SCHEME AND SYLLABI FOR

FOURTH SEMESTER

OF

BACHELOR OF

TECHNOLOGY IN
COMPUTER SCIENCE AND ENGINEERING

FROM 2009 ADMISSION ONWARDS

CALICUT UNIVERSITY (P.O), THENHIPALAM

Semester IV		Hours / Week			Marks		Semester-end duration-hours	Credits
Code	Subject	L	T	D/P	Inte-rnal	S emes ter-end		
EN09 401B	Engineering Mathematics IV	3	1		30	70	3	4
EN09 402	Environmental Studies	2	1		30	70	3	3
CS09 403	Computer Organization and Design	4	1		30	70	3	5
CS09 404	Programming paradigms	3	1		30	70	3	4
CS09 405	Systems Programming	3	1		30	70	3	4
CS09 406	Microprocessor Based design	3	1		30	70	3	4
CS09 407(P)	***Data Structures Lab***			3	50	50	3	2
CS09 408(P)	***Digital Systems Lab***			3	50	50	3	2
Total		**18**	**6**	**6**				**28**
Total Marks								

EN09 401B: Engineering Mathematics IV

(Common for IC, EC, EE, AI, BM, CS, and IT)

Teaching scheme **Credits:** 4

3 hours lecture and 1 hour tutorial per week

Objectives

- *To inculcate the students an adequate understanding of the basic concepts of probability theory to make them develop an interest in the area which may find useful to pursue their studies.*
- *To stimulate the students understanding of the Z-transform. A study of some important partial differetial equations is also included to make the student get acquainted with the basics of PDE.*

Module I – Probability Distributions - (13 hours)

Random variables – Mean and Variance of probability distributions – Binomial Distribution – Poisson Distribution – Poisson approximation to Binomial distribution – Hyper Geometric Distribution – Geometric Distribution – Probability densities – Normal Distribution – Uniform Distribution – Gamma Distribution.

Module II – Z transforms - (14 hours)

Introduction – The Z transform – Z transform and Region of Convergence (ROC) of finite duration sequences – Properties of ROC – Properties of Z-Transforms: Linearity, Time Shifting, Multiplication by exponential sequence, Time reversal, Multiplication by *n*, Convolution, Time Expansion, Conjugation, Initial Value Theorem, Final Value Theorem – Methods to find inverse transforms – long division method – partial fraction method – residue method – Solutions of difference equations using Z Transforms.

Module III - Series solutions of differential equations - (14 hours)

Power series method for solving ordinary differential equations – Legendre's equation – Legendre polynomials – Rodrigue's formula – Generating functions – Relation between Legendre polynomials – Orthogonality property of Legendre polynomials (Proof not required) – Frobenius method for solving ordinary differential equations – Bessel's equation – Bessel functions – Generating functions – Relation between Bessel functions – Orthogonality property of Bessels functions (Proof not required).

Module IV - Partial Differential Equations - (13 hours)

Introduction – Solutions of equations of the form $F(p,q) = 0$; $F(x,p,q) = 0$; $F(y,p,q) = 0$; $F(z,p,q) = 0$; $F_1(x,q) = F_2(y,q)$; Clairaut's form, $z = px + qv + F(p,q)$; Legrange's form, $Pp + Qq = R$ – Classification of Linear PDE's – Derivation of one dimensional wave equation and one dimensional heat equation – Solution of these equation by the method of separation of variables – D'Alembert's solution of one dimensional wave equation.

Text Books

Text Books

Module I:
Richard A Johnson, CB Gupta, *Miller and Freund's Probability and statistics for Engineers, 7e*, Pearson Education - Sections: 4.1, 4.2, 4.3, 4.4, 4.6, 4.8, 5.1, 5.2, 5.5, 5.7

Module II:
P Ramesh Babu, R Ananda Natarajan, *Signals and* Systems, 2e, Scitech Publications.
Sections: 10.1, 10.2, 10.3, 10.4, 10.5.1, 10.5.2, 10.5.3, 10.5.4, 10.5.5, 10.5.6, 10.5.7, 10.5.8, 10.5.12, 10.5.13, 10.6, 10.10

