University of Mumbai

Syllabus Structure(R-2007)

At

S.E. (Computer Engineering)

Semester-III

Sr. No.	Subject	Scheme of Instructions Periods per Week Each Period of 60 Min.		Scheme of Evaluation				
		Theory	Practical	Paper		TW	Practical &Oral	Total
				Hours	Marks			
1.	Applied Mathematics-III	*05	---	3	100	25	---	125
2.	Electronic Devices & Linear Circuits	04	02	3	100	25	25	150
3.	Discrete Structure & Graph Theory	03	02	3	100	25	---	125
4.	Digital Logic Design & Application	03	02	3	100	25	---	125
5.	Data Structure and Files	04	02	3	100	25	25	150
6.	Computer Organization & Architecture	03	02	3	100	25	---	125
7.	Presentation and Communication Techniques	02	02	---	---	50	---	50
		24	12	18	600	200	50	850

*After four conjugative periods test should be conducted at fifth period and the assessed papers should be considered as a part of term work.

University of Mumbai			
Class: S.E.	**Branch:** Computer Engineering	**Semester:** III	
Subject: Applied Mathematics –III (Abbreviated as AM-III)			
Periods per Week (each 60 min)	Lecture	05	
	Practical	00	
	Tutorial	---	
		Hours	Marks
Evaluation System	Theory	03	100
	Practical / Oral	---	---
	Oral	---	---
	Term Work	---	25
	Total	03	125

Module	Contents	Hours
1	**Laplace Transform:** • Function of bounded variation, Laplace Transform of standard functions such as 1, $t^n, e^{at}, \sin at, \cos at, \sinh at, \cosh at, erf(t)$ • Linearity property of Laplace Transform, First Shifting property, Second Shifting property, Change of Scale property of L.T. $L\{t^n f(t)\}, L\left\{\frac{f(t)}{t}\right\}, L\left\{\int_0^t f(u)du\right\}, L\{f^n(t)\}$ Heaviside Unit step function, Direct Delta function, Periodic functions and t their laplace Transform. • Inverse Laplace Transform: Linearity property, use of theorems to find inverse Laplace Transform, Partial fractions method and convolution theorem (without proof). • Applications to solve initial and boundary value problems involving ordinary differential equations with one dependent variable.	03 07 06 03
2	**Matrices(I):** • Types of matrices, Adjoint of a matrix, Inverse of a matrix, orthogonal matrix, unitary matrix, Rank of a matrix, reduction to normal form PAQ, Linear dependence and independence of rows/columns over a field. • System of homogeneous and non-homogeneous equation, their consistency and solutions.	07 04
3	**Fourier Series:** • Orthogonal and orthonormal set, Expressions of a function in a series of orthogonal functions. Dirichlet's conditions. Fourier series of periodic function in the interval $[c, c+2\pi], [c, c+2l]$.	08

	• Dirichlet's theorem even and odd functions. Half range sine and cosine series, Parsevel's identities (without proof) • Complex form of Fourier series • Practical harmonic analysis	04 02 02
4	**Fourier Transform:** Introduction, Fourier integrals-Fourier sine and cosine integrals, Fourier sine and cosine transform, Linearity property, change of scale property, shifting property, convolution theorem(without proof)	06
5	**Z-transform:** Z-transform of standard functions such as $Z(a^n)$, $Z(n^p)$, Linearity property, damping rule, shifting rules, Initial & Final value theorem, convolution theorem (all without proof), idea of Inverse Z- transform.	06
6	**Use of Scilab(Computer Software) to solve integral transform.**	02

TERM WORK:

1. Based on above syllabus at least 10 tests assessed papers (10 marks)
2. One term test of 100 marks like university pattern must be conducted and scaled to 10 marks.
3. Attendance 05 marks.

