RAMAKRISHNA MISSION VIDYAMANDIRA

BELURMATH, HOWRAH, WEST BENGAL

DEPARTMENT OF COMPUTER SCIENCE

PROGRAMME OFFERED : B.Sc. COMPUTER SCIENCE HONOURS

PROGRAMME CODE : CMSA

DURATION : 6 SEMESTERS

TOTAL CREDIT : 148

FULL SYLLABUS WITH COURSE OUTCOME

VALID & ONGOING AS ON 30TH JUNE, 2019

Following is the credit distribution for B.Sc. Computer Science Hons. Programme:

	CR SEM 1	CR SEM 2	CR SEM 3	CR SEM 4	CR SEM 5	CR SEM 6	Total Credit
Core Course / Hons.	14	14	14	14	26	26	**108**
Generic Elective	6	6	6	6	--	--	**24**
AECC-Lang.	2	2	2	2	--	--	**4**
AECC-ENVS	--	--	--	--	--	--	**4**
SEC- ICSH	1	1	1	1	2	2	**8**
	23	**23**	**23**	**23**	**28**	**28**	**148**

Following is the Grade Point distribution:

% of Marks	Descriptor	Grade	Grade Point
85 - 100	OUTSTANDING	**O**	**10**
70 - 84.99	EXCELLENT	**A+**	**9**
60 - 69.99	VERY GOOD	**A**	**8**
55 - 59.99	GOOD	**B+**	**7**
50 - 54.99	ABOVE AVERAGE	**B**	**6**
40 - 49.99	AVERAGE	**C**	**5**
35 - 39.99	PASS (HONOURS)	**P**	**4**
30 - 34.99	PASS (OTHERS)	**P**	**4**
LESS THAN 35	FAILED (HONOURS)	**F**	**0**
LESS THAN 30	FAILED (OTHERS)	**F**	**0**

Name of the Core Course	Credit for the Core Course	Generic Elective Course and the Credit
Computer Science Hons	108	Total Credit : 24 At present, considering the future prospect of the students the college offers following two Generic Elective subjects Courses for all students of this Hons programme: a) Mathematics & b) Electronics

B.Sc. Computer Science Hons. Programme has introduced Discipline Specific Elective Course (DSE) and/or Project in 5th and/or 6th semester:

Sl. No.	Name of the Programme	Discipline Specific Elective / Project
1	Computer Science Hons	DSE & Project

Students of B.Sc. Computer Science Hons. Programme must take following courses :

- Ability Enhancement Compulsory Courses (AECC):
  - Environmental Science : 4 Credit
  - English Language and MIL (Bengali Language/ Alternative English) : 4 Credit
- Value-Oriented Course (Indian Cultural and Spiritual Heritage) : 8 Credit

Total Credit to be earned by a student to complete B.Sc. Computer Science Hons. Programme: 148 Credit
Mark sheet after each semester will be given both with SGPA and detailed marks obtained by the examinee.
Similarly Mark sheet after the final semester will be given with CGPA and detailed marks obtained by the examinee.

Calculation of SGPA = (Total Credit X Total Grade Point = Total Credit Point);
Total Credit Points / Total Credits
Calculation of CGPA = (Total SGPA X Total Credits in each Sem.) / Total Credits earned in all the Semesters

B.Sc. Computer Science Honours

6 Semester Course

Course Structure

Sl No	Name of the Course	Semester	Course Code	Credit	Marks in the Course	Course outcome
1	Computer Fundamentals, Computer Architecture and Organization	1	CMSA P1T	10	75	i) Able to develop algorithms for mathematical and scientific problems. ii) To impart the basic concepts of digital computers. iii) Able to analyse the designing process of combinational and sequential circuits iv) Identify different input output devices and the control circuit. v) Able to understand the design and implementation of ALU and CU.

2	Digital Laboratory, C Programming Laboratory	1	CMSA P1P	4	25	i) Identify the strength and limitations of theoretical models and establish a relationship between measured data and underlying physical principles. ii) Specify appropriate equipment and procedures, implement these procedures, analyse and interpret the resulting data. iii) Design and build a software/hardware part to meet desired specifications and tests it using appropriate testing strategy and/or equipments. iv) Illustrate flowchart and algorithm for a given problem v) Inscribe C programs using operator, array, pointer, string, function, structure, file-handling operations etc.
3	Data Structure-I, Numerical Analysis and Operational Research	2	CMSA P2T	10	75	i) Interpret and compute asymptotic notations of an algorithm to analyze the consumption of resources (time/space). ii) Exemplify and implement stack, queue and list ADT to manage the memory using static and dynamic allocations. iii) Develop and compare the comparison-based search algorithms and sorting algorithms. iv) Identify appropriate data structure and algorithm for a given contextual problem and develop in C. v) Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions to otherwise intractable mathematical problems. vi) Apply numerical methods to obtain approximate solutions to mathematical problems. vii) Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations. • viii)Formulate and solve problems as networks and graphs. • ix)Construct linear integer programming models and discuss the solution techniques.

						• x) Set up decision models and use some solution methods for nonlinear optimization problems.
4	Data Structure-I, Numerical Analysis (Lab)	2	CMSA P2P	4	25	i) Interpret and compute asymptotic notations of an algorithm to analyze the consumption of resources (time/space). ii) Exemplify and implement stack, queue and list ADT to manage the memory using static and dynamic allocations. iii) Develop and compare the comparison-based search algorithms and sorting algorithms. iv) Identify appropriate data structure and algorithm for a given contextual problem and develop in C. v) Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions to otherwise intractable mathematical problems. vi) Apply numerical methods to obtain approximate solutions to mathematical problems. vii) Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations. • viii)Formulate and solve problems as networks and graphs. • ix)Construct linear integer programming models and discuss the solution techniques. • x) Set up decision models and use some solution methods for nonlinear optimization problems.

5	Discrete Mathematics, Graph Theory, Object Oriented Programming, Data Structure-II	3	CMSA P3T	10	75	i) Able to construct simple mathematical proofs and possess the ability to verify them. ii) Achieve substantial experience to comprehend formal logical arguments iii) Be skilful in expressing mathematical properties formally via the formal language of propositional logic and predicate logic iv) Be able to specify and manipulate basic mathematical objects such as sets, functions, and relations and will also be able to verify simple mathematical properties that these objects possess v) Acquire ability to describe computer programs (e.g. recursive functions) in a formal mathematical manner vi) Be able to apply basic counting techniques to solve combinatorial problems vii) Able to understand the basic concepts of graph theory viii)Use a combination of theoretical knowledge and independent mathematical thinking to solve some real-time problems. ix)Write about graph theory in a coherent and technically accurate manner. xi)Codes basic programs in C++ and JAVA. xii) Uses objects and classes. xiii) Be familiar to the object-oriented programming concepts. xiv) Able to compare and contrast the interfaces and internal representation of a number of nonlinear abstract data types. xv) Exposure to several data structure concept like tree, graph etc.

