costs, Opportunity Costs, Recurring And Nonrecurring Costs, Incremental Costs, Cash Costs vs Book Costs, Life-Cycle Costs; Concepts of short and long run average cost curves; Types Of Estimate, Estimating Models - Per Unit Model, Segmenting Model, Cost Indexes, Power-Sizing Model, Improvement & Learning Curve. Concepts of revenue, shut-down and break-even points.	*9L*
2.	Cash Flow, Interest and Equivalence: Cash Flow – Diagrams, Categories & Computation, Time Value of Money, Debt repayment,Nominal & Effective Interest. Cash Flow & Rate Of Return Analysis – Calculations, Treatment of Salvage Value, Annual Cash Flow Analysis, Analysis Periods; Internal Rate Of Return, Calculating Rate of Return, Incremental Analysis; Best Alternative Choosing An Analysis Method, Future Worth Analysis, Benefit-Cost Ratio Analysis, Sensitivity And Breakeven Analysis. Economic Analysis In The Public Sector -Quantifying And Valuing Benefits & drawbacks.	*9L*
3.	Inflation And Price Change – Definition, Effects, Causes, Price Change with Indexes, Types of Index, Composite vs Commodity Indexes, Use of Price Indexes In Engineering Economic Analysis, Cash Flows that inflate at different Rates. Present Worth Analysis: End-Of-Year Convention, Viewpoint Of Economic Analysis Studies, Borrowed Money Viewpoint, Effect Of Inflation & Deflation, Taxes, Economic Criteria, Applying Present Worth Techniques, Multiple Alternatives. Uncertainty In Future Events - Estimates and Their Use in Economic Analysis, Range Of Estimates, Probability, Joint Probability Distributions, Expected Value, Economic Decision Trees, Risk, Risk vs Return, Simulation, Real Options.	*9L*
4.	Depreciation - Basic Aspects, Deterioration & Obsolescence, Depreciation And Expenses, Types Of Property, DepreciationCalculation Fundamentals, Depreciation And Capital Allowance Methods, Straight-Line Depreciation Declining BalanceDepreciation, Common Elements Of Tax Regulations For Depreciation And Capital Allowances. Replacement Analysis - Replacement Analysis Decision Map, Minimum Cost Life of a New Asset, Marginal Cost, Minimum Cost Life Problems. Accounting – Function, Balance Sheet, Income Statement, Financial Ratios Capital Transactions, Cost Accounting, Direct and Indirect Costs, Indirect Cost Allocation.	*9L*

Recommended Books

1.	Mansfield, E and Hoye, G. Microeconomics- Theory/Applications, W W Norton & Co. New York
2.	James L.Riggs, David D. Bedworth, Sabah U. Randhawa : Economics for Engineers 4e , Tata McGraw-Hill
3.	Donald Newnan, Ted Eschembach, Jerome Lavelle : Engineering Economics Analysis, OUP
4.	John A. White, Kenneth E.Case,DavidB.Pratt : Principle of Engineering Economic Analysis, John Wiley
5.	Sullivan and Wicks: Engineering Economy, Pearson
6.	R.PaneerSeelvan: Engineering Economics, PHI
7.	Michael R Lindeburg : Engineering Economics Analysis, Professional Pub

Subject : ANALOG AND DIGITAL CIRCUITS LAB
Code : IT391 Subject Category: Sessional
Full Marks: 100
Contact Hours per week = 4P *Credits: 2*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl No.	Details of the lesson
1.	Digital Logic Gates: Investigation on logic behaviour of AND, OR, NAND, NOR, EX-OR, EX –NOR GATES
2.	Combinational Circuits: adders and subtractors, 7 segment display.
3.	To implement a given design with (i) NAND Gates only (ii) NOR Gates only
4.	multiplexers and de-multiplexers.
5.	Experiments on Flip-Flop
6.	Experiments on Counters

Subject : DATA STRUCTURE & ALGORITHMS LABORATORY.
Code : IT392 Subject Category: Sessional
Full Marks: 100
Contact Hours per week = 4P *Credits: 2*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl No.	Details of the lesson
1.	Some iterative and recursive implementations in C: decimal number to binary number and binary to decimal, permutations of digits of n digits number.
2.	Implementation of Stack and linear Queue and circular Queue in C using array and linked list, Application of Stack – Conversion of Infix to Postfix, prefix expressions and Evaluation. Implementation of linear and circular linked list and linear and circular doubly linked list, Insertion and deletion, printing the elements, counting the number of elements in a linked list, Application of linked list – Polynomial addition and multiplication, High precision arithmetic, Sparse matrix addition and multiplication.
3.	Recursive and non-recursive Implementation of Binary Tree, Binary Search Tree, Tree traversal, Implementation of searching and sorting techniques. Implementation of BFS, DFS. Prims & Kruskal Algorithm.