Reference Books:

1 Elements of Applied mathematics, P N & J N Wartikar, Pune Vidarthi Gruha Prakashan
2 Advanced Engineering Mathematics, E Kreyszing, Wiley Eastern Limited
3 Advanced Modern Engineering Mathematics, Glyn James
4 Fourier Transform, Schuam Series
5 Higher Engineering Mathematics, B. V. Ramanna, Tata McGraw Hill

University of Mumbai			
Class: S.E.	**Branch:** Computer Engineering	**Semester:** III	
Subject: Electronics Devices and Linear Circuits (Abbreviated as EDLC)			
Periods per Week (each 60 min)	Lecture	04	
	Practical	02	
	Tutorial	---	
		Hours	Marks
Evaluation System	Theory	03	100
	Practical and Oral	02	25
	Oral	---	--
	Term Work	---	25
	Total	05	150

Module	Contents	Hours
1	Bipolar Junction Transistor: - BJT modeling, the hybrid equivalent model, Graphical determination of the H parameters. Negative feedback	07
2	Field Effect Transistor :- Construction of JFETs, Transfer characteristics, FET small signal Model , JFET configurations (Fixed bias, self bias, voltage divider, source follower and common gate) , Common source amplifier.	08
3	Operational Amplifier: Introduction, block diagram representation, Analysis of equivalent circuit, the ideal op-amp, open loop op-amp configuration	08
4	Practical op-amp – Input offset voltage , input bias current , Input offset current , Total output offset voltage , Thermal drift, effect of variation in power supply voltage on offset voltage, Common mode configuration and common mode rejection ratio .	09
5	General linear application, Comparators and Converters: - AC – DC amplifier, Summing amplifier, Instrumentation amplifier, the integrator, the differentiator, zero crossing detector, Schmitt trigger, Analog to digital and Digital to analog converter	09
6	Timer & Voltage regulator:-The IC 555 timer, monostable and astable multivibrator , PLL, voltage regulator(fixed, adjustable, switching regulator)	07

TERM WORK:

List of Experiments:-

- Study of Characteristics of FET.
- Study of RC coupled amplifier involving negative feedback
- Study of JFET amplifier
- Study of variable voltage power supply using operational amplifier.
- Study of inverting Amplifier.
- Study of Non- inverting amplifier.
- Study of Inverting adder. & subtractor.
- Study of Non- inverting & inverting comparator.
- Study of Schmitt trigger.
- Study of square wave generator.
- Study of triangular wave generator.
- Study of IC555 as Astable multivibrator / monostable multivibrator.

Note: -

- As per the pattern of university question paper, the question no. 1 which is compulsory question of 20 marks should cover all contains of syllabus
- Term work of 25 marks to be allotted as 15 marks for practical performance & attendance in theory lectures and 10 marks for unit test.

Reference Books:-

1. Electronics Devices & Circuits by Robert L. Boylestad ,Louis Nashelsky , PHI Publication
2. Electronics Devices and circuits by S Salivahanan ,N.sureshkumar,A Vallavaraj ,TATA McGraw Hill Publication
3. Circuits,Devices & Systems by Ralph J. Smith ,Richard C. Dorf , Wiley India Pvt. Ltd.
4. Electronics Laboratory Prime – a Design Approach by S. Poorna Chandra , S Chand Publication
5. Sergio Franco, 'Design with op-amp and analog integrated circuits,' Tata McGraw Hill series.
6. Op-amp and linear integrated circuits by Ramakant A. Gayakwad , PHI Publication
7. 'Semiconductor Data Manual', BPB Publications.
8. 'Data Book volume I and II', Elektor India.
9. ''TTL / CMOS Data book' , Semiconductor, Texas Instruments.

University of Mumbai			
Class: S.E.	**Branch:** Computer Engineering	**Semester:** III	
Subject: Discrete Structure & Graph Theory (Abbreviated as DSGT)			
Periods per Week (each 60 min)	Lecture	03	
	Practical	--	
	Tutorial	---	
		Hours	Marks
Evaluation System	Theory	03	100
	Practical and Oral	--	--
	Oral	---	--
	Term Work	---	25
	Total	03	125