6	Discrete Mathematics, Graph Theory, Object Oriented Programming, Data Structure-II	3	CMSA P3P	4	25	i) Able to construct simple mathematical proofs and possess the ability to verify them. ii) Achieve substantial experience to comprehend formal logical arguments iii) Be skilful in expressing mathematical properties formally via the formal language of propositional logic and predicate logic iv) Be able to specify and manipulate basic mathematical objects such as sets, functions, and relations and will also be able to verify simple mathematical properties that these objects possess v) Acquire ability to describe computer programs (e.g. recursive functions) in a formal mathematical manner vi) Be able to apply basic counting techniques to solve combinatorial problems vii) Able to understand the basic concepts of graph theory viii)Use a combination of theoretical knowledge and independent mathematical thinking to solve some real-time problems. ix)Write about graph theory in a coherent and technically accurate manner. xi)Codes basic programs in C++ and JAVA. xii) Uses objects and classes. xiii) Be familiar to the object-oriented programming concepts. xiv) Able to compare and contrast the interfaces and internal representation of a number of nonlinear abstract data types. xv) Exposure to several data structure concept like tree, graph etc.

7	System Software & Operating System, Formal Language and Automata Theory, Design and Analysis of Algorithm	4	CMSA P4T	10	75	) Describe the important computer system resources and the role of operating system in their management policies and algorithms. ii) Understand the process management policies and scheduling of processes by CPU iii) Describe and analyze the memory management and its allocation policies. iv) Identify use and evaluate the storage management policies with respect to different storage management technologies. v) Define languages by abstract, recursive definitions and by regular expressions. vi) Design a finite automaton to recognize a given regular language. vii) Define deterministic and nondeterministic finite automata. viii) Define relationship between regular languages and context-free grammars. ix) Determine decidability, finiteness and equivalence properties. x)To develop an understanding of different standard algorithm design techniques such as divide & conquer, greedy technique, dynamic programming and backtracking xi) To improve the logical ability of designing proper algorithm for a given problem and analyzing the developed algorithms. xii) To gain the ability perform optimal analysis of algorithms xiii) To obtain optimal algorithm for a problem, that is Students would be able to pick and choose the best algorithm for a given problem

8	System Software & Operating System, Formal Language and Automata Theory, Design and Analysis of Algorithm	4	CMSA P4P	4	25	) Describe the important computer system resources and the role of operating system in their management policies and algorithms. ii) Understand the process management policies and scheduling of processes by CPU iii) Describe and analyze the memory management and its allocation policies. iv) Identify use and evaluate the storage management policies with respect to different storage management technologies. v) Define languages by abstract, recursive definitions and by regular expressions. vi) Design a finite automaton to recognize a given regular language. vii) Define deterministic and nondeterministic finite automata. viii) Define relationship between regular languages and context-free grammars. ix) Determine decidability, finiteness and equivalence properties. x)To develop an understanding of different standard algorithm design techniques such as divide & conquer, greedy technique, dynamic programming and backtracking xi) To improve the logical ability of designing proper algorithm for a given problem and analyzing the developed algorithms. xii) To gain the ability perform optimal analysis of algorithms xiii) To obtain optimal algorithm for a problem, that is Students would be able to pick and choose the best algorithm for a given problem

9	Database Management System, Microprocessor, Software Engineering	5	CMSA P5T	13	100	i) Ability to define a problem at the view level & ability to understand the physical structure of the database to handle data. ii) Students would be able to implement the logic by using tools like ERD. iii) Ability to normalize the database & understand the internal data structure. iv) Students would clearly understand the transaction system &could extract data efficiently. v) Describe the general architecture of a microcomputer system and architecture &organization of 8085 & 8086 Microprocessor and understand the difference between 8085 and advanced microprocessor. vi) Understand and realize the Interfacing of memory & various I/O devices with 8085 microprocessor vii) Understand and classify the instruction set of 8085 microprocessor and distinguish the use of different instructions and apply it in assembly language programming. ix) Understand the architecture and operation of Programmable Interface Devices and realize the programming & interfacing of it with 8085 microprocessor. x) Design applicable solutions in one or more application domains using software engineering approaches that integrate ethical, social, legal and economic concerns. xi) Deliver quality software products by possessing the leadership skills as an individual or contributing to the team development and demonstrating effective and modern working strategies by applying both communication and negotiation management skill. xii) Apply new software models, techniques and technologies to bring out innovative and novelistic solutions for the growth of the society in all aspects and evolving into their continuous professional development.

10	Database Management Laboratory, Assembly Language Programming and I/O Interfacing, GUI Development Laboratory	5	CMSA P6P	13	100	) Develop students' understanding through laboratory activities to solve problems related to key concepts taught in the classroom. ii) Develop students' ability to solve open ended problems through the design and construction of new artifacts or processes. iii) Develop debugging capability in order to propose and apply effective engineering solutions. Procedures/algorithms analyze and interpret theresulting data.
11	Graphics and Multimedia, Computer Networking, Data Communication and Internet Technology	6	CMSA P7T	13	100	i)Understand Raster graphics, vector graphics and various graphics I/O devices. ii) To develop mathematical models for representing various objects (both regular and irregular) in computer. iii) To understand effects of colour, lighting, shading etc. on modelled objects/scenes to make it realistic. iv) To obtain various operators for performing various affine transformation operations. v) To build strong foundation to study advanced courses like Image Processing, Pattern Recognition and research work. vi) Analyse the concepts of networks, types and architectures and identify error free transmission of data and analyse data collision with various protocols. vii) Apply various routing algorithms over a network to provide optimal path. viii) Illustrate the real time applications of networks ix) Examine the addressing entities of a network with implementation of TCP, UDP protocols.

12	Network Programming, Web Programming, Project Work	6	CMSA P8P	13	100	i) Understand the key protocols which supports the Internet ii) Able to use common programming interfaces for network communication iii) Acquire the knowledge of TCP/UDP sockets iv) Create applications using techniques such as multiplexing, forking, multithreading etc. v) Acquire knowledge of UNIX/LINUX OS to build client-server applications. vi) Learn the basics of HTML5 vii) Build the foundation of front-end design viii) Learn client-side programming in Javascript ix) Able to produce solutions that meet specified needs with consideration public health, safety, and welfare as well as global, cultural, social, environmental and economic factors.

B.Sc. Computer Science Honours
6 Semester Course
Mapping of Employability etc.

Sl No	Name of the Course	Semester	Course Code	Activities with direct bearing on employbility
1	Computer Fundamentals, Computer Architecture and Organization	1	CMSA P1T	In this course, students are involved in basic computer literacy considered as base of the said programme which helps them to enter in administration and similar job fields, hence during class assignements and different logical problem are given to make better understandings regarding subject.

2	Digital Laboratory, C Programming Laboratory	1	CMSA P1P	In this course students are given different hands-on experiment regarding operational paradigm of computer hardware, which helps to build the basis to become a computer hardware engineer, also students are asked in class to solve assignments to learn the basic building blocks of writing and developing the software programs, which in turn helps them to acquire the position in IT industry for software development.

3	Data Structure-I, Numerical Analysis and Operational Research	2	CMSA P2T	In this course students are given assignemnts in the form of small project to develop logic and structure of a logical problem. Such approach helps them to develop logic for software development in IT industry. Hereafter students have to face sudden test based on different approaches in computational mathematics, which in turn helps them to face the challenge to design the basic blocks of optimized and sophisticated application laboratory.

4	Data Structure-I, Numerical Analysis (Lab)	2	CMSA P2P	In this course studnets are taught different software tools through assignements and presentation to implement different approaches in computational mathematics paradigm. It helps them to implement basic building blocks of optimized and sophisticated application in softawre industry. Also sudden qualitative tests are taken to teach them instant implementation of logic and structure of a logical problem using programming laguages, which in turn helps them in future to implement different modules of a softawre in IT related industries.