Subject : MICROPROCESSORS AND MICROCONTROLLERS LAB
Code : IT393 Subject Category: Sessional
Full Marks: 100
Contact Hours per week = 4P *Credits: 2*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl No.	Details of the lesson

1.	Familiarization with 8085 and 8086 register level architecture and trainer kit components including the memory map. Familiarization with the process of storing and viewing the contents of memory as well as registers.
2.	Studies on prewritten programs using basic instruction set (data transfer, Load/Store, Arithmetic, Logical).
3.	Interfacing of Programmable Peripheral Interface (PPI).
4.	Interfacing and Programming of Stepper Motor and DC Motor Speed control.
5.	Programming using Arithmetic, Logical and Bit Manipulation instructions of 8051 microcontroller.
6.	Interfacing and Programming of peripheral devices with 8051.

Subject : IT WORKSHOP (PYTHON)
PaperCode : IT394 Subject Category:
SessionalFull Marks : 100
Contact Hours per week = 1L + 4P(3S) *Credits: 3*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 60*

Sl. No.	**Details of the lesson**
1.	Introduction and features, Basic Syntax, data types, variable, operators. Control statements – if-else and nest if-else, loops, break, continue, pass. Strings – Definition and Basic operations, String slices, Functions and Methods, Working with python.
2.	List, Tuple and Dictionaries – Basic concept and objective, operations, Functions and Methods, properties. Functions – Function prototype, calling, definition and types. Global variables and Function arguments. Anonymous functions.
3.	Modules – Importing module, Math module, Random module, Packages, Composition, I/O, reading data from keyboard, Printing on screen, opening and closing file. Exception Handling – Exceptions and handling, except clause, Try, finally clause, user defined exceptions.
4.	Laboratory assignment and implementation based on above topics.

PART –II, 2ND SEMESTER (IT)

NO. OF THEORETICAL SUBJECT	: 06	CREDITS ON THEORETICAL SUBJECTS	: 16
NO. OF SESSIONAL SUBJECT	: 01	CREDITS ON SESSIONAL	: 2
		TOTAL SEMESTER CREDITS	: 18

A. THEORETICAL SUBJECTS							
Sl. No.	Subject Code	Subject Name	Contacts (Periods/Week)				Credits
			L	T	P	Total	
1.	IT401	Discrete Mathematics	3			3	3
2.	IT402	Computer Architecture and Organization	3			3	3
3.	IT403	Operating System	3	1		4	4
4.	IT404	Formal Language & Automata Theory	3			3	3
5.	HU401	Organizational Behaviour Management	3			3	3
6.	HU402	Environmental Science	3			3	0
		Total of Theoretical Subjects				16	16
B. SESSIONAL SUBJECTS							
1.	IT491	Operating System Lab			4	4	2
		Total of Sessional Subjects				4	2
		Total of Semester				20	18