Module	Contents	Hours
1	**Set Theory** • Sets , Venn diagrams, Operations on sets • Laws of set theory, Power set and products • Partitions of sets, The Principle of Inclusion-Exclusion 3	03
2	**Logic** • Propositions and logical operations, Truth tables • Equivalence, Implications • Laws of logic, Normal Forms • Predicates and Quantifiers • Mathematical Induction	04
3	**Relations, Diagraph and Lattices** • Relations, paths and digraphs; • Properties and types of binary relations; • Manipulation of relations, closures, Warshall's algorithm; • Equivalence and Partial ordered relations; • Posets and Hasse diagram; • Lattice.	07
4	**Functions and Pigeon Hole Principle:** • Definition and types of functions : injective, surjective and bijective; • Composition, identity and inverse; • Pigeon-hole principle.	04

5	**Graphs** • Definition; • Paths and circuits : Eulerian, Hamiltonian; • Planer graphs, Graph coloring • Isomorphism Of Graphs • Traveling salesperson problem	04
6	**Trees** • Trees, Rooted tree and path length in rooted tree • Spanning tree and minimum spanning tree • Isomorphism of trees • Weighted Trees and Prefix Codes	03
7	**Algebraic Structures** • Algebraic structures with one binary operation - semigroups, monoids and groups. • Product and quotient of algebraic structures • Isomorphism, homomorphism, automorphism; • Cyclic Groups, Normal subgroup, Codes and group codes • Algebraic structures with two binary operations - rings, integral domains and fields. • Ring Homomorphisms and Isomorphisms	07
8	**Generating Functions and Recurrence Relations.** • Series and Sequences; • Generating functions; • Recurrence relations; • Applications: Solving Differential equations, Fibonacci	04

Text Books:

1. Ralph P. Grimaldi, B. V. Ramana, " Discrete and Combinatorial Mathematics" Fifth Edision, Pearson Education.
2. Bernard Kolman, Robert C. Busby ,Sharon Cutler Ross, Nadeem-ur-Rehman, " Discrete Mathematical Structures" Pearson Education.
3. D. S. Malik and M. K. Sen , "Discrete Mathematical Structures", Thomson

Reference Books:

1. Kenneth H. Rosen, "Discrete Mathematics and its Applications", Tata McGraw-Hill.
2. Garry Haggard, John Schlipf, Sue Whitesides. "Discrete Mathematics For Computer Science", Thomson.
3. Joe Mott, Abraham Kandel and Theodore Baker, " Discrete Mathematics for Computer Scientist and Mathematicians", Second Edition PHI
4. Richard Johnsonbaugh, " Discrete Mathematics " Pearson Education
5. C. L. Liu, " Elements of Discrete Mathematics" Tata McGRAW-Hill

University of Mumbai			
Class: S.E.	**Branch:** Computer Engineering	**Semester:** III	
Subject: Digital Logic Design and Application (Abbreviated as DLDA)			
Periods per Week (each 60 min)	Lecture	03	
	Practical	02	
	Tutorial	--	
		Hours	Marks
Evaluation System	Theory	03	100
	Practical and Oral	--	--
	Oral	---	--
	Term Work	---	25
	Total	03	125

Module	Contents	Hours
1	**Number systems:** Decimal , Binary, Octal and Hexadecimal number system and conversion, Number system's application e.g. shaft encoding, Binary weighted codes, Signed number binary order, 1's and 2's complement codes, All number system's arithmetic. **Boolean Algebra:** Binary logic functions, Boolean laws, Truth Tables, Associative and distributive properties, Demorgan's Theorem, Realization of switching functions using logic gates.	07
2	**Combinational logic:** Switching equations, Canonical logic forms, Sum of product & Product of sum, karnaugh maps, two, three & four variable karnaugh graph, Simplification of expression Quine-mccluskey minimization techniques, Mixed logic combinational circuits, Multiple output functions.	06
3	**Analysis and design of combinational logic:** Introduction of combinational circuits, Multiplexer and demultiplexer,, Multiplexers as function generator, Binary adder, Substractor, BCD adder, Binary comparator with physical applications, Arithmetic and logic units, Design of combinational circuits using statements.	07
4	**Sequential Logic:** Sequential circuits, Flip flop conversions, Clocked and edge triggered flip flops timing specifications, Timing analysis, state diagrams and tables, transition tables, Excitation table and equations, Examples using flip flops.	05
5	**Sequential Circuits:** Simple synchronous and asynchronous sequential circuit analysis, Different types of counters asynchronous and synchronous, Counter Design with state equations, Registers, Different types of Shift registers, Construction of state diagram and counter design.	06
6	**Digital integrated circuits:** Digital circuit logic levels, Propagation	05