Module III:
Erwin Kreysig, *Advanced Engineering Mathematics, 8e*, John Wiley and Sons, Inc.
Sections: 4.1, 4.3, 4.4, 4.5

Module IV:
N Bali, M Goyal, C Watkins, *Advanced Engineering Mathematics, A Computer Approach, 7e*, Infinity Science Press, Fire Wall Media.
Sections: 16.1, 16.2, 16.3, 16.4, 16.5, 16.6, 16.7, 16.8, 16.9
Erwin Kreysig, *Advanced Engineering Mathematics, 8e*, John Wiley and Sons, Inc.
1. Sections: 11.2, 11.3, 11.4, 9.8 Ex.3, 11.5

Reference books

1. William Hines, Douglas Montgomery, avid Goldman, Connie Borror, *Probability and Statistics in Engineering*, 4e, John Wiley and Sons, Inc.
2. Sheldon M Ross, *Introduction to Probability and Statistics for Engineers and Scientists*, 3e, Elsevier, Academic Press.
3. Anthony Croft, Robert Davison, Martin Hargreaves, *Engineering Mathematics*, 3e, Pearson Education.
4. H Parthasarathy, *Engineering Mathematics, A Project & Problem based approach*, Ane Books India.
5. B V Ramana, *Higher Engineering Mathematics*, McGrawHill.
6. Sarveswara Rao Koneru, *Engineering Mathematics*, Universities Press.
7. J K Sharma, *Business Mathematics, Theory and Applications*, Ane Books India.
8. John bird, *Higher Engineering Mathematics*, Elsevier, Newnes.
9. M Chandra Mohan, Vargheese Philip, *Engineering Mathematics-Vol. I, II, III & IV.*, Sanguine Technical Publishers.
10. Wylie C.R and L.C. Barret, *Advanced Engineering Mathematics*, McGraw Hill.
11. V R Lakshmy Gorty, *Advanced Engineering Mathematics-Vol. I, II.*, Ane Books India.
12. Sastry S.S., *Advanced Engineering Mathematics-Vol. I and II.*, Prentice Hall of India.
13. Michael D Greenberg, *Advanced Engineering Mathematics*, Pearson Education.
14. Lary C Andrews, Bhimsen K Shivamoggi, *Integral Transforms for Engineers*, Prentice Hall of India.

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

University Examination Pattern

PART A: *Short answer questions (one/two sentences)* *5 x 2 marks=10 marks*

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

PART B: *Analytical/Problem solving questions* *4 x 5 marks=20 marks*

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

PART C: *Descriptive/Analytical/Problem solving questions* *4 x 10 marks=40 marks*

Two questions from each module with choice to answer one question.

Maximum Total Marks: 70

EN09 402 : Environmental Studies

Teaching scheme **Credits:** 3
2 hours lecture and 1 hour tutorial per week

Objectives

- *To understand the problems of pollution, loss of forest, solid waste disposal, degradation of environment, loss of biodiversity and other environmental issues and create awareness among the students to address these issues and conserve the environment in a better way.*

Module I (8 hours)
The Multidisciplinary nature of environmental science, Definition-scope and importance-need for public awareness. Natural resources, Renewable and non-renewable resources:
Natural resources and associated problems-forest resources: Use and over exploitation, deforestation, case studies. Timber extraction, mining, dams and their defects on forests and tribal people.- water resources : Use and over utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems - Mineral resources: Use and exploitation,environmental effects of extracting and using mineral resources, case studies - Food resources: World food problems, changes caused by agriculture over grazing, effects of modern agriculture, fertilizer-pesticide problems, water logging,salinity,case studies -Energy resources: Growing energy needs, renewable and non-renewable energy resources, use of alternate energy resources, Land resources: Land as a resource, land degradation, man induced land slides, soil erosion and desertification.