5	Discrete Mathematics, Graph Theory, Object Oriented Programming, Data Structure-II	3	CMSA P3T	In this course assignments and real-life examples are considered as teaching aids to teach different computational mathematical approach which helps the students to be data analytics, research analytics. Different presentation of new applications related to data science, data analysis, statistics engineering etc are also shown them. Guidance through different programming tools help them to learn the basic building blocks of writing and developing the OOP software programs.
6	Discrete Mathematics, Graph Theory, Object Oriented Programming, Data Structure-II (Lab)	3	CMSA P3P	In this course different assignments and small project works are given as well as they are asked to give presentation on some relevant topics, to be more familiar regarding the course. It helps them to infer the knowledge for future working paradigm.

7	System Software & Operating System, Formal Language and Automata Theory, Design and Analysis of Algorithm	4	CMSA P4T	In this course different case studies are provided for outer and inner look of operating system to become technician in bussiness applications. Case studies on different scenario in automation industry are also discussed to build the basis of working globally with automakers, suppliers, and technology companies that are developing automation mechanism. It also helps to work in the domain of AI and machine learning.
8	System Software & Operating System, Formal Language and Automata Theory, Design and Analysis of Algorithm	4	CMSA P4P	Uses of different software tools in the paradigm of automation based on different operating systems are taught them to get the flavour of real-life applications of computation world.

9	Database Management System, Microprocessor, Software Engineering	5	CMSA P5T	In this course students are provided several real-life alike query handling system. Presentation on the application and uses of search engines. Also the optimization techniques of the machine dependent instructions through microprocessors. Altogether these help the students to be system admin, query handler, performance optimizer of computation system in future.
10	Database Management Laboratory, Assembly Language Programming and I/O Interfacing, GUI Development Laboratory	5	CMSA P6P	In this course assignments and class test on the basis of current on-going system enhancement policies are arranged. Students are asked to share their view regarding new query application, development of H/W architecture through presenation etc. Thus they become familiar about current trends in on going market.

11	Graphics and Multimedia, Computer Networking, Data Communication and Internet Technology	6	CMSA P7T	In this course small projects and assignments are given them. Hey are asked to present some reports on the existing applications. Thus the learning about existing concepts become little bit easier.
12	Network Programming, Web Programming, Project Work	6	CMSA P8P	In this course different existing real-life problems based on their gained knowledge from prior course are implemented. It helps them to use their inherent knowledge with the acquired knowledge to flourish their thinking, which in turn helps them to cope up as fast as possible with the challenging scenario of S/W industry.
13	Number System & Boolean Algebra Basic Building Blocks of Computer and Their Implementation	1	CMSGP1T	In this course though assignments and presentation on the course topics students learn basic idea of the course which in turn helps them to acquire positions in basic job market in computation industry.

14	C Programming -I	1	CMSGP1P	In this course students are taught through programming tools and practical assignments which helps them to know how to develop the programming architecture. Thus it helps them to work in S/W development industry in future.
15	Algorithms & Data Structure Operating System	2	CMSGP2T	Students are taught through the assignemnts and discussion on the working principle of OS through presentation. It helps them to make their footprints in IT industry.
16	C Programming -II	2	CMSGP2P	In this course students are taught advanced level of the programming language through different practical assignments and presentation, thus they become familiar how to develop logic and applications through programming.

17	Database Management System Cryptography	3	CMSGP3T **Revision vide BoS dated 21.12.2015**	In this course students are taught by considering the examples of some real-life on going query management system which helps them to make better understanding of the query exection. Thus it helps them to become system administrator in future in different application domain.
18	Database Lab	3	CMSGP3P	Practical approaches of the theoretical applications are taught through different query execution tools which enrich them for better understading of different existing real-life applications.

19	Computer Network and Internet Technologies Graph Theory	4	CMSGP4T	In this course students are taught by mentioning the examples of different network protocols through presentation and they are also asked to solve assignemnts, which in turn helps them to be familiar with the working activity of networking. It helps them to understand the data communication system in IT industry.
20	Python Programming	4	CMSGP4P **New Course vide BoS dated 21.12.2015**	In this course students get introduced to flavor of scripting language through Python scripting. In Python scripting they gets used to using several mathematical and scientific packages like numpy, mathplotlib. This helps them in building solutions for scientific problems in respective domain.

21	Circuit components and network Physics of semiconductor devices	1	ELTGP1T	Studnets are taught through basic texts and class assignments. Also they are given assignments so that they they gets accoustomed to witing technical content or papers. This method helps them building technical paper writing skills.
22	Circuit Theory and Study of Junction Diode & Transistors	1	ELTGP1P	Students are first introduced to basics of electronics experimental devices. They are given assignments on analog electronics so that they gets an idea on how to work with eqipments of analog elctronics. This shold help them to achieve experimental exposure in basic electonics.
23	Transistor circuit – Design and applications Analog integrated circuits – OPAMP and Timer chip:	2	ELTGP2T	Transistors are OP AMPs are inherent part of study of electronics. Student are taught theory of these devices through use case senarios along with the basics. They gets an idea on useability of these.

24	Applications of BJT and Analog IC OPAMP & IC 555.	2	ELTGP2P	The industry visit is one of the highlights of the course. They visit institutions like VECC and by guided visit, they acquire immense knowledge of the current search and applications of electronics and relevent domain. Also in practical they need to complete assignments on OP AMPs and transistors.
25	Electronic Instrumentation IC Design Technology	3	ELTGP3T	During the course students are provided with class assignments on ICs. Also they are required to submit reports on pactical uses of IC.
26	Simulations with Hardware & Circuit Description Languages	3	ELTGP3P	Use cases of CRO is a important aspect of this laboratory. Students are required to generate various waveforms on various functions and study them using CRO
27	Digital Communication and Communication Technology : Optoelectronics and Display Devices:	4	ELTP4T	Students are given mthematical assignmets and thory assignmets related to basics of communiction technology.

28	Project Work	4	ELTGP4P	Through the project students try to implement their basic knowledge of electronics implementing a project. Students try to implement utility devices or automated circuits.

Semester-I (July-December)

Paper – *CMSAP1T (Theory)*
MARKS: 75
Credit: 10
Revision vide BoS dated 27.07.2015

Course Outcome:

i) Ability to develop algorithms for mathematical and scientific problems.
ii) Ability to develop skill on modeling problems in computational environment.
iii) Ability to write program with structured programming approach
iv) To impart the basic concepts of digital computers.
v) Able to analyse the designing process of combinational and sequential circuits
vi) Identify different input output devices and the control circuit.
vii) Able to understand the design and implementation of ALU.

Group A: Computer Fundamentals: (Full Marks: 25)

Introduction to Programming:
Programming Concept: Flow Charts and Algorithms;
Languages: Machine Language, Assembly Language, High Level Language.

Number Systems and Codes:
Number representation: Positional, Binary, Octal, Hexadecimal, Conversion of bases;
Complement notions: r's complement, (r-1)'s complement. Binary Arithmetic,
Binary Codes: Weighted Code, BCD; Non-weighted codes: Excess Code, Gray Code, Alphanumeric: ASCII;
Error Detection and Correction: Parity, Hamming Codes.

Logic: Proposition, Predicates, Logical connectives, Well-formed formula.

Boolean Algebra: Theorems and Postulates of Boolean Algebra with proof Functionally Completeness, Universal Logic
Boolean Functions: Standard form and Canonical form and their equivalence.