	delay times, Power dissipation, Fan out and fan in, Noise margin for popular logic families, TTL, TTL sub families, CMOS and their performance comparison(Numericals expected)	

TERM WORK

1. Term work should consist of at least 8 practical experiments duly graded (Desirable 10 experiment) and two assignments covering all the topics of the syllabus.
2. A term work test must be conducted with a weightage of 10 marks covering complete syllabus.

List of experiments:

1. Study of Basic Gates and Universal Gates.
2. Realization of logical expression using Universal Gates and Basic Gates.
3. Binary Arithmetic circuits I) Adder II) subtractor.
4. Implement certain functions using multiplexers [16:1, 8:1, 4:1]
5. Design and implement 4:1 multiplexer with strobe I/P active low using NAND & NOR Gate.
6. To design & implement any one code converter [e.g. Excess-3, BCD -- Gray] using Decoder & Demultiplexer.
7. To design & implement 4-bit parity generator/ checker using
   I) Minimum number of gates.
   II) IC 74180.
8. Design of 7-segment display using decoder [IC 7447]
9. Design of JK Flipflop using NAND gates and verification of the same flip flop using IC 7476.
10. Design of asynchronous Up & Down Counter.
11. Design of synchronous counter.
12. Design of random sequence generator.
13. Design of shift register using flip flops verification of different modes.
14. Verification of function table of universal shift register IC 74194.
15. Compare propagation delay and transfer characterstic of TTL & CMOS gates [use odd no. of gates].

Text Books:

1. R. P. Jain, "Modern Digital Electronics", Tata McGraw Hill.
2. John F. Wakerly, "Digital Design Principles and Practices", Pearson Education, Russia
3. M. Morris Mano, "Digital Logic and computer Design", PHI.

Reference Books:

1. John M. Yarbrough, "Digital Logic", Thomson Learning.
2. Samuel Lee, "Digital Circuits and Logic Design", PHI.
3. Charles H. Roth, "Fundamentals of Logic Design, (4 th Edition)", Junior Jaico Book.

University of Mumbai			
Class: S.E.	**Branch:** Computer Engineering	**Semester:** III	
Subject: Data Structure and Files (Abbreviated as DSF)			
Periods per Week (each 60 min)	Lecture	04	
	Practical	02	
	Tutorial	--	
		Hours	Marks
Evaluation System	Theory	03	100
	Practical and Oral	02	25
	Oral	---	--
	Term Work	---	25
	Total	05	150

Pre-requisites: A Course in Object Oriented Programming Language such as (JAVA)

Module	Contents	Hours
1	**Introduction to Data Structures:** • Definition • The Abstract Data Type(ADT) • Arrays • Strings • Recursion	05
2	**File Handling:** • File Organization • Types of files • File operations	04
3	**Sorting and Searching:** **A. Sorting** • Insertion sort • Selection sort • Exchange sort (Bubble, Quick) • Merge sort • Heap sort **B. Searching:** • Linear Search • Binary Search • Hashing Technique and collision handling	07
4	**Stack:** • The Stack as an ADT • Representation	03

	• Stack Operations • Applications	
5	**Queue:** • The Queue as an ADT • Representation • Queue Operations • Circular and Priority Queues • Applications	03
6	**Linked List:** • The Linked List as an ADT • Operation on Linked List • Linked Stacks and Queues • The Linked List as a Data Structure • Array implementation of Linked List • Linked List using Dynamic variable • Comparison of Dynamic and Array implementation of Linked List • Doubly Linked List • Circular Linked List	10
7	**Trees:** • Basic tree concepts • Binary Tree Operations and Applications • Binary Tree representations • Binary Tree Traversals • Threaded Binary Tree • The Huffman Algorithm • Binary Search Tree Implementation • Expression Trees • Introduction of multiway tree (B-Tree, B+ Trees, AVL Tree)	12
8	**Graphs:** • Graph as an ADT • Graph Representation • Graph Traversal (Depth First Search, Breadth First Search)	04