Subject : DISCRETE MATHEMATICS
PaperCode : IT401 Subject Category: Theoretical
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30 Marks]
Contact Hours per week = 3L *Credits: 3*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl. No.	Details of the lesson	Contact hours
1.	***Sets, Relation and Function:*** *Operations and Laws of Sets, Cartesian Products, Binary Relation, Partial Ordering Relation, Equivalence Relation, Image of a Set, Sum and Product of Functions, Bijective functions, Inverse and Composite Function, Size of a Set, Finite and infinite Sets, Countable and uncountable Sets, Cantor's diagonal argument and The Power Set theorem, Schroeder-Bernstein theorem.* ***Principles of Mathematical Induction:*** *The Well-Ordering Principle, Recursive definition, The Division algorithm: Prime Numbers, The Greatest Common Divisor: Euclidean Algorithm, The Fundamental Theorem of Arithmetic.*	*8L*
2.	Basic counting techniques-inclusion and exclusion, pigeon-hole principle, permutation and combination.	*4L*
3.	Propositional Logic: Syntax, Semantics, Validity and Satisfiability, Basic Connectives and Truth Tables, Logical Equivalence: The Laws of Logic, Logical Implication, Rules of Inference, The use of Quantifiers. Proof Techniques: Some Terminology, Proof Methods and Strategies, Forward Proof, Proof by Contradiction, Proof by Contraposition, Proof of Necessity and Sufficiency.	*6L*
4.	Algebraic Structures and Morphism: Algebraic Structures with one Binary Operation, Semi Groups, Monoids, Groups, Congruence Relation and Quotient Structures, Free and Cyclic Monoids and Groups, Permutation Groups, Substructures, Normal Subgroups, Algebraic Structures with two Binary Operation, Rings, Integral Domain and Fields. Boolean Algebra and Boolean Ring, Identities of Boolean Algebra, Duality, Representation of Boolean Function, Disjunctive and Conjunctive Normal Form	*9L*
5.	Graphs and Trees: Graphs and their properties, Degree, Connectivity, Path, Cycle, Sub Graph, Isomorphism, Eulerian and Hamiltonian Walks, Graph Colouring, Colouring maps and Planar Graphs, Colouring Vertices, Colouring Edges, List Colouring, Perfect Graph, definition properties and Example, rooted trees, trees and sorting, weighted trees and prefix codes, Bi-connected component and Articulation Points, Shortest distances.	*9L*

Recommended Books:

1.	Kenneth H. Rosen, Discrete Mathematics and its Applications, Tata McGraw – Hill
2.	Susanna S. Epp, Discrete Mathematics with Applications,4th edition, Wadsworth Publishing Co. Inc.
3.	C L Liu and D P Mohapatra, Elements of Discrete Mathematics A Computer Oriented Approach, 3rd Edition by, Tata McGraw – Hill.
4.	J.P. Tremblay and R. Manohar, Discrete Mathematical Structure and It's Application to Computer Science", TMG Edition, TataMcgraw-Hill
5.	Norman L. Biggs, Discrete Mathematics, 2nd Edition, Oxford University Press.
6.	Schaum's Outlines Series, Seymour Lipschutz, Marc Lipson, Discrete Mathematics, Tata McGraw - Hill

Subject : COMPUTER ARCHITECTURE AND ORGANIZATION
PaperCode : IT402 Subject Category: Theoretical
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30 Marks]
Contact Hours per week = 3L *Credits: 3*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl. No.	Details of the lesson	Contact hours
1.	**Concepts & Terminology:** Digital computer concepts; Von-Neumann concept; Hardware & Software and their dual nature, Role of operating system (OS). Features of PCs, Minis, Workstations and Mainframes.	3L+ 1T
2.	**Memory Unit:** Memory classification, characteristics; Organization of RAM, address decoding, Registers and Stack, ROM/PROM/EEPROM basic cells: Organization and erasing schemes, Magnetic memories, recording formats & methods, Concept of memory map, memory hierarchy, Associative memory organization; Cache introduction, techniques to reduce cache misses, concept of virtual memory & paging. Bipolar and MOS storage cells. Instruction sequencing with examples. Microprogramming concept and variation in microprogramming configuration.	9L+ 2T
3.	**CPU Design:** ALU organization, Serial & Parallel Address; implementation of highspeed Address Carry Look Ahead & carry Save Address; **Multiplication of signed binary numbers -** Booth's algorithm; Divide algorithms - Restoring & Non-Restoring; Floating point number arithmetic; Overflow detection, status flags.	9L+ 3T
4.	**Control Design–** Timing diagrams; T-States, Controlling arithmetic & logic instruction, control structures; Hardwired & Micro-programmed, CISC & RISC characteristics.	3L+ 2T
5.	**Parallel Processing:** Pipelining-general concept, speed up, instruction & arithmetic pipeline; Examples of some pipeline in modern processors, pipeline hazards; Flynn's classification – SISD, SIMD, MISD, MIMD architectures-Vector and Array processors & their comparison, Concept of Multiprocessor; Centralized & distributed architectures.	9L+ 2T
6.	**Instruction Set Architecture**- Choice of instruction set; Instruction word formats; Addressing modes. Input/output Organization: Introduction to Bus architecture, effect of bus widths, Programmed & Interrupt I/O, DMA.	3L+ 2T

Recommended Books:

1.	"Computer Architecture & Organization", Hayes, 3/e, McGraw Hill
2.	"Computer Architecture (Schaum Series)", Carter, Tata McGraw Hill
3.	"Computer System Architecture", Mano M. M., Prentice Hall India
4.	"Computer Organization & Design", Chaudhury P. Pal, Prentice Hall India
5.	"Computer Organization", Hamacher, 5/e, McGraw Hill