Module II (8 hours)
Ecosystems-Concept of an ecosystem-structure and function of an ecosystem – producers, consumers, decomposers-energy flow in the ecosystem-Ecological succession- Food chains, food webs and Ecological pyramids-Introduction, types, characteristics features, structure and function of the following ecosystem-Forest ecosystem- Grassland ecosystem –Desert ecosystem-Aquatic ecosystem(ponds, streams, lakes, rivers, oceans , estuaries)
Biodiversity and its consideration
Introduction- Definition: genetic , species and ecosystem diversity-Biogeographical; classification of India – value of biodiversity: consumptive use, productive use, social ethical , aesthetic and option values Biodiversity at Global, national , and local level-India at mega –diversity nation- Hot spot of biodiversity-Threats to biodiversity: habitat loss, poaching of wild life, man , wild life conflicts –Endangered and endemic species of India-Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity.

Module III (10 hours)
Environmental pollution
Definition-Causes, effects and control measures of Air pollution-m Water pollution –soil pollution-Marine pollution-Noise pollution-Thermal pollution-Nuclear hazards-Solid waste management: Causes, effects and control measures of urban and industrial wastes-Role of an individual in prevention of pollution-pollution case studies-Disaster management: floods, earth quake, cyclone and landslides-Environmental impact assessment

Module IV (10 hours)
Environment and sustainable development-Sustainable use of natural resources-Conversion of renewable energy resources into other forms-case studies-Problems related to energy and Energy auditing-Water conservation, rain water harvesting, water shed management-case studies-Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust-Waste land reclamation-Consumerism and waste products-Reduce, reuse and recycling of products-Value education.

Text Books

1. Clark,R.S., *Marine pollution*, Clanderson Press Oxford.
2. Mhaskar A. K., *Matter Hazrdous*, Techno-science Publications.
3. Miller T. G. Jr., *Environmental Science*, Wadsworth Publishing Co.
4. Townsend C., Harper J, Michael Begon, *Essential of Ecology*, Blackwell Science
5. Trivedi R. K., Goel P. K., *Introduction to Air Pollution*, Techno-Science Publications.

Reference Books

1. Raghavan Nambiar, K., Course *book on Environmental Studies*, Nalpat Publishers, Kochi.
2. Bharucha Erach, *Biodiversity of India*, Mapin Publishing Pvt. Ltd., Ahmedabad.
3. Cunningham, W.P., Cooper, T.H., Gorhani, E & Hepworth, M.T. 2001, *Environmental encyclopedia*, Jaico publishing House Mumbai 1196p
4. *Down to Earth*, Centre for Science and Environment
5. Hawkins, R.E. *Encyclopedia of Indian Natural History*, Bombay Natural History Society, Bombay
6. Mckinney, M.L. & School, R.M. 1996. *Environmental Science system & Solutions*, Web enhanced edition, 639p.
7. Odum, E.P. 1971. *Fundamentals of Ecology*. W.B.Saunders Co. USA, 574p
8. Rao, M.N. & Datta, A.K 1987, *Waste Water treatment*, Oxford & IBH Publ. Co. Pvt. Ltd.,
9. *Survey of the Environment*, The Hindu Magazine
10. Wagner.K.D. 1998, *Environmental Management*, W.B. Saunders Co. Philadelphia, USA.

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

University Examination Pattern

PART A: *Short answer questions (one/two sentences)* *5 x 2 marks=10 marks*

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

PART B: *Analytical/Problem solving questions* *4 x 5 marks=20 marks*

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

PART C: *Descriptive/Analytical/Problem solving questions* *4 x 10 marks=40 marks*

Two questions from each module with choice to answer one question.

Maximum Total Marks: 70

CS09 403: Computer Organization and Design

Teaching scheme **Credits:** 5
4 hours lecture and 1 hour tutorial per week

Objectives

- *To lay the foundation for the study of hardware organization of digital computers. It brings out the interplay between various building blocks of computers, without being specific to any particular computer. At the end of the course, the student is expected to gain a fair idea about the functional aspects of each building block in computer design, in the general sense.*

Module I (17 hours)
Computer abstraction and technology: Below your program - Under the covers - Historical perspective - Measuring performance - Relating the metrics - evaluating, comparing and summarizing performance - Case study: SPEC95 bench mark - Instructions - Operations and operands of the computer hardware - Representing instructions - Making decision - Supporting procedures - Beyond numbers - Other styles of addressing - Starting a program - Case study: 80x86 instructions.