Truthtable and minimization of Boolean function upto four variables: Algebraic, K-map ; tabular method: Quine –McClusky and Graphical method : Binary Decision Diagram

Group B: Computer Organization and Architecture: (Full Marks: 50)

Digital Circuits:

Universal Gates, Logic Synthesis, Code Converters, Adders, Subtractors, Comparators Decoders/Demultiplexers, Encoders, Multiplexers. Study of Clocked Flip Flops (Characteristic Functions, Preset & Clear, Master-slave): SR, JK, D, T. Sequential Design Procedure, Design with State Equation, Synchronous & Asynchronous Counters (up to 4 bit): Ripple, Mod-n, Ring , Johnson's Counter. Registers: Shift and Parallel.

Basic Computer Organization:

Von Neumann vs Harvard architecture, Dataflow vs Controlflow architecture. ALU: Data Representation & Arithmetic (fixed & floating point).
Instruction: Types, Formats, Addressing mode, RISC vs CISC(Basic Concept).

Control Unit:

Hardwired Control vs Micro programmed Control (Basic Concept), Horizontal vs Vertical Microinstruction.

Memory:

Hierarchy, Register Organizations; Cache: Write Policies, Mapping, Miss Techniques; SRAM, DRAM, EPROM, Associative memory, Disk accessing strategy.

Bus and Interconnection:

D/A and A/D converter, Tri State Devices, Bus Arbitration, Standard Bus Protocols(only basic idea): SCSI, PCI, USB.

I/O:

Programmed (Memory mapped & IO mapped), Interrupted (Single line, Multiline & Vectored), DMA.

Paper – *CMSAP1P (Practical)*
MARKS: 25
Credit: 4

Group A: Digital Laboratory: (Full Marks: 10)

Combinational Circuits:

Study the functionalities & applications of - IC 7483, (IC 74153 and/or IC 74151) (IC74155 and/or IC 74138), IC 7485.
Use of seven segment display unit with driver chip.
Study of IC 7489 and applications. Horizontal and Vertical expansion.

Sequential Circuits:
Study the functionalities & applications of IC 7476, IC 74194, IC 74193.

Group B: C Programming Laboratory: (Full Marks: 15)

Problems should cover basic features of the Language.

Text and Reference Books:

1. Computer Organization and Architecture 8th Edition by William Stallings, Pearson Education.

2. Computer Architecture and Organizations 3rd Edition, J. P. Hayes, McGraw Hill Education (India) Private Limited.

3. Computer Organization 5th Edition by Zvonko Vranesic , Safwat Zaky , Carl Hamacher, McGraw Hill Education (India) Private Limited.

4. Computer System Architecture 3rd Edition by M. Morris Mano, Pearson Education.

5. Computer Architecture: A Quantitative Approach 5th Edition by David A. Patterson , John L. Hennessy, Elsevier Science.

6. Digital Logic and Computer Design 1st Edition by M.Morris Mano, Pearson Education.

7. Digital Systems Principles and Applications by Ronal J. Tocci and Neal S. Widmer, 8th Edition, PHI

8. Digital Circuits and Design 4th Edition by S Salivahanan and S Arivazhogan, Vikas Publishing House Pvt Ltd.

9. Fundamentals Of Digital Circuits 3rd Edition by A. Anand Kumar, PHI.

10. Switching And Finite Automata Theory by Zvi Kohavi and Niraj K Jha 3rd Edition, Cambridge.

11. The C Programming Language (ANSI C Version) 2nd Edition by Karnighan and Ritchie, PHI.

12. Programming With C by Byron Gottfried 3rd Edition, McGraw Hill Education (India) Private Limited.

13. C: The Complete Reference 4th Edition by Herbert Schildt, McGraw Hill Education (India) Private Limited

Semester-II (January-June)

Paper – *CMSAP2T (Theory)*
MARKS: 75
Credit: 10

Course Outcome:

i) Interpret and compute asymptotic notations of an algorithm to analyze the consumption of resources (time/space).
ii) Exemplify and implement stack, queue and list ADT to manage the memory using static and dynamic allocations.
iii) Develop and compare the comparison-based search algorithms and sorting algorithms.
iv) Identify appropriate data structure and algorithm for a given contextual problem and develop in C.
v) Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions to otherwise intractable mathematical problems.
vi) Apply numerical methods to obtain approximate solutions to mathematical problems.
vii) Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations.
viii)Formulate and solve problems as networks and graphs.
ix)Construct linear integer programming models and discuss the solution techniques.
x) Set up decision models and use some solution methods for nonlinear optimization problems.

Group A: Data Structure-I :(Full Marks: 35)

Arrays:

Types, Memory Representation, Address Translation and Functions of single and multi-dimensional arrays with examples, Sparse Matrix: Triplet array representation.

Linked Structures:

Singly and doubly linked list (non-circular and circular).

***Stacks and Queues*:**

Definition, Representation, Uses and Applications, Infix, Prefix &Postfix notations, Infix to postfix: conversion and evaluation, Circular Queue.

Searching:

Linear Search, Binary Search and Interpolation Search (Algorithm: Recursive, Non Recursive and Performance Evaluation).

Sorting:

Terminology: Stability, Inversion; Algorithm: Recursive, Non Recursive and Performance Evaluation.

Bubble, Insertion, Selection, Quick sort, Merge Sort, Count Sort, Radix Sort.

Group B: Numerical Analysis and Operational Research :

(Full Marks: 40)

Errors:

Concepts, types of errors.

Interpolation:

Newton Forward and Backward interpolation, Lagrange interpolation

System of Linear Equations:

Properties of Set of Linear Equations – linearly dependent and independent, Rank, Singularity of Coefficient matrix, Ill-conditioned matrix.

Gaussian Elimination, Gauss– Jordan Elimination, Iteration method & its convergence condition and testing, Gauss-Seidel Iteration.

Nonlinear Equation:

Iterative Methods and different types of convergence, divergence, Bisection algorithm, Regula-falsi method, Secant and Newton-Raphson method.

Solution of Differential Equation:

Euler Method, Runge-Kutta second and fourth order method for solving differential equations.

Curve Fitting and Least Square Method:

Linear, Quadratic fit.

Numerical Integration:

Trapezoidal and Simpson's 1/3rd Rules.

Operational Research:

L.P.P., Transportation & Assignment Problem; Travelling Salesperson Problem.

Paper – *CMSAP2P (Practical)*
MARKS: 25
Credit: 4

Group A: Numerical Laboratory: (Full Marks 10)

Implementation of various Numerical problems using SKYLAB/OCTAVE/C Programming.

Group B: Data Structure-I Laboratory: (Full Marks 15)

Implementation of applications and problems related to: Arrays, Linked Lists, Stack, Queue, Searching and Sorting;

Text and Reference Books:

13. Data Structure and Program Design in C by Robert Kruse, C.L. Tondo; Pearson.
14. Fundamentals of Data Structure in C by Ellis Horowitz, Sartaz Sahani; Galgotia
15. Data Structure Using C by S. K. Bandyopadhyay and K. N. Dey; Pearson Education
16. Data Structures and Algorithm Analysis in C by Mark Allen Weiss, 2nd Edition, Pearson Education
17. Data Structures using C and C++ by Tanenbaum, Langsam, Augestein; PHI
18. Algorithms + Data Structures = Programs by Niklaus Wirth, Prentice-Hall.
19. Numerical Analysis and Computational Procedures by Mollah; New Central Book.
20. Numerical Methods for Scientific and Engineering Computation by M.K.Jain, S.R.K.Iyengar, R.K.Jain, 4th Edition, New Age International Publishers
21. Computer Oriented Numerical Methods, 3rd Edition, V Rajaraman, PHI
22. Operation Research by Kalavathy, Vikas Publishing House.