Subject : OPERATING SYSTEM
PaperCode : IT403 Subject Category: Theoretical
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30 Marks]
Contact Hours per week = 3L + 1T *Credits: 3*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Details of the lesson	Contact hours
1.	Introduction: Concept of Operating Systems, Generations of Operating systems, Types of Operating Systems, OS Services, System Calls, Structure of an OS - Layered, Monolithic, Microkernel Operating Systems, Concept of Virtual Machine. Case study on UNIX and WINDOWS Operating System.	*3L*
2.	Processes: Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching Thread: Definition, Various states, Benefits of threads, Types of threads, Concept of multithreads,Process Scheduling: Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time; Scheduling algorithms: Pre-emptive and Non pre-emptive, FCFS, SJF, RR; Multiprocessor scheduling: Real Time scheduling: RM and EDF	*3L + 2L*

3.	Inter-process Communication: Critical Section, Race Conditions, Mutual Exclusion, Hardware Solution, Strict Alternation, Peterson's Solution, The Producer ConsumerProblem, Semaphores, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problem etc.	*6L + 1T*
4.	Deadlocks: Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery.	*3L+ 1T*
5.	Memory Management: Basic concept, 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, Page Replacement algorithms: Optimal, First in First Out (FIFO), Second Chance (SC), Not recently used (NRU) and Least Recently used (LRU).	*6L + 2T*
6.	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 algorithms File Management: Concept of File, Access 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 and performance. Disk Management: Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C-SCAN, Disk reliability, Disk formatting, Boot-block, Bad blocks	*6L + 2T*
7.	Protection & Security: goals of protection, domain of protection, security problem, authentication, one time password, program threats, system threats, threat monitoring, encryption.	*2L + 2T*
8.	Advance Topic: Basic architectural model and working principles of distributed OS	*1L + 2T*

Recommended Books:

1.	Operating System Concepts Essentials, 9th Edition by Avi Silberschatz, Peter Galvin, Greg Gagne, Wiley Asia Student Edition.
2.	Operating Systems: Internals and Design Principles, 5th Edition, William Stallings, Prentice Hall of India.
3.	Operating System: A Design-oriented Approach, 1st Edition by Charles Crowley, Irwin Publishing
4.	Operating Systems: A Modern Perspective, 2nd Edition by Gary J. Nutt, Addison-Wesley
5.	Design of the Unix Operating Systems, 8th Edition by Maurice Bach, Prentice-Hall of India
6.	Understanding the Linux Kernel, 3rd Edition, Daniel P. Bovet, Marco Cesati, O'Reilly and Associates

Subject : FORMAL LANGUAGE & AUTOMATA THEORY
PaperCode : IT404 Subject Category: Theoretical
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30 Marks]
Contact Hours per week = 3L *Credits: 3*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl. No.	Details of the lesson	Contact hours
1.	Finite State Machines: Definition, concept of sequential circuits, state table & state assignments, concept of synchronous, asynchronous and liner sequential machines. Introduction to alphabet, strings & languages, graphs & trees, set & relations), definition, recognition of a language by an automata - idea of grammars, productions and derivation, Chomsky hierarchy of languages.	*3L*
2.	Finite Automaton: DFA, NDFA, equivalence of DFA and NDFA, NDFA with Є-moves, regular sets & regular expressions: equivalence with finite automata, NDFA from regular expressions, regular expressions from DFA, two way finite automata equivalence, applications of finite automata. State equivalence and minimization of finite automata. Finite State Models: Basic definition, mathematical representation, Moore versus Mealy machines, capability & limitations of FSM, incompletely specified machines, merger graph & compatibility graph, merger table.	*18L*

	Regular Language and Closure Properties: Regular grammars and equivalence with finite automata, properties of regular languages, pumping lemma for regular languages & its application, closure properties.	
3.	Context-free languages and pushdown automata: Context-free grammars (CFG) and languages (CFL), parse trees, ambiguity in CFG, simplification, Chomsky and Greibach normal forms, pumping lemma for context-free languages, closure properties of CFLs. PDA: nondeterministic pushdown automata (PDA), acceptance by final state & empty stack, equivalence with CFG, deterministic pushdown automata.	*6L*
4.	Context-sensitive languages: Context-sensitive grammars (CSG) and languages, linear bounded automata and equivalence with CSG.	3L
5.	Turing machines: The basic model for Turing machines (TM), Turing recognizable (recursively enumerable) and Turing-decidable (recursive) languages and their closure properties, variants of Turing machines, nondeterministic TMs and equivalence with deterministic TMs, unrestricted grammars and equivalence with Turing machines, TMs as enumerators.	*3L*
6.	Undecidability: Church-Turing hypothesis, universal Turing machine, the universal and diagonalization languages, reduction between languages and Rice's theorem, undecidable problems about languages.	*3L*