Module II (15 hours)
Computer arithmetic - Signed and unsigned numbers - Addition and subtraction - Logical operations - Constructing an ALU - Multiplication and division - Floating point - Case study: floating point in 80x86

Module III (16 hours)
The processor: Building a data path - Simple and multi-cycle implementations - Microprogramming - Exceptions - Case study: Pentium Pro implementation.

Module IV (17 hours)
Memory hierarchy - Caches - Cache performance - Virtual memory - Common framework for memory hierarchies - Case study - Pentium Pro memory hierarchy . input/output - I/O performance measures - Types and characteristics of I/O devices - Buses - Interfaces in I/O devices - Design of an I/O system

Text Books

1. Pattersen D.A. & Hennesy J.L., *Computer Organisation & Design: The Hardware/Software Interface*, Harcourt Asia.

Reference Books

1. Heuring V.P. & Jordan H.F., *Computer System Design & Architecture*, Addison Wesley
2. Hamacher, Vranesic & Zaky, *Computer Organisation*, McGraw Hill

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

University Examination Pattern

PART A:	*Short answer questions (one/two sentences)* All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.	*5 x 2 marks=10 marks*
PART B:	*Analytical/Problem solving questions* Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.	*4 x 5 marks=20 marks*
PART C:	*Descriptive/Analytical/Problem solving questions* Two questions from each module with choice to answer one question.	*4 x 10 marks=40 marks*

Maximum Total Marks: 70

CS09 404: Programming Paradigms

Teaching scheme **Credits:** 4
3 hours lecture and 1 hour tutorial per week

Objectives

- *To introduce the different models of programming and the various constructs and their implementation to support on a bare machine.*

Module I (15 hours)
Role of programming languages - high level languages - programming paradigms - language implementation on a machine - language Syntax description - notation for expressions, abstract syntax trees, lexical syntax, context free grammars, variants of grammars - Language Semantic description - introduction to synthesized attributes, attributed grammar, natural semantics, de-notational semantics Imperative programming: Introduction - structured programming - constructs for structured control flow - syntactic concerns - handling special cases in loops - discussion based on C. Role of types: Basic types - compound types like arrays, records, union and variant records, sets - pointers and dynamic allocation - Types and error checking - discussion based on C. Introduction to procedures: parameter passing methods - scope rules - nested scopes - implementation - discussion based on C.

Module II (14 hours)
Object oriented programming: Introduction - grouping of data and operations - constructs for program structuring - information hiding - program design with modules - modules and defined types - illustration based on C++ on class declaration, dynamic allocation, templates, objects. Definition of object - object oriented thinking - Inheritance - derived classes and information hiding- illustration based on C++.

Module III (12 hours)
Functional Programming: Elements of Functional programming - Types: values and operations - Functional declaration- approaches to expression evaluation- lexical scopes - type checking. Functional programming with lists - introduction to scheme - structures of lists - list manipulation - simplification of expressions - storage allocation for lists.

Module IV (11 hours)
Logic Programming: Introduction - computing with relations - introduction to PROLOG - data structures - programming techniques - control in PROLOG - cuts. Concurrent programming: parallelism in hardware-implicit synchronization-interleaving - liveness properties - safe access to shared data - synchronized access to shared variables.

Text Books

1. Sethi R., *Programming Languages: Concepts and Constructs*, Addison Wesley

Reference Books

1. Tennent R.D., *Principles of Programming Languages*, Prentice Hall International.
2. Sayed. H, Roosta; *Foundation of programming languages Design and Implementations*; Vikas Publising House, New Delhi.
3. Pratt T.W, and Zelkowitz M.V, *Programming Languages: Design and Implementation*, Prentice Hall International.
4. Appleby. D and VandeKopple J.J; *Programming Languages: Paradigm and Practice*, Tata McGraw Hill.
5. Scott M.L; *Programming Language Pragmatics*; Harcourt Asia(Morgan Kaufman).
6. Clocksin W F, Mellish C S; *Programming in PROLOG*.

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

University Examination Pattern

PART A: *Short answer questions (one/two sentences)* *5 x 2 marks=10 marks*

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

PART B: *Analytical/Problem solving questions* *4 x 5 marks=20 marks*

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

PART C: *Descriptive/Analytical/Problem solving questions* *4 x 10 marks=40 marks*

Two questions from each module with choice to answer one question.