Semester-III (July-December)

Paper – *CMSAP3T(Theory)*
MARKS: 75
Credit: 10
Revision vide BoS dated 27.07.2015

Course Outcome:

i) Able to construct simple mathematical proofs and possess the ability to verify them.
ii) Achieve substantial experience to comprehend formal logical arguments
iii) Be skilful in expressing mathematical properties formally via the formal language of propositional logic and predicate logic
iv) Be able to specify and manipulate basic mathematical objects such as sets, functions, and relations and will also be able to verify simple mathematical properties that these objects possess
v) Acquire ability to describe computer programs (e.g. recursive functions) in a formal mathematical manner
vi) Be able to apply basic counting techniques to solve combinatorial problems
vii) Able to understand the basic concepts of graph theory
viii)Use a combination of theoretical knowledge and independent mathematical thinking to solve some real-time problems.
ix)Write about graph theory in a coherent and technically accurate manner.
xi)Codes basic programs in C++ and JAVA.
xii) Uses objects and classes.
xiii) Be familiar to the object-oriented programming concepts.
xiv) Able to compare and contrast the interfaces and internal representation of a number of nonlinear abstract data types.
xv) Exposure to several data structure concept like tree, graph etc.

Group A: Discrete Mathematics: (Full Marks: 25)

Sets:

Introduction to Set Theory; Relation, Equivalence Relation, Poset, Hasse Diagram; Functions; Introductory concepts of Group, Ring, Field.

Counting Theory:

Pigeon Hole Principle (generalized statement, proof and standard applications to mathematical problems), Principle of Inclusion and Exclusion (generalized statement, proof and standard applications to mathematical problems), Permutations and Combinations(with and without repetition), Recurrence relation and Generating Function(Their applications to standard problems).

Introduction to Probability:

Definition of sample space, events, probability, simple problems, Conditional Probability, Probability distribution – Binomial Distribution, Poison Distribution, Normal Distribution (Definition only), Random variable, expected value, Standard Deviations and Variance.

Group B: Graph Theory : (Full Marks: 15)

Introduction: Definition of linear graph, self loop, Parallel edges, simple graph, multi graph, Pseudo graph, directed graph, Application of graph, Finite and Infinite graph, Incidence and degree, Indegree and Outdegree of directed graph and their relation, Isolated vertex, Pendant vertex and Null graph.

Walk, Path & Circuit: Isomorphic Graph, Subgraph (Edge and Vertex disjoint), Walk, path, circuit and their differences, Connected & Disconnected Graph, Components, Operation On Graphs (Union, Intersection, Ring sum, Decomposition, Deletion of edge and vertex, Fusion, Euler Graph, Arbitrarily Traceable Graph, Hamiltonian paths and circuit, Complete graph, Bipartite graph, complete bipartite graph.

Tree: Definition of tree, Distance, Eccentricity, Center, Radius and diameter, rooted tree, Binary tree and its properties, Spanning tree, Breadth First Search and Depth First Search, Minimum spanning tree, Algorithm for finding Minimum Spanning Tree (Prim's and Kruskal).

Shortest Path Problem: Dijkstra Algorithm, Floyd and Warshall algorithm.

Searching: BFS, DFS.

Planar Graph: Euler formula, Kuratowski's theorem.

Cut Set & Cut Vertices:Cut set and its properties, All Cut-sets in a graph, Fundamental circuit and Cut set, Connectivity (Edge & Vertex), Separability.

Representation of Graph:Adjacency matrix and adjacency list, Incidence matrix, Path matrix, Circuit matrix, their relative advantage & disadvantages.

Group C: Object Oriented Programming: (Full Marks: 15)

Concepts:

Difference with procedure oriented programming, Data Abstraction and Information Hiding : Objects, Classes and Methods, Encapsulation, Inheritance, Polymorphism.

Object Oriented Programming through C++:

Input/Output, Function and Operator Overloading, Constructors and Destructors, Copy Constructors and Assignment Operator, Overloading, Single and Multiple Inheritance, Polymorphism and Virtual Functions, Namespace, Exception Handling, Templates.

Group D: Data Structure II :(Full Marks 20)

***Trees* :** Binary Tree- Traversal (Inorder, Preorder, Postorder), Searching (DFS, BFS),

Search Tree: Binary Search Tree- Insertion, Deletion, Searching; Height Balanced Tree (No algorithm required); Multiway tree: Introduction to B Tree and B+ Tree (No algorithm required).

Applications of tree: Heap- Insertion, Deletion and Sorting. Huffman Encoding (only static), Red & Black tree (Definition and Construction).

Hashing: Definition, Hash functions: Properties and Standards Hash functions. Collision: Definition and Resolution Techniques – Probing (Linear and Quadratic) and Chaining (Linear and Coalesced). Idea of Universal Hashing.

Paper – *CMSAP3P (Practical)*
MARKS: 25
Credit: 4
Revision vide BoS dated 27.07.2015

Group A: Object Oriented Programming Lab: :(Full Marks: 10)

Problems should cover basic features of the Language.

Group B: Data Structure-II Laboratory: :(Full Marks: 15)

Implementation of applications and problems related to: Tree and Hashing.

Text and Reference Books:

1. Discrete Mathematics and its applications by Rosen, 5th Edition, TMH
2. Elements Of Discrete Mathematics 3rd Edition by C. L. Liu and D.P. Mohapatra, Tata Mcgraw Hill Education Private Limited.
3. Graph Theory With Applications To Engineering And Computer Science by Narsingh Deo, PHI.
4. Graph Theory by J.A. Bondy and U.S.R. Murty, Springer.
5. Introduction to Graph Theory by D B West, 2nd edition, Pearson Education.

6. C++ The Complete Reference 4th Edition by Harbert Schildt.
7. Thinking in C++ (Vol.1 and Vol.2) by Bruce Eckel.
8. The C++ Programming Language 3rd Edition by Bjarne Stroustrup.
9. C++ How to Program by Deitel and Deitel.
10. Data Structure and Program Design in C by Robert Kruse, Cl Tondo.
11. Fundamentals of Data Structure 2nd Edition by Ellis Horowitz, Sartaz Sahani, Galgotia
12. Algorithms + Data Structures = Programs by Niklaus Wirth, Prentice-Hall.

Semester-IV (January-June)

Paper – *CMSAP4T(Theory)*
MARKS: 75
Credit: 10
Revision vide BoS dated 27.07.2015

Course Outcome:

i) Describe the important computer system resources and the role of operating system in their management policies and algorithms.
ii) Understand the process management policies and scheduling of processes by CPU
iii) Describe and analyze the memory management and its allocation policies.
iv) Identify use and evaluate the storage management policies with respect to different storage management technologies.
v) Define languages by abstract, recursive definitions and by regular expressions.
vi) Design a finite automaton to recognize a given regular language.
vii) Define deterministic and nondeterministic finite automata.
viii) Define relationship between regular languages and context-free grammars.
ix) Determine decidability, finiteness and equivalence properties.
x)To develop an understanding of different standard algorithm design techniques such as divide & conquer, greedy technique, dynamic programming and backtracking
xi) To improve the logical ability of designing proper algorithm for a given problem and analyzing the developed algorithms.
xii) To gain the ability perform optimal analysis of algorithms
xiii) To obtain optimal algorithm for a problem, that is Students would be able to pick and choose the best algorithm for a given problem

Group A: System Software & Operating System: (Full marks 30)

System Software: Introduction: Different System Softwares: Introduction to Assemblers, Loaders, Linkers, Interpreters, Compilers; various phases of compilation.