Recommended Books:

1.	John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman, Introduction to Automata Theory, Languages, and Computation, Pearson Education Asia.
2.	Harry R. Lewis and Christos H. Papadimitriou, Elements of the Theory of Computation, Pearson Education Asia.
3.	Dexter C. Kozen, Automata and Computability, Undergraduate Texts in Computer Science, Springer.
4.	Michael Sipser, Introduction to the Theory of Computation, PWS Publishing.
5.	John Martin, Introduction to Languages and The Theory of Computation, Tata McGraw Hill.

Subject : ORGANIZATIONAL BEHAVIOUR MANAGEMENT
Code : HU401
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30 Marks]
Contact Hours per week = *3L* Credits: 3
Duration of the semester: *12* weeks Total contacts hours in a semester: *36* Hours

Sl. No.	**Details of the lesson**	**Contact Hours**
1.	Organizational Behaviour: Definition, Importance, Historical Background, Fundamental Concepts of OB, OB Processes, OB in the context of changing business.	2 *L*
2.	Personality and Attitudes: Meaning of personality, Personality Determinants and Traits, Development of Personality, Types of Attitudes, Job Satisfaction.	2 *L*
3.	Perception: Definition, Nature and Importance, Factors influencing Perception, Perceptual Selectivity, Link between Perception and Decision Making.	*2 L*
4.	Motivation: Definition, Theories of Motivation - Maslow's Hierarchy of Needs Theory, McGregor's Theory X & Y, Herzberg's Motivation-Hygiene Theory, Alderfer's ERG Theory,McClelland's Theory of Needs, Vroom's Expectancy Theory, Motivation and Productivity.	4 *L*
5.	Group Perspective: Foundation of Group Behaviour, Characteristics of Group, Formal and Informal Groups, Stages of Group Development, Group Decision Making. Organizational conflict and Conflict resolution – Organizational Culture.	4 *L*
6.	Communication: Communication Process, Direction of Communication, Barriers to Effective Communication	2*L*
7.	Leadership: Definition, Importance, Types of Leadership, Theories of Leadership Styles. Organizational Politics: Definition, Factors contributing to Political Behaviour.	4 *L*
8.	Organizational Design: Various Organizational Structures and their Effects on Human Behaviour, Concepts of Organizational Climate and Organizational Development.	4 *L*

Recommended Books	
1.	Robbins, S. P. & Judge, T.A.: Organizational Behavior, Pearson Education, 15th Edn.
2.	Luthans, Fred: Organizational Behavior, McGraw Hill, 12th Edn.
3.	3. Shukla, Madhukar: Understanding Organizations – Organizational Theory & Practice in India, PH
4.	Fincham, R. & Rhodes, P.: Principles of Organizational Behaviour, OUP, 4th Edn.
5.	Hersey, P., Blanchard, K.H., Johnson, D.E.- Management of Organizational Behavior Leading Human Resources, PHI, 10th Edn.

Subject : ENVIRONMENTAL SCIENCE
Code : HU402
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30 Marks]
Contact Hours per week = *3L* Credits: 0
Duration of the semester: *12* weeks Total contacts hours in a semester: *36* Hours