TERM WORK

Term work should consist of graded answer papers of the test and 12 implementations using object oriented constructs & concepts. Students are expected to build their own classes and methods. Built-in classes are not to be used (preferably). Each student is to appear for atleast one written test during the Term. Each implementation must consist of Problem Statement, Brief Theory, Algorithm, Flowchart and Conclusion.

Topics for Implementation

1. String functions , Recursion and Files
2. Implementations of Stack & Queues (Circular & Priority)
3. Implementation of Linked Lists (Singly & Doubly)
4. Implementation of Searching & Sorting methods
5. Implementation of Binary Tree
6. Implementation of Graph

Text Books:

1. Y. Langsam, M.J. Augenstein and A.M. Tanenbaum, "Data Structures Using Java", Pearson Education .
2. R.F. Gilberg and Behrouz A. Forouzan, "Data Structure: A Pseudocode Approach with C", Thomson Edition .
3. Michael Goodrich & Roberto Tamassia, "Data structures and algorithms in Java^{JM}", Second Edition, Wiley India Edition.

Reference Books:

1. John R. Hubbard and Hurry "Data structures with Java", Pearson Education.
2. Mark Allen Weiss, "Data Structure & Algorithm Analysis in C++", Third Edition, Pearson Education.
3. Sanjay Pahuja, "A Practical to Data Structure & Algorithms", First Edition, New Age International Publisher.
4. Alan L. Tharp "File organization and processing", Amazon Publication.

University of Mumbai			
Class: S.E.	**Branch:** Computer Engineering	**Semester:** III	
Subject: Computer Organization and Architecture (Abbreviated as COA)			
Periods per Week (each 60 min)	Lecture	03	
	Practical	02	
	Tutorial	--	
		Hours	Marks
Evaluation System	Theory	03	100
	Practical and Oral	--	--
	Oral	---	--
	Term Work	---	25
	Total	03	125

Module	Contents	Hours
1	**Basic structure of computer** Introduction of computer system and its sub modules, Basic organization of computer and block level description of the functional units. Von newmann model, Introduction to buses and connecting I/O devices to CPU and memory, Asynchronous and synchronous bus, PCI, SCSI.	04
2	**Arithmetic and Logic Unit.** Arithmetic and logical unit hardware implementation, Booth's Recoding, Booth's algorithm for signed multiplication , Restoring division and non restoring division algorithm, IEEE floating point number representation and operations.	07
3	**Central processing unit.** CPU architecture, Register organization , Instruction formats and addressing modes (Intel processor)., Basic instruction cycle, Instruction interpretation and sequencing, Control Unit operation, Hardwired control unit design methods and design examples, Multiplier control unit, Micro programmed control unit, basic concepts, Microinstruction sequencing and execution , Micro operations, concepts of nanoprogramming, Introduction to RISC and CISC architectures, design issues and examples of RISC processors.	06
4	**Memory Organization.** Characteristics of memory system and hierarchy, concepts of semiconductor memories, main memory, ROM, EPROM, RAM, SRAM, DRAM, SDRAM, RDRAM, , Flash memory, Stack Organization. High speed memories: Cache memory organization and mapping, replacement algorithms , cache coherence, Interleaved and associative memories , Virtual memory, main memory allocation , segmentation paging, Secondary storage, RAID, optical memory, CDROM, DVD.	07

5	**I/O Organization.** Input/Output systems, Programmed I/O, Interrupt driven I/O, I/O channels, DMA, Peripheral Devices, U.S.B.	03
6	**Multiprocessor Configurations.** Flynn's classifications, parallel processing concepts, Introduction to pipeline processing and pipeline hazards, design issues of pipeline architecture, Instruction pipeline, Instruction level parallelism and advanced issues.	04
7	**SPARC** Static and Dynamic data flow design, Fault tolerant computers, Interprocessor communication and synchronization, cache coherence, shared memory multiprocessor.	03
8	**Systolic Architectures** Systolic arrays and their applications, wave front arrays.	02

TERM WORK:

Based on above syllabus at least 10 experiments and one written test of 10 marks to be conducted.