Operating Systems:

What is OS? User mode, Kernel mode, Mode Switching, Multiprogramming, Multitasking OS, Concepts of processes, Files, Shell,
System Calls; Structures: Monolithic, Layered, Virtual, Client Server and Distributed Model.

Concepts of Synchronization:

Critical Regions, Monitor, Semaphores, Inter Process Communication Mechanism.

Processor Management:

Scheduling and its types, Priority Queue; Deadlock: Definition, Prevention, Avoidance, Detection, Recovery.

I/O Management:

Device and Device Controllers, Interrupt Handlers and Device drivers.

Memory Management:

Logical & Physical memory, Contiguous allocation, Paging, Segmentation, Swapping, Virtual memory, Page Replacement Techniques.

File Systems:

Files and Directories, File Servers, Security and Protection.

Case Study: *UNIX*.

Group B: Formal Language and Automata Theory: (Full Marks 20)

Finite Automata, Deterministic and Non Deterministic, State Minimization, Output dependent classification: Mealy and Moore Machine;

Regular Expression:

Identities and Proofs, Arden's Theorem, Pumping Lemma, Relation with Automata.

Grammar and Language:

Definition and Properties, Chomsky Classification of Grammars:
Context Sensitive Grammar, Context Free Grammar and Regular Grammar.

Linear Bounded Automata, Pushdown Automata: Basic Concepts

Turing Machine:

Concept and Design.

Group C: Design and Analysis of Algorithm: (Full Marks 25)

***Introduction to Algorithms*:**

Definition, Characteristics, Recursive and Non-recursive algorithms.

Asymptotic Complexity Analysis of Algorithms:

Space and Time Complexity, Efficiency of an algorithm. Growth of Functions, Polynomial and Exponential Complexity, Asymptotic Notations: Big O Notation, Big Omega

and Big-Theta Notations, Properties: Best case/worst case/average case analysis of well-known algorithms.

Algorithm Design Techniques:

Concepts and simple case studies of Greedy algorithms.

Divide and conquer: Basic concepts, Case study of selected searching and sorting problems as divide and conquer techniques: Strassen's Matrix Multiplication Method ;

Dynamic programming: General issues in Dynamic Programming, Case study of Binomial Coefficient computation,

Graph Representation and Algorithm:

Linked Representation, Matrix representations of graphs, Incidence, Adjacency and Circuit matrices, Graph operations.

Graph searching algorithms: BFS,DFS, Minimal spanning trees: Prim's Algorithm, Kruskal's Algorithm, Shortest path algorithms: Floyd's Algorithm, Floyd-Warshall Algorithm, Dijkstra's Algorithm.

Classification of Problems: P, NP, Cook's Theorem (Statement Only).

Paper – *CMSAP4P (Practical)*
MARKS: 25
Credit: 4

Group A: Graph Algorithm Lab : (Full Marks 10)

Implementation of Graph algorithms: BFS, DFS, Prim's Algorithm, Kruskal's Algorithm, Floyd's Algorithm, Floyd-Warshall Algorithm, Dijkstra's Algorithm.

Group B: Linux Shell and System Programming Lab: (Full Marks 15)

Shell Programming : Concept and simple programming problems.
Linux system calls, IPC problems, use of semaphore for synchronization problems.

Text Books:

23. Operating System Concepts by A.Silberschatz, Peter B. Galvin, G. Gagne, 6th Edition, John Wiley & Sons, Inc.
24. Modern Operating System by Andrew S. Tanenbaum, 3rd Edition, PHI Learning.
25. Operating Systems by H.M.Deitel, 2nd Edition, Pearson Education.
26. Systems Programming & Operating Systems by Dhamdhere, 2nd Edition, Genesis Pr Inc.
27. System Programming by John J. Donovan, 1st Edition, TMH.
28. Introduction to Automata Theory, Languages, and Computation by John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, 3rd Edition, Pearson.

29. Theory of Computer Science (Automata, Languages & Computation) by K L P Misra & N Chandrasekharan, 3rd Edition, PHI.
30. Introduction to Theory of Computation by Micheal Sipser, 3rd Edition, Cengage Learning.
31. Switching and Finite Automata Theory by Zvi Kohavi, Niraj.K.Jha, 3rd Edition, TMH.
32. Introduction to Algorithms by Cormen et al, 3rd Edition, PHI Learning.
33. The Art of Programming (Vol.1 and Vol.2) by Donald. E. Knuth, 3rd Edition, Pearson.
34. Algorithms & Data structure by Ellis Horowitz, H.Sahani, Sanguthevar Rajasekaran, 2nd Edition, Universities Press.
35. Linux System Programming by Robert Love, 2nd Edition, O'Reilly.
36. Unix concepts and Applications by Sumitava Das, 4th Edition, Mcgraw Hill Education.
37. The Design of the UNIX Operating System by Maurice J. Bach, 1st Edition, PHI Learning.

Semester-V (July-December)

Paper – *CMSAP5T (Theory)*
MARKS: 100
Credit: 13

Course Outcome:

i) Ability to define a problem at the view level & ability to understand the physical structure of the database to handle data.
ii) Students would be able to implement the logic by using tools like ERD.
iii) Ability to normalize the database & understand the internal data structure.
iv) Students would clearly understand the transaction system &could extract data efficiently.
v) Describe the general architecture of a microcomputer system and architecture &organization of 8085 & 8086 Microprocessor and understand the difference between 8085 and advanced microprocessor.
vi) Understand and realize the Interfacing of memory & various I/O devices with 8085 microprocessor
vii) Understand and classify the instruction set of 8085 microprocessor and distinguish the use of different instructions and apply it in assembly language programming.
ix) Understand the architecture and operation of Programmable Interface Devices and realize the programming & interfacing of it with 8085 microprocessor.
x) Design applicable solutions in one or more application domains using software engineering approaches that integrate ethical, social, legal and economic concerns.
xi) Deliver quality software products by possessing the leadership skills as an individual or contributing to the team development and demonstrating effective and modern working strategies by applying both communication and negotiation management skill.
xii) Apply new software models, techniques and technologies to bring out innovative and novelistic solutions for the growth of the society in all aspects and evolving into their continuous professional development.

Group A: Database management system: (Marks 40)

Introduction: Drawbacks of Legacy System; Advantages of DBMS; Layered Architecture of Database, Data Independence; Data Models; Schemas And Instances; Database Languages; Database Users, DBA; Data Dictionary; Functional Components of a DBMS.

ER Model: Entity, Attributes and Relationship; Structural Constraints; Keys; ER Diagram of Some Example Database; Weak Entity Set; Symbolic Conventions; Specialization and Generalization; Constraints of Specialization and Generalization; Aggregation.

Relational Model: Basic Concepts of Relational Model; Relational Algebra; Tuple Relational Calculus; Domain Relational Calculus.

Integrity Constraints: Domain Constraints, Referential Integrity, Assertions, Triggers.

Relational Database Design: Problems of Un-Normalized Database; Functional Dependencies, Derivation Rules, Closure Of FD Set, Membership Of A Dependency, Canonical Cover; Decomposition to 1NF, 2NF, 3NF Or BCNF Using FD; Lossless Join Decomposition Algorithm; Dependency preservation.