Sl. No.	**Details of the lesson**	**Contact Hours**
1.	**Basics:** Basic ideas of environment, basic concepts, man, society & environment, their interrelationship Mathematics of population growth and associated problems, Importance of population study in environmental engineering, definition of resource, types of resource, renewable, non-renewable, potentially renewable, effect of excessive use vis-à-vis population growth, Sustainable Development. Materials balance: Steady state conservation system, steady state system with non conservative pollutants, step function. Environmental degradation: Natural environmental Hazards like Flood, earthquake, Landslide-causes, effects and control/management; Anthropogenic degradation like Acid rain-cause, effects and control. Nature and scope of Environmental Science and Engineering.	6 *L*
2.	**Ecology:** Elements of ecology: System, open system, closed system, definition of ecology, species, population, community,definition of ecosystem- components types and function. Biodiversity- types, importance, Endemic species, Biodiversity Hot-spot, Threats to biodiversity, Conservation of biodiversity.	3 *L*
3.	**Air pollution and control:** Atmospheric Composition: Troposphere, Stratosphere, Mesosphere, Thermosphere, Tropopause and Mesopause. Energy balance: Conductive and Convective heat transfer, radiation heat transfer, simple global temperature model[Earth as a black body, earth as albedo], Problems. Green house effects: Definition, impact of greenhouse gases on the global climate and consequently on sea water level,agriculture and marine food.Global warming and its consequence, Control of Global warming. Earth's heat budget. Atmospheric dispersion: Maximum mixing depth, ventilation coefficient, effective stack height,	*9 L*

	smokestack plumes and Gaussian plume model. Definition of pollutants and contaminants, Primary and secondary pollutants: emission standard, criteria pollutant.Sources and effect of different air pollutants- Suspended particulate matter, oxides of carbon, oxides of nitrogen, oxides of sulphur, particulate, PAN. Smog, Photochemical smog and London smog.Depletion Ozone layer: CFC, destruction of ozone layer by CFC, impact of other green house gases, effect of ozone modification. Standards and control measures: Industrial, commercial and residential air quality standard, control measure (ESP.cyclone separator, bag house, catalytic converter, scrubber (ventury), Statement with brief reference).	
4.	**Water Pollution and Control:** Hydrosphere, Hydrological cycle and Natural water.Pollutants of water, their origin and effects: Oxygen demanding wastes, pathogens, nutrients, Salts, thermal application,heavy metals, pesticides, volatile organic compounds. **River/Lake pollution:** River: DO, 5 day BOD test, Seeded BOD test, BOD reaction rate constants, Effect of oxygen demanding wastes on river[deoxygenation, reaeration], COD, Oil, Greases, pH. Lake: Eutrophication [Definition, source and effect]. **Standard and control:** Waste water standard [BOD, COD, Oil, Grease], Water Treatment system [coagulation and flocculation, sedimentation and filtration, disinfection, hardness and alkalinity, softening] Waste water treatment system, primary and secondary treatments [Trickling filters, rotating biological contractor, Activated sludge, sludge treatment, oxidation ponds] tertiary treatment definition. Water pollution due to the toxic elements and their biochemical effects: Lead, Mercury, Cadmium, and Arsenic	9 *L*
5.	**Land Pollution:** Lithosphere; Internal structure of earth, rock and soil Solid Waste: Municipal, industrial, commercial, agricultural, domestic, pathological and hazardous solid wastes; Recovery and disposal method- Open dumping, Land filling, incineration, composting, recycling. Solid waste management and control (hazardous and biomedical waste).	*3L*
6.	**Noise Pollution: [3L]** Definition of noise, effect of noise pollution, noise classification [Transport noise, occupational noise, neighbourhood noise] Definition of noise frequency, noise pressure, noise intensity, noise threshold limit value, equivalent noise level, L10 (18hr Index) ,n Ld.Noise pollution control.	*3L*
7.	**Environmental Management:** Environmental impact assessment, Environmental Audit, Environmental laws and protection act of India, Different international environmental treaty/ agreement/ protocol.	3*L*

Recommended Books

6.	Masters, G. M., "Introduction to Environmental Engineering and Science", Prentice Hall of India Pvt. Ltd.,1991
7.	De, A. K., "Environmental Chemistry", New Age International.

Subject: OPERATING SYSTEMS LAB
Paper Code : IT491 Subject Category: Sessional
Full Marks : 100 [End Semester Examination: 100 Marks]
Contact Hours per week = 4P Credits: 2
Duration of the semester: 12 weeks Assumed total contact hours in a semester: 48

Sl No.	Details of the lesson
2.	Shell Programming: creating a script, making a script executable, shell syntax (variables, conditions, control structures, functions, and commands).
3.	Process: starting new process, replacing a process image, duplicating a process image, waiting for a process.
4.	Signal: signal handling, sending signals, signal interface, signal sets.
5.	Semaphore: programming with semaphores (use functions semctl, semget, semop, set_semvalue, del_semvalue, semaphore_p, semaphore_v).
6.	Inter process Communication: pipes (use functions pipe, popen, pclose), named pipes (FIFO, accessing FIFO).