UNIVERSITY OF MUMBAI

Bachelor of Engineering

Computer Engineering (Second Year – Sem. III & IV)

Revised course

(REV- 2012) from

Academic Year 2012 -13

Under

FACULTY OF TECHNOLOGY

(As per Semester Based Credit and Grading System)

Program Structure for B.E. Computer Engineering

Second Year (Computer) (Semester III)

(REV 2012)

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Pract	Tut	Theory	TW/ Pract	Tut	Total
CSC301	Applied Mathematics III*	4	-	1#	4	-	1	5
CSC 302	Object Oriented Programming Methodology*	4	2	-	4	1	-	5
CSC303	Data Structures	4	2	-	4	1	-	5
CSC304	Digital Logic Design and Analysis	3	2	-	3	1	-	4
CSC305	Discrete Structures	4	-	-	4	-	-	4
CSC306	Electronic Circuits and Communication Fundamentals	4	2	-	4	1	-	5
	Total	**23**	**8**	**1**	**23**	**4**	**1**	**28**

Course Code	Course Name	Examination Scheme							
		Internal Assesment							
		Internal Assesment			End Sem Exam	Exam Duration (in Hrs)	TW	Pract / oral	Tot
		Test 1	Test 2	Avg					
CSC301	Applied Mathematics III*	20	20	20	80	03	25!	-	125
CSC302	Object Oriented Programming Methodolgy*	20	20	20	80	03	25	25	150
CSC303	Data Structures	20	20	20	80	03	25	25	150
CSC304	Digital Logic Design and Analysis	20	20	20	80	03	25	-	125
CSC305	Discrete Structures	20	20	20	80	03	-	-	100
CSC306	Electronic Circuits and Communication Fundamentals	20	20	20	80	03	25	25	150
	Total	**-**	**-**	**120**	**480**	**-**	**125**	**75**	**800**

* Common Subjects with IT # Tutorial to be taken class wise ! **Tutorials will be evaluated as Term work**

Course Code	Course Name	Credits
CSC301	**Applied Mathaematics III**	05

Objectives:

1) Complex Variable (2) Laplace Transform (3) Fourier Series (4) Discrete Structures (5) Z-transform

These topics involve the study of analytic function and mapping of complex function, Laplace transform, Inverse Laplace transform and application of Laplace transform to solve differential equations, finding Fourier series, Sine and cosine Fourier integral and Z-transform. These topics help them to solve many engineering problems arising in course of their further studies and also while working in the practical life situations.

Outcomes:

Students in this course will apply the Procedure and methods to solve technical problems.

Details of the Syllabus:-

Module	Topics	Hrs
01	**Complex Variable & mapping** 1.1 Functions of a complex variable, Analytic functions, Cauchy-Riemann equations in Cartesian co-ordinates, Polar co-ordinates. 1.2 Harmonic functions, Analytic method and Milne Thomson methods to find f(z), Orthogonal trajectories. 1.3 Conformal Mapping, Linear, Bilinear transformations, Cross ratio, fixed points and standard transformation such as rotation and magnification, invertion, translation.	**(10)**
02	**Laplace Transform** 2.1 Introduction, Definition of Laplace transform, Laplace transform of constant, trigonometrical, exponential functions. 2.2 Important properties of Laplace transform: First shifting theorem, Laplace transform of $L\{t^n f(t)\}$, $L\{f(t)/t\}$, $L\left\{\frac{d^n f(t)}{dt^n}\right\}$, $L\{\int_0^t f(u)du\}$, $L\{f(at)\}$ without proof. 2.2Unit step function, Heavi side function, Dirac-delta function, Periodic function and their Laplace transforms, Second shifting theorem. 2.3Inverse Laplace transform with Partial fraction and Convolution theorem (without proof). 2.4 Application to solve initial and boundary value problem involving ordinary differential equations with one dependent variable and constant coefficients.	**(10)**