SQL: Basic Structure, Data Definition, Constraints and Schema Changes; Basic SQL Queries (Selection, Insertion, Deletion, Update); Order by Clause; Complex Queries, Aggregate Function and Group by Clause; Nested Sub Queries; Correlated Sub Queries; Views (Insert-Able and Updatable), Joined Relations; Set Comparisons (All, Some); Derived Relations Etc; Grant and Revoke, Transaction in SQL.

Record Storage and File Organization: Fixed Length and Variable Length Records; Concepts of Disk Blocks; Spanned and Un-Spanned Organization of Records; Primary File Organizations and Access Structures Concepts; Unordered, Sequential, Hashed; Concepts of Primary and Secondary Index; Dense and Sparse Index; Index Sequential Files; Multilevel Indices.

Transaction Processing: ACID Properties; Transaction States, Concurrent Execution; Serializability (Conflict and View), Recoverability, Test for Serializability.

Group B: Microprocessor :(Marks 35)

Introduction to Microcomputer based system:

Evolution of Microprocessor and Microcontrollers and their advantages and disadvantages, Architecture of 8 bit and 16 bit microprocessor and Preliminary concepts of 32 bit and 64 bit architecture.

Architecture of 8085 Microprocessor:

Hardware and Programming Model, Address/data bus DE multiplexing, Status Signals and the control signals.

Instruction format, Instruction set of 8085 microprocessor, Addressing modes, Instruction Cycle and Timing diagram of the instructions.

Interrupts of 8085 processor:

(Software and Hardware), I/O Device Interfacing-I/O Mapped I/O and Memory Mapped I/O, Serial (using SID and SOD pins and RIM, SIM Instructions) and Parallel data transfer,

Interfacing concepts:

Memory Interfacing, Concept of Foldback Memory.

I/O Interfacing, Peripheral Interfacing, Keyboard Interfacing, Display Interfacing (Case Studies 8155, 8255, 8279)
Concepts of DMA (Case Study 8237).

Assembly language programming:

Arithmetic and Logical Operations, Data Movements between registers and memory, Stack and Subroutine.

8086 Microprocessor:

Basic Architecture, Addressing Modes, Register S\supports for virtual Memory.

Group C: Software Engineering: (Marks 25)

Software Life Cycle;

Different Models:

Waterfall, Spiral; Software Requirement Analysis & Specification, Structured Analysis, DFD, Data Dictionary, Structured Design, Structure Charts;

Software Testing:

White Box and Black Box Testing, Software Quality Assurance.

UML:

Introduction; Class diagrams, State transition diagrams, Object Diagrams, Interaction Diagrams, Module Diagrams, Process Diagrams.

Paper – *CMSAP6P (Practical)*
MARKS: 100
Credit: 13

Group A: Database management Laboratory: (Marks 40)

Introduction of SQL, PL/SQL

Group B: GUI Development Laboratory: (Marks 20)

Using C#.net / Java

Group C: Assembly Language Programming & I/O Interfacing: (Marks 40)

Experiment with 8085A based micro computing kits + 8086 simulators

- Data movement between register – register, register-memory, memory-memory.

- Arithmetic operations on single byte, word and multi-byte integer, signed and
  - Ordered arrangement of a set of operands.
  - Sorting, Replacement, Searching.

- Block and transfer.
- Parity Generator.
- Delay Routines.

Interfacing :

- Display of Alphanumeric Characters on 7 segment displays.
- Matrix Keyboard Interfacing and Identification of the keys.

Text Book:

1. Database System Design by Elmasri, Navathe, Somayajulu, Gupta, Pearson Education
2. Database Systems: Concept, Design and Application by S. K. Singh, Pearson Education, st 1 Edition
3. An Introduction to Database Systems by C.J. Date, A.Kannan, S.Swamynathan, Pearson Education
4. Relational Database Design by Jan L. Harrington, an imprint of Elsevier
5. Database Systems by Korth
6. 8085 Microprocessor by Gaonkar, PHI
7. Intel Microprocessor by Bray.
8. Microprocessor & Microcontroller by Hall.
9. An Integrated Approach to Software Engineering by Pankaj Jalote, Narosa Publishing House
10. Introduction to System Analysis and Design by Igor Hawryszkiewycz, PHI
11. Software Engineering by Pressman.
12. SQL by Ivan Barros.
13. The Unified Modeling Language User Guide by Booch (AW)
14. The Unified Modeling Language Reference Manual by Rumbaugh (AW)

Semester-VI (January-June)

Paper – *CMSAP7T (Theory)*
MARKS: 100
Revision vide BoS dated 10.01.2015
Credit 13

Course Outcome:

i)Understand Raster graphics, vector graphics and various graphics I/O devices.
ii) To develop mathematical models for representing various objects (both regular and irregular) in computer.

iii) To understand effects of colour, lighting, shading etc. on modelled objects/scenes to make it realistic.
iv) To obtain various operators for performing various affine transformation operations.
v) To build strong foundation to study advanced courses like Image Processing, Pattern Recognition and research work.
vi) Analyse the concepts of networks, types and architectures and identify error free transmission of data and analyse data collision with various protocols.
vii) Apply various routing algorithms over a network to provide optimal path.
viii) Illustrate the real time applications of networks
ix) Examine the addressing entities of a network with implementation of TCP, UDP protocols.

Group A: Graphics and Multimedia: (Marks 25)

Introduction : Co-ordinate System, Information Handling Software, Graphics Software, Area of Application, Translation, Rotation, Scaling, Matrix Representation, Homogeneous Co-ordinateSystem, 2D & 3D Transformations, Lines, Curves (Spline, Bspline and Circle) and their presentations, Fill Algorithm (Boundary and Region Fill) Composite Transformation, Inverse Transformation, Computer Art, Animation, Morphing, Projection & Clipping.

Multimedia Data Formats: Image, Audio, Video; Multimedia Compression Techniques: JPEG, MPEG.

Group B: Computer Networking, Data Communication & Internet Technology:

(Marks 45)

Data Communications and Computer Network:

Components, Uses, Application

Network Hierarchy: LAN, MAN, WAN; Topology;

Network Softwares: Layered, Interface, Protocol, Connection Less and Connection Oriented Service.

Reference Model: ISO-OSI and TCP/IP; Functionalities of each layer, Comparison between two models.

Data and Signals (Analog and Digital): Periodic & Non-periodic signals, FDM, TDM, Bandwidth, Bit Rate, Baud Rate, Bit Length, and Composite Signal.

Transmission Media: Transmission Spectrum, Guided (Twisted Pair, Coaxial, Optical Fiber) and Unguided (Radio Wave, Microwave, Infrared, and Satellite Communication: Geostationary, Low Orbit and VSAT).

Transmission Impairments: Noise, Distortion and Attenuation;

Data Rate Limitation: Nyquist Theorem and Shannon Capacity.*Addressing:*
Physical Addressing, Logical Addressing and Port Addressing.

Digital Transmission: Line Coding (NRZ, NRZ-L,NRZ-I, RZ, Manchester, Differential Manchester); Block Coding (Basic Idea); Code Modulation (PCM, DM), Concepts of ADSL Modem.

Analog Transmission: Shift Keying (ASK, FSK, PSK, QPSK, QAM);
Multiplexing: FDM, TDM, WDM.
Switching: Circuit Switching and Packet Switching; Datagram.