Text Books:

1. Miles Murdocca, "Computer Architecture and Organization", Wiley India
2. William Stallings, "Computer Organization and Architecture: Designing and performance": Prentice-Hall India
3. Carl Hamacher, Zvonko Vranesic and Safwat Zaky "Computer Organization", McGraw Hill

Reference Books:

1. John L. Hennessy and David Patterson," Computer Architecture A Quantitative Approach", Morgan Kaufman
2. Andrew S. Tanenbaum," Structured Computer Organization", Prentice-Hall India

University of Mumbai			
Class: S.E.	**Branch:** Computer Engineering	**Semester:** III	
Subject: Presentation and Communication Techniques(Abbreviated as PCT)			
Periods per Week (each 60 min)	Lecture	02	
	Practical	02	
	Tutorial	---	
		Hours	Marks
Evaluation System	Theory	---	---
	Practical and Oral	---	---
	Oral	---	---
	Term Work	---	50
	Total	---	50

	Contents	Hours
1.	**Communication in a business organization:** Internal and external communication, Types of meetings, strategies for conducting successful business meetings, documentation (notice, agenda, minutes, resolution) of meetings. Introduction to modern communication techniques. (e-mail, internet, video-conferencing, etc.) Legal and ethical issues in communication (Intellectual property rights: patents, TRIPS, Geographical indications).	05
2	**Advanced technical writing**: Report writing: Definition and importance of reports, qualities of reports, language and style in reports, types of reports, formats (letter, memo, project-repots). Methods of compiling data for preparing report. A computer-aided presentation of a technical project report based on survey-based or reference based topic. The topics are to be assigned to a group of 8-10 students. The written report should not exceed 20 printed pages. Technical paper-writing, Writing business proposals.	07
3	**Interpersonal skills**: Introduction to emotional intelligence, motivation, Negotiation and conflict resolution, Assertiveness, team-building, decision-making, time-management, persuasion	03

4	**Presentation skills**: Elements of an effective presentation, Structure of a presentation, Presentation tools, Audience analysis, Language: Articulation, Good pronunciation, Voice quality, Modulation, Accent and Intonation.	03
5	**Career skills**: Preparing resumes and cover letters. Types of Resumes, Interview techniques: Preparing for job interviews, facing an interview, verbal and non-verbal communication during interviews, observation sessions and role-play techniques to be used to demonstrate interview strategies (mock interviews).	03
6	**Group discussion**: Group discussions as part of selection process. Structure of a group discussion, Dynamics of group behavior, techniques for effective participation, Team work and use of body language.	03

Term work:

Part-I (25 Marks): Assignments;

Two assignments on communication topics
Three assignments on report-writing
Three assignments on interpersonal skills
Two assignments on career skills
At least one class test (written)
Distribution of term work marks will be as follows:

Assignments : 10 marks
Written test : 10 marks
Attendance (Theory and Practical) : 05 marks

Part-II (25 Marks): Presentation;

Distribution of term work marks will be as follows:

Project report presentation : 15 marks
Group discussion : 10 marks

The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and minimum passing in the term-work.

Text books:

1. Lesikar and Petit, *Report writing for business*, Tata McGraw Hill.
2. Raman and Sangeeta Sharma, *Technical communication*, Oxford University Press, New Delhi.

Reference Books:

1. Wallace & Masters, *Personal development for Life & work*, Thomson Lerning.
2. Heta Murphy, *Effective Business Communication*, McGraw Hill.
3. Huckin & Olsen, *Technical writing and professional communication*, McGraw Hill.
4. Fred Luthans, *Organizational behavior*, McGraw Hill.