Maximum Total Marks: 70

CS09 405: Systems Programming

Teaching scheme **Credits:** 4
3 hours lecture and 1 hour tutorial per week

Objectives

- *To familiarize the students with the essentials of system software design. System software consists of programs necessary to make the hardware function properly.*
- *To equip the student with the right kind of tools for computer systems design and development.*

Module I (15 hours)
Background - system software machine architecture - the simplified instructional computer - traditional machines - RISC machines - assemblers - basic assembler functions - machine dependent and machine independent - assembler features - assembler design - assembler design options - implementation examples - AIX Assembler.

Module II (13 hours)
Loaders and linkers - basic loader functions - machine dependent and machine independent loader features - loader design options and implementation examples - macro processors - basic macro processor functions - machine-independent macro processor features - macro processor design options and implementation examples.

Module III (14 hours)
Introduction to operating systems - basic principles - batch processing - multiprogramming - timesharing systems and real-time systems - parallel and distributed systems - computer system structure - computer system operation - I/O structure - structure - storage hierarchy - hardware protection - general system architecture - operating system structure - system components - OS services -system calls - system structure - virtual machines.

Module IV (10 hours)
General overview of the UNIX operating system - history of UNIX - system structure - user perspective - services - hardware assumptions - unix architecture - system concepts - kernel data structures - system administration process (concepts only)

Text Books

1. Beck L.L., *System Software - An introduction to Systems Programming*, Addison Wesley
2. Bach M. J., *The Design of the Unix Operating System*, Prentice Hall India

Reference Books

1. Dhamdhere D.M., *Systems Programming and Operating Systems*, Tata McGraw Hill
2. Godbole S., *Operating Systems*, Tata McGraw Hill.

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

University Examination Pattern

PART A: *Short answer questions (one/two sentences)* *5 x 2 marks=10 marks*

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

PART B: *Analytical/Problem solving questions* *4 x 5 marks=20 marks*

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

PART C: *Descriptive/Analytical/Problem solving questions* *4 x 10 marks=40 marks*

Two questions from each module with choice to answer one question.

Maximum Total Marks: 70

CS09 406: Microprocessor Based Design

Teaching scheme **Credits:** 4
3 hours lecture and 1 hour tutorial per week

Objectives

- *To familiarize the student with the internals of a microprocessor with a wide range of processing capabilities.*
- *Also to give a fair idea of various interfacing methods and devices, along with a detailed treatment of important design issues.*

Module I (12 hours)
Historical background of microprocessors - Inside the PC: Motherboard - Graphic adapters and monitors - Drive controllers - Floppy and hard disk drives - Streamers and other drives - Parallel interfaces and printers - Serial interfaces and modems - Network adapters and LANs - CMOS RAM and real clock - Keyboard, mouse and other rodents - The power supply - Operating system - BIOS and memory organization - 8086/8088 Hardware specification: Clock generator - Bus. buffering and latching - bus timing - Ready and wait states - Minimum and maximum modes - Advanced processors - Features of 80386, 80486 and Pentium processors.

Module II (13 hours)
Microprocessor architecture: Real mode and protected mode memory addressing - Memory paging - Addressing modes - Data addressing - Program memory addressing - Stack memory addressing - Data movement instructions - Arithmetic and logic instructions - Program control instructions - Programming the microprocessor: modular programming - Using keyboard and display - Data conversions - disk files - interrupt hooks.

Module III (12 hours)
Memory interface: Memory devices - Address decoding, 8 bit (8088), 16 bit (8086), 32 bit (80486) and 64 bit (Pentium) memory interfaces - Dynamic RAM. I/O interface - Port address decoding - PPI, 8279 interface - 8254 timer interface - 16550 UART interface - ADC/DAC interfaces.

Module IV (15 hours)
Interrupts: Interrupt processing - Hardware interrupts - Expanding the interrupt - 8259A programmable interrupt controller - DMA: DMA operation - 8237 DMA controller - Shared bus operation - Disk memory systems - Video displays - Bus interface: ISA bus - EISA and VESA buses - PCI bus.