Data Link Layer: Error Codes- Detection, Correction, Case Studies: Parity, Hamming Code, CRC, Checksum), Basic Concepts of Framming, Error Control and Flow Control.
LAN: IEEE Standards (802.1, 802.3, 802.11), Ethernet Cabling.

Network Layer: Logical Addressing, IPv4 (Classless and Classful), NAT, IPv6 (Basic Idea), Basic idea of Routing.

Transport Layer: Process to process delivery, TCP and UDP (Basic Idea), Basic idea of TCP Connection.

Internet:
Distributed and Client-Server Computing; Servers.
World Wide Web: Concepts, URL, Browser, Web Documents (Static and Dynamic, Active and Inactive).
Domain Name Server (DNS): Level, Domains, Generic and Country wise domain, Resolution.*E-Mail:* Architecture, User Agent, Case Studies: SMTP, POP3, IMAP4, MIME; Web Based Mail.

Other Protocols: Remote Login: TELNET, SSH, FTP, HTTP

Group C: Special Group: (Any One) (Marks 30)

Image Processing:

Image acquisition and digital image representation – sampling, quantization, pixel representation: Bitmap.

Gray level values, Histogram, Colour representation model: RGB model, CMYK model, YC_bC_r model. Image transformations in spatial domain – contrast enhancement, brightness enhancement (Log transform, Gamma correction etc.), gray scale conversion, Histogram equalization, image averaging – use in smoothing ; Frequency Domain Analysis: Fourier Transform, Gaussian Filter. Basic concepts of Image Filtering. Image Compression – Lossy vs Lossless, few lossy compression techniques – RLE Applications of image processing, Baseline JPEG.

ii)**Cryptography:**

Foundations of Cryptography and Security. Principles of Security: Confidentiality, Integrity, Authentication, Repudiation.

Types of Attacks:
Cryptanalytic Attacks, Non-Cryptanalytic Attacks, Active Attacks, Passive Attacks.

Mathematical Foundations of Cryptography:

Mathematics of Cryptography: Modular Arithmetic, Congruence & Residue Matrix.

Mathematics of Asymmetric key Cryptography: Euler's Phi-Function; Fermat's Little Theorem; Euler's Theorem; Chinese Remainder Theorem; Quadratic Congruence, Exponentiation & Logarithm.

Symmetric Key Cryptography:

Traditional Symmetric Key Ciphers: Substitution Ciphers – Monoalphabetic ciphers (Basic concepts of Additive Cipher, Caesar Cipher, Multiplicative Cipher, Affine Cipher) , Polyalphabetic Ciphers (Basic concepts of Playfair Cipher, Hill Cipher) ; Transposition Ciphers – Keyless (Basic concepts of Rail Fence Technique, Simple Columnar) & Keyed.

Modern Symmetric Key Ciphers: Block Ciphers – concept, components of block cipher, Encipherment using Block Ciphers, S-Boxes, Confusion & Diffusion, Product Cipher (Feistel & Non-Feistel ciphers).

Symmetric Key Cryptography and Problem of Key Distribution:: Deffie-Hellman Key Exchange Algorithm.

Data Encryption Standard (DES):: DES Structure - Rounds , DES Functions, Key Generation ; DES Analysis – Avalanche Effect, DES Weaknesses; Security of DES ; Multiple DES; Meet in the middle attack.

Asymmetric key Cryptography:

Computer Based Asymmetric Key Cryptographic Algorithms:

Trapdoor One-Way Function, RSA Algorithm & Digital Envelop, Digital Signatures and its application in Digital Certificate.

Authentication:

Password (Fixed Password, One - Time Password) authentication, Challenge-Response authentication, Zero-Knowledge authentication- Fiat-Shamir Protocol, Biometric authentication.

iii) Data Mining & Data Warehouse:

Data Mining: Introduction, Relational Databases, Data Warehouses, Transactional databases, Advanced database Systems and Application, Data Mining Functionalities, Classification of Data Mining Systems, Major Issues in Data Mining.

Data Warehouse: Introduction, A Multidimensional data Model, Data Warehouse Architecture, Data Warehouse Implementation, Data Cube Technology, From Data warehousing to Data Mining.

Data Processing: Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and concept Hierarchy Generation.

***Data Mining Primitives, Languages and System Architecture*:** Data Mining Primities, DMQL, Architectures of Data Mining Systems.

Concept Description: Data Generalization & Summarization – Based Characterization, Analytical Characterization, Mining class Comparisons, Mining Descriptive Statistical Measures in Large Databases.

Classification and Prediction: Classification & Prediction, Issues Regarding Classification & Prediction, Classification by decision Tree Induction, Bayesian Classification, Classification by Back propagation, Classification based on concepts & Association Rule, Other Classification, Prediction, Classification Accuracy.

iv) **Artificial Intelligence:**

General issues and overview of AI.

Problem Solving by Search:
State Space Search:
Uninformed Search: BFS, DFS, Bi-directional Search.
Informed Search: Heuristic Search Techniques, Greedy Best First Search, A* Search, Hill Climbing algorithm.

Game Playing:
Adversial Search, Min-max algorithm, Alpha-Beta pruning.
Constraint Satisfaction Problem (Basic Ideas).

Automated Reasoning:
Proposition and First Order Logic, Inference and Deduction, Resolution refutation, Answer Extraction.
Knowledge Based Systems, Logic Programming and Constrained Logic Programming: AI Programming Language (PROLOG).
Introduction to Soft Computing Techniques:
Supervised and Unsupervised learning. Neural Network: Preliminary ideas. Fuzzy Logic: Membership function, α-cut, fuzzy set operations.

Paper – *CMSAP8P (Practical)*
MARKS: 100
Credit : 13
Revision vide BoS dated 10.01.2015

Group A: Network Programming: (Marks 25)

Fundamental ideas on client-server programming using socket.

Group B: Web programming: (Marks 25)

Basic Web Programming using HTML, Javascript, CSS.

Group C: Project Work: (Marks 50)

Text Books:

1.Data Communications and Networking by Behrour A. Forouzan, 4th Edition, TMH.
2.Data and Computer communication by William Stallings, 6th Edition, Pearson Education 3.Computer Networks by Tanenbaum, Pearson Education.
4.R. C. Gonzalez and R. E. Woods, "Digital Image Processing"
5.Malay K Pakhira, "Digital Image Processing and Pattern Recognition "
6.Milan Sonka, V. Hlavac, R. Boyle, "Image Processing, Analysis and Machine Vision" 7.William K. Pratt, "Digital Image Processing"
8.Atul Kahate “Cryptography and Netwrok Security”
9.Douglas R Stinson “Cryptography: Theory and Practice, Third Edition” 10.A Kahate and Godbole “Web Technologies”
11.William Stallings, "Network Security Essentials"
12.Gollmann, Dieter, "Computer Security"
13.Micki Krause, Harold F. Tipton, "Handbook of Information Security Management"
14.Pearlman and Kaufman “Private Communication in a Public World”
15. Jiawei Han & Micheline Kamber - Data Mining Concepts & Techniques Publisher Harcout India. Private Linited.
16. G.K. Gupta – Introduction to Data Mining with case Studies, PHI, New Delhi – 2006.
17. A. Berson & S.J. Smith – Data Warehousing Data Mining, COLAP, TMH, New Delhi – 2004
18. H.M. Dunham & S. Sridhar – Data Mining, Pearson Education, New