03	**Fourier series** 3.1 Dirichlet's conditions, Fourier series of periodic functions with period 2π and 2L. 3.2 Fourier series for even and odd functions. 3.3 Half range sine and cosine Fourier series, Parsevel's identities (without proof). 3.4Orthogonal and Ortho-normal functions, Complex form of Fourier series. 3.5 Fourier Integral Representation.	**(10)**
04	**Vector Algebra and Calculus** 4.1 Vector Algebra: Scalar and vector product of three and four Vectors and their properties. 4.2 Vector Calculus: Vector differential operator ∇, Gradient of a scalar point function, Diversions and Curl of Vector point function, $\nabla\,(u\,v)$, $\nabla.(\emptyset\bar{u}), \nabla x(\emptyset\bar{u}), \nabla x\,(\bar{u}x\bar{v}\,)$. 4.3 Vector Integration: Line integral; conservative vector field,Green's theorem in a plane (Without proof) 4.4 GaussDivergence theorem & Stokes' theorem (Without proof and no problems on verification of above theorems).	**(10)**
05	**Z transform** 5.1 Z-transform of standard functions such as $Z(a^n)$, $Z(n^p)$. 5.2 Properties of Z-transform :Linearity, Change of scale, Shifting property, Multiplication of K, Initial and final value, Convolution theorem (all without proof) 5.3 Inverse Z transform: Binomial Expansion and Method of Partial fraction.	**(8)**

Term work:

Term work shall consist of minimum four SCILAB practicals and six tutorials.

SCILAB practicals	:	10 marks
Tutorials	:	10 marks
Attendance	:	05 marks
Total	**:**	**25 marks**

Text Books:

- Higher Engineering Mathematics by Grewal B. S. 38th edition, Khanna Publication 2005.
- Advanced Engineering Mathematics by Kreyszig E. 9th edition, John Wiley.
- A Text Book of Applied Mathematics Vol. I & II by P.N.Wartilar & J.N.Wartikar, Pune, Vidyarthi Griha Prakashan., Pune.
- Discrete and Combinational Mathematics by Ralph P. Crimaldi, B Y Ramana.

References:

- Advanced Engg. Mathematics by C. Ray Wylie & Louis Barrett.TMH International Edition.
- Mathematical Methods of Science and Engineering by Kanti B. Datta, Cengage Learning.
- Lapplace Treansforms by Murry R. Spieget, Schaun's out line series-McGraw Hill Publication.
- Discrete mathematics by ERIL FOSSETT, Wiley India.

Theory Examination:

1. Question paper will comprise of total 6 questions, each of 20 Marks.
2. Only 4 questions need to be solved.
3. Question 1 will be compulsory and based on maximum part of the syllabus.
4. Remaining questions will be mixed in nature (for example suppose Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)

In question paper, weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.

Subject Code	Subject Name	Credits
CSC302	Object Oriented Programming Methodology (OOPM)*	05

Course Objectives

1. To understand Object oriented concepts like data abstraction, encapsulation, etc.
2. To solve the real world scenarios using top down approach.
3. To understand various Java programming constructs.

Course Outcomes

1. Students will be able to solve computational problems using basic constructs like if-else, control structures, array, strings.
2. Student can understand how to model real world scenario using class diagram.
3. Students will exhibit communication between 2 objects using sequence diagram.
4. Students will be able to implement relationships between classes.
5. Students will be able to demonstrate various collection classes.
6. The students will be able to demonstrate programs on exceptions, multithreading and applets.

Sr. No	Topic	No of Hours
1	Programming Approach from proceduaral to Object Orientation OO methodologies: Grady Booch Methodology of OO development	4
2	OO Concepts: Object, Class, Encapsulation or information hiding, Inheritance, Polymorphism, Message communication, Abstraction, Reuse, Coupling and Cohesion, Sufficiency Completeness and Primitiveness, Meta class	5
3	Object Oriented Programming: Java Evolution: History, How java differs from others Overview of Java language: Introduction, Installing and implementing Java, JVM	3
4	Constants, variables and data types Operators and Expressions Revision of Branching and looping	6
5	Class Object and Method: member, method, Modifier, Selector, constructer, destructor, iterator, State of an object, Method Overloading, Inheritance, Method Overriding ,Final class, abstract class and method	6