Text Books

1. Brey B.B., *The Intel Microprocessors 8086 to Pentium: Architecture, Programming and Interface*, Prentice Hall of India
2. Messmer H.P., The *Indispensable PC Hardware Book*, Addison Wesley.

Reference Books

1. Ray K. & Bhurchandi K.M., *Advanced Microprocessors & Peripherals*, Tata McGraw Hill.
2. Hall D.V., *Microprocessors & Interfacing: Programming & Hardware*, Tata McGraw Hill.
3. Miller K., *An Assembly Language Introduction to Computer Architecture using the Intel Pentium*, Oxford University Press.
4. Bigelow SJ., *Troubleshooting, Maintaining & Repairing PCs*, Tata McGraw Hill.

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

University Examination Pattern

PART A: *Short answer questions (one/two sentences)* *5 x 2 marks=10 marks*

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

PART B: *Analytical/Problem solving questions* *4 x 5 marks=20 marks*

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

PART C: *Descriptive/Analytical/Problem solving questions* *4 x 10 marks=40 marks*

Two questions from each module with choice to answer one question.

Maximum Total Marks: 70

CS09 407(P) : Data Structure Lab

Teaching scheme **Credits:** 2
3 hours practical per week

Objectives

- *To give hands on experience in viewing data as the central resource in computing process and to visualize the importance of structuring data.*
- *To demonstrate the impact of organizing data on the efficiency of algorithms that process the data, including static and dynamic data structures as well as linear and nonlinear data structures.*

1. Stack and Queue: Implementation using arrays and Linked lists
2. Searching Methods: Binary search and Hashing
3. Sorting: Recursive implementation of Quick Sort and Merge Sort
4. Binary Search Tree. Implementation with insertion, deletion and traversal
5. Infix Expression Evaluation: Using expression tree
6. Graph Search Algorithms: DFS and BFS on A connected directed graph
7. Minimal Spanning Tree. Implementation of Kruskal's and Prim's Algorithms
8. Shortest Path Algorithm. Dijkstra and Floyd Warshall Algorithsm
9. Disjoint Set operations: Union and Find using rank and path compression
10. Applications of Heap: Priority Queue and Heap Sort.

Reference Books

1. Cormen T.H., Lieserson C.E. & Rivest R.L., *Introduction to Algorithms,* Prentice Hall of India.
2. Sahni S., *Data structures, Algorithms & Applications in C++*, McGraw Hill.

Internal Continuous Assessment *(Maximum Marks-50)*

60%-Laboratory practical and record
30%- Test/s
10%- Regularity in the class

Semester End Examination *(Maximum Marks-50)*

70% - Procedure, conducting experiment, results, tabulation, and inference
20% - Viva voce
10% - Fair record

CS09 408(P) : Digital Systems Lab

Teaching scheme **Credits:** 2
3 hours practical per week

Objectives

- *To give a hands on experience on digital electronics components and systems; which are fundamental building blocks of the Computer systems.*
- *To deal extensively with the characteristic and features of indispensable digital electronic circuits and systems through structured experiments.*

1. Verification of truth tables of AND, OR, NOT, NAND, NOR and XOR gates, used for gating digital signals.
2. TIL characteristics
3. Verification of the postulates of Boolean algebra and DeMorgan's theorem using logic gates.
4. Half and full adders, half and full subtractors.
5. Digital comparator, parity gererator and checker, and code converter
6. Characteristics and operations of RS, gated RS, D, T, and JK master slave flipflops
7. Multiplexer and demultiplexer using gates
8. Shift register, ring counter, and twisted ring counter.
9. Decade counter and variable modulo asynchronous counter
10. Astable multivibrator and schmitt trigger using gates, astable and monostable rnultivibrator and frequency divider using 555.

Reference Books

1. C Nagarath J., *Electronics Analog & Digital*, Prentice Hall India
2. Millman & Halkias, *Integrated Electronics*, Tata McGraw Hill.

Internal Continuous Assessment *(Maximum Marks-50)*

60%-Laboratory practical and record
30%- Test/s
10%- Regularity in the class

Semester End Examination *(Maximum Marks-50)*

70% - Procedure, conducting experiment, results, tabulation, and inference
20% - Viva voce
10% - Fair record