6	Classes and Relationships : Implementation of Association and Aggegation using simple scenarios	2
7	Array, String, Vector	6
8	Interfaces : variables in Interfaces, Extending an Interface, Difference between an Abstarct class and an Interface	4
9	Multithread programming	4
10	Grouping of classes for deployment and reuse: Built-in Packages: java.lang: wrapper classes java.util: ArrayList and LinkedList Creating and using User defined packages	3
11	Managing Error and Exception	3
12	Applet programming	2

Suggested list of Programming Assignments /Laboratory Work

Divide laboratory work into 3 parts

A. Basic Java structural components and Conditional and control statements:

- To demonstrate the use of command line argument.
- To demonstrate various ways of accepting data through keyboard.
- To understand the working of an array.
- To understand string class and demonstrate its various functions.

B. Perform following practical on some case study like Banking Application, Library Application etc.

- Find out classes, objects and their properties.
- Create and display objects found in above.
- Add methods to classes and implement.
- Refine above objects by adding constructors and local variables.
- Show communication between the objects by calling instance of one object from another class.
- Find relationships like inheritance, association, aggregation, composition.
- Implement above relationships.

C.

- To implement user defined exceptions in Java.
- Demonstrate the use collection classes like ArrayList/LinkedList/HashSet/TreeSet/Map.

- To illustrate Multithreading in Java.
- Simple programs on Applets and AWT.

TermWork:

Students will submit Term Work in the form of a journal that will include at least 15 programming assignments. Each programming assignment will consist of an algorithm or class diagram/sequence diagram (if applicable), program listing with proper documentation and snapshot of the output.

Practical Examination will be based on the term work and questions will be asked to judge understanding of the assignments at the time of the examination.

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

Term Work: 25 Marks (total marks) = 15 Marks (Experiment) + 5 Marks (Assignment) + 5 (Attendance (theory+practical))

Practical Exam will based on above syllabus

Theory Examination:

1. Question paper will comprise of total 6 questions, each of 20 Marks.
2. Only 4 questions need to be solved.
3. Question 1 will be compulsory and based on maximum part of the syllabus.
4. Remaining questions will be mixed in nature (for example suppose Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)

In question paper, weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.

Text Books:

1. Ralph Bravaco , Shai Simoson , “Java Programing From the Group Up” ,Tata McGraw-Hill
2. Grady Booch, Object Oriented Analysis and Design ;
3. Jaime Nino, Frederick A. Hosch, ‘An introduction to Programming and Object Oriented Design using Java’, Wiley Student Edition.

Reference Books:

1. Java: How to Program, 8/e, Dietal, Dietal, PHI
2. Grady Booch, James Rumbaugh, Ivar Jacobson, “The Unified Modeling Language User Guide”, Pearson Education
3. Sachin Malhotra, Saurabh Chaudhary “Programming in Java”, Oxford University Press, 2010

Subject Code	Subject Name	Credits
CSC303	**Data Structures (DS)**	5

Course Objectives

1. To teach efficient storage mechanisms of data for an easy access.
2. To design and implementation of various basic and advanced data structures.
3. To introduce various techniques for representation of the data in the real world.
4. To develop application using data structures.
5. To teach the concept of protection and management of data.
6. To improve the logical ability

Course Outcomes

1. Student will be able to choose appropriate data structure as applied to specified problem definition.
2. Student will be able to handle operations like searching, insertion, deletion, traversing mechanism etc. on various data structures.
3. Students will be able to apply concepts learned in various domains like DBMS, compiler construction etc.
4. Students will be able to use linear and non-linear data structures like stacks , queues , linked list etc.

Module	Detailed content	Hours
01	**Introduction to Data Structure** Types of Data Structure, Arrays, Strings, Recursion, ADT (Abstract Data type),Concept of Files,Operations with files, types of files	05
Linear Data Structure		
02	**Linked List** Linked List as an ADT, Linked List Vs. Arrays, Memory Allocation & De-allocation for a Linked List, Linked List operations, Types of Linked List, Implementation of Linked List, Application of Linked List- polynomial, sparse matrix.	10
03	**STACK** The Stack as an ADT, Stack operation, Array Representation of Stack, Link Representation of Stack, Application of stack – Recursion, Polish Notation	04
04	**Queues** The Queue as an ADT, Queue operation, Array Representation of Queue, Linked Representation of Queue, Circular Queue, Priority Queue, & De-queue, Application of Queues – Johnsons Algorithm, Simulation	05

Non-linear Data Structure		
05	**Trees** Basic trees concept, Binary tree representation,Binary tree operation, Binary tree traversal, Binary search tree implementation, Thread Binary tree, The Huffman Algorithm, Expression tree, Introduction to Multiway search tree and its creation(AVL, B-tree, B+ tree)	10
06	**Graphs** Basic concepts, Graph Representation, Graph traversal (DFS & BFS)	04
Sorting AND Searching		
07	**Sorting :** Sort Concept, Shell Sort, Radix sort, Insertion Sort, Quick Sort, Merge Sort,Heap Sort, **Searching :** List Search,Linear Index Search, Index Sequential Search Hashed List Search, Hashing Methods , Collision Resolution	10

Text Books:

1. Data Structures A Psedocode Approach with C, Richard F. Gilberg & Behrouz A. Forouzan, second edition, CENGAGE Learning.
2. Data Structures using C, Reema Thareja, Oxford University press.
3. Introduction to Data Structure and its Applications Jean-Paul Tremblay, P. G. Sorenson

Reference Books:

1. Data Structures Using C & C++, Rajesh K. Shukla, Wiley- India.
2. Data Structures Using C, ISRD Group, Second Edition, Tata McGraw-Hill
3. Data Structure Using C, Balagurusamy
4. C & Data Structures, Prof. P.S. Deshpande, Prof. O.G. Kakde, Dreamtech press.
5. Data Structures, Adapted by: GAV PAI, Schaum's Outlines

Termwork:

Term work should consist of at least 12 experiments.
Journal must include at least 2 assignments.
The final certification and acceptance of term work ensures that satisfactory performance of laboratory work and minimum passing marks in term work.
Term Work: 25 Marks (total marks) = 15 Marks (Experiment) + 5 Marks (Assignment) + 5 (Attendance (theory+practical))
Practical exam will be based on the above syllabus.

Theory Examination:

1. Question paper will comprise of total 6 questions, each of 20 Marks.
2. Only 4 questions need to be solved.
3. Question 1 will be compulsory and based on maximum part of the syllabus.
4. Remaining questions will be mixed in nature (for example suppose Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)

In question paper, weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.

Suggested Experiments:

Note: Students are required to complete 12 experiments. The star (*) marks experiments are mandatory.

Linked List
• Implementations of Linked Lists menu driven program. • * Implementation of different operations on linked list – copy, concatenate, split, reverse, count no. of nodes etc • Representation of Sparse matrix using multilinked structure. Implementation of sparse matrix multiplication. • Implementation of polynomials operations (addition, subtraction) using Linked List. • Implementations of Linked Lists menu driven program (stack and queue) • Implementations of Double ended queue using Linked Lists. • Implementation of Priority queue program using Linked Lis
Stack
• Implementations of stack menu driven program • Implementation of multistack in one array. • * Implementations of Infix to Postfix Transformation and its evaluation program. • Implementations of Infix to Prefix Transformation and its evaluation program. • Simulation of recursion
Queue
• Implementations of circular queue menu driven program • * Implementations of double ended queue menu driven program • Implementations of queue menu driven program • Implementation of Priority queue program using array. • Implementation of Johnsons Algorithm • Implementation of Simulation Problem
Tree

- *Implementations of Binary Tree menu driven program
- Implementation of Binary Tree Traversal program.
- *Implementation of construction of expression tree using postfix expression.
- Implementations of Huffman code construction
- Implementations of BST program
- Implementation of various operations on tree like – copying tree, mirroring a tree, counting the number of nodes in the tree, counting only leaf nodes in the tree.
- Implementations of B-tree menu driven program
- Implementations of B+ tree program
- Implementation of Preorder traversal of a threaded binary tree.
- Implementations of AVL Tree menu driven program

Sorting

- *Implementations of Shell sort, Radix sort and Insertion sort menu driven program
- Implementations of Quick Sort, Merge sort and Heap Sort menu driven program

Searching

- *Implementations of searching methods (Index Sequential, Interpolation Search) menu driven program
- Implementation of hashing functions with different collision resolution techniques

Graph

- * Implementations of Graph menu driven program (DFS & BSF)

Subject Code	Subject Name	Credits
CSC304	Digital Logic Design and Analysis	4

Course Objective:

1. To provide concepts that underpins the disciplines of digital electronics and microprocessor systems.
2. To provide the concept of modeling Combinational and sequential circuits.
3. To provide basic knowledge of how digital building blocks are described in VHDL.

Course Outcomes:

1. Binary and hexadecimal calculations and conversions.
2. Designing of combinational circuits.
3. Design synchronous and asynchronous sequential circuits.
4. Translate real world problems into digital logic formulations.
5. Construct test and debug digital networks using VHDL.
6. Learners will show awareness about TTL and CMOC Logic

Module	Detailed Contents	Hours
1	Number Systems and Codes: Revision of Binary, Octal, Decimal and Hexadecimal number Systems and their conversion, Binary Addition and Subtraction (1's and 2's complement method), Gray Code, BCD Code, Excess-3 code, ASCII Code, Error Detection and Correction Codes.	05
2	Boolean Algebra and Logic Gates: Theorems and Properties of Boolean Algebra, Standard SOP and POS form, Reduction of Boolean functions using Algebric method, K -map method (2,3,4 Variable), and Quine-McClusky Method. NAND-NOR Realization. Basic Digital Circuits: NOT,AND,OR,NAND,NOR,EX-OR,EX-NOR Gates, Logic Families: Terminologies like Propagation Delay, Power Consumption, Fan in and Fan out etc. with respect to TTL and CMOS Logic and comparison.	10
3	Combinational Logic Design: Introduction, Half and Full Adder, Half and Full Subtractor, Four Bit Binary Adder, one digit BCD Adder, Four Bit Binary Subtractor (1's and 2's compliment method), code conversion, Multiplexers and Demultiplexers, Decoders, One bit, Two bit ,4-bit Magnitude Comparator .	08
4	Sequential Logic Design: Concept of Multivibrators: Astable, Monostable and Bistable multivibrators, Flip Flops:SR, D, JK, JK	10

	Master Slave and T Flip Flop, Truth Tables and Excitation Tables, Flip-flop conversion. sequential circuit analysis , construction of state diagrams. Counters: Design of Asynchronous and Synchronous Counters, Modulo Counters, UP- DOWN counter . Shift Registers: SISO, SIPO,PIPO,PISO, Bidirectional Shift Register, Universal Shift Register, Ring and Johnson Counter. Pseudorandom sequence generator.	
5	Functional Simulation , Timing Simulation, Logic synthesis, Introduction to VHDL, Framework of VHDL program(Syntax and programming to be done only during Practicals), Introduction to CPLD and FPGA	03

Text Books:

1. R. P. Jain, "Modern Digital Electronics", Tata McGraw Hill.
2. Yarbrough John M. , "Digital Logic Applications and Design ", Cengage Learning
3. J. Bhasker." VHDL Primer", Pearson Education

Reference Books:

1. M. Morris Mano, "Digital Logic and computer Design", PHI.
2. Douglas L. Perry, "VHDL Programming by Example", Tata McGraw Hill.
3. Donald p Leach, Albert Paul Malvino,"Digital principles and Applications",Tata McGraw Hill.

Termwork:

Term work should consist of at least 12 experiments out of which at least 2 to be VHDL based.
Journal must include at least 2 assignments.
The final certification and acceptance of term work ensures that satisfactory performance of laboratory work and minimum passing marks in term work.
Term Work: 25 Marks (total marks) = 15 Marks (Experiment) + 05 Marks (Assignment) + 05 (Attendance (theory+practical))

Theory Examination:

1. Question paper will comprise of total 6 questions, each of 20 Marks.
2. Only 4 questions need to be solved.
3. Question 1 will be compulsory and based on maximum part of the syllabus.
4. Remaining questions will be mixed in nature (for example suppose Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)

In question paper, weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.

Subject Code	Subject Name	Credits
CSC305	Discrete Structures	4

Course Objectives

1. To assimilate discrete mathematical concepts.
2. Introducing discrete maths as basic foundation of analysis and applications like communication,

Course Outcomes

1. Ability to reason logically.
2. Ability to understand use of functions, graphs and trees in programming applications.
3. Understand use of groups and codes in Encoding-Decoding.
4. Express recursive functions of other subjects like Data Structures as recurrence relation.

Module	Detailed content	Hours
01	**Set Theory** • Sets, Venn diagrams, Operations on Sets • Laws of set theory, Power set and Products • Partitions of sets, The Principle of Inclusion and Exclusion	05
02	**Logic** • Propositions and logical operations, Truth tables • Equivalence, Implications • Laws of logic, Normal Forms • Predicates and Quantifiers • Mathematical Induction	06
03	**Relations, Digraphs 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	08

04	**Functions and Pigeon Hole Principle** • Definition and types of functions: Injective, Surjective and Bijective • Composition, Identity and Inverse • Pigeon-hole principle	**06**
05	**Generating Functions and Recurrence Relations** • Series and Sequences • Generating functions • Recurrence relations • Recursive Functions: Applications of recurrence relations e,g, Factorial, Fibonacci, Binary search, Quick Sort etc.	**06**
06	**Graphs and Subgraphs** • Definitions, Paths and circuits: Eulerian and Hamiltonian • Planer graphs, Graph coloring • Isomorphism of graphs • Subgraphs and Subgraph isomorphism	**06**
07	**Trees** • Trees and weighted trees • Spanning trees and minimum spanning tree • Isomorphism of trees and sub trees • Prefix codes	**05**
08	**Algebraic Structures** • Algebraic structures with one binary operation: semigroup, monoids and groups • Product and quotient of algebraic structures • Isomorphism, Homomorphism and Automorphism • Cyclic groups, Normal subgroups • Codes and group codes	**06**

Text Books:

1. Kenneth H. Rosen. ”Discrete Mathematics and its Applications”, Tata McGraw-Hill.
2. Bernad Kolman, Robert Busby, Sharon Cutler Ross, Nadeem-ur-Rehman, “Discrete Mathematical Structures”, Pearson Education.
3. D. S. Malik and M. K. Sen, “Discrete Mathematical Structures”, Thompson.

References:

1. C. L. Liu, D. P. Mohapatra, “Elements of Discrete Mathematics” Tata McGrawHill.
2. J. P. Trembley, R. Manohar “Discrete Mathematical Structures with Applications to Computer Science”, Tata Mcgraw-Hill.
3. Y N Singh, “Discrete Mathematical Structures”, Wiley-India.

Theory Examination:

1. Question paper will comprise of total 6 questions, each of 20 Marks.
2. Only 4 questions need to be solved.
3. Question 1 will be compulsory and based on maximum part of the syllabus.
4. Remaining questions will be mixed in nature (for example suppose Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)

In question paper, weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.

Subject Code	Subject Name	Credits
CSC306	Electronic Circuits and Communication Fundamentals	05

Course Objectives:

1. To develop the knowledge of semiconductor devices and circuits, and explain their use in communication applications.
2. To inculcate circuit analysis capabilities in students.
3. To make students aware of various types of integrated circuits that can be used in computer applications.
4. To make students aware that knowledge gained in electronic devices and circuits is useful in real life applications.

Course Outcomes:

1. Ability to understand and use semiconductor devices in circuits.
2. Ability to analyze the given circuit.
3. Ability to understand field effect devices and carry out their DC analysis.
4. Ability to understand concept of feedback and oscillations.
5. Ability to use oscillators in various applications.
6. Ability to use operational amplifier in various applications.
7. Ability to understand concept of phase lock loop and their use communication applications.
8. Ability to understand fundamental concepts of communication.
9. Ability to apply knowledge of electronic devices and circuits to communication applications.

Module	Detailed content	Hours
01	**Electronic Circuits** • Field effect based devices and circuits: Junction Field Effect Transistors, JFET Characteristics, FET amplification and switching, DC load line and bias point, ate bias, self bias, voltage divider bias, coupling, bypassing and AC load lines, FET models and parameters, Common source circuit analysis principle of oscillation, FET based Hartley and Colpitts Oscillator. • Crystal oscillator • BJT as power amplifier (only class A and C)	12
02	• Operational Amplifier and its applications: Op-amp parameters and characteristics, Inverting and Non-inverting amplifier, Comparator, Summing Amplifier, Integrator, Differentiator, Zero Crossing Detector. • Phase Lock Loop: Operating principle of PLL, Lock range and capture range.	06
03	**Modulation** • Principles of Analog Communication: Elements of analog communication systems, Theory of amplitude modulation and types of AM, Generation of DSB SC using balanced modulator, Generation of SSB using phase shift method Theory of FM and PM, Generation of FM by Armstrong method	12

04	**Demodulation :** • Principle of super heterodyne receiver. • Foster seely detector for FM detection • Application of PLL (IC 565) as FM detector , Frequency translator, Phase shifter, and freq synthesizer	06
05	• Concept of sampling :Sampling Theorem, Types of sampling Quantization , A/D and D/A conversion concept • Pulse Modulation: generation and detection of PAM, PPM, PWM, PCM, DM and ADM.Principle of TDM and FDM.	12

Text Books:

1. David Bell, 'Electronic Devices and Circuits', Oxford, 5th Edition.
2. Wayne Tomasi 'Electronic Communication Systems (fundamentals through advanced)', Pearson Education, 4th Edition.
3. Ramakant A. Gayakwad, 'Op-amp and linear integrated circuits', PHI, 3rd edition.
4. G. Kennedy, B. Davis, S R M Prasanna, 'Electronic Communication Systems', Mc Graw Hill, 5th Edition.

References:

1. Robert Diffenderfer, 'Electronic Devices: Systems & Applications', Cengage Learning, India Edition.
2. K. R. Botkar, 'Integrated Circuits', Khanna Publishers, 9th Edition
3. Donald Neamen, 'Electronic Circuit Analysis and Design', Tata McGraw Hill,2nd Edition.
4. David Bell, 'Electronic Devices and Circuits', Oxford, 5th Edition.
5. Wayne Tomasi 'Electronic Communication Systems (fundamentals through advanced)', Pearson Education, 4th Edition.
6. Ramakant A. Gayakwad, 'Op-amp and linear integrated circuits', PHI, 3rd edition.
7. G. Kennedy, B. Davis, S R M Prasanna, 'Electronic Communication Systems', Mc Graw Hill, 5th Edition.
8. Robert Diffenderfer, 'Electronic Devices: Systems & Applications', Cengage Learning, India Edition.
9. K. R. Botkar, 'Integrated Circuits', Khanna Publishers, 9th Edition
10. Donald Neamen, 'Electronic Circuit Analysis and Design', Tata McGraw Hill,2nd Edition.

Termwork:

Term work should consist of at least 08 experiments.
Journal must include at least 2 assignments.
The final certification and acceptance of term work ensures that satisfactory performance of laboratory work and minimum passing marks in term work.
Term Work: 25 Marks (total marks) = 15 Marks (Experiment) + 5 Marks (Assignment) + 5 (Attendance (theory+practical))
Oral exam will be based on the above syllabus.

Suggested List of Experiments:

1. Study of various test and measuring instruments
2. Implementation of diode detector
3. Implementation of single stage FET amplifier
4. Implementation of oscillators
5. Implementation of IC 741 based application
6. Implementation of IC741 based active filters
7. Implementation of IC555 based application
8. Troubleshooting of given faults
9. Modulation and demodulation of AM/SSB/FM
10. Study of superheterodyne receiver
11. Generation and detection of PAM/PPM/PWM
12. Generation and detection of PCM/DM/ADM
13. Study of FDM and TDM
14. SPICE based simulations

Important Note:

- **50% experiments from communication and 50% experiments from electronic circuits should be taken.**
- **In theory exam the weightage for marks out of 80 : 35 for Devices and 45 for communications**

Theory Examination:

1. Question paper will comprise of total 6 questions, each of 20 Marks.
2. Only 4 questions need to be solved.
3. Question 1 will be compulsory and based on maximum part of the syllabus.
4. Remaining questions will be mixed in nature (for example suppose Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)

In question paper, weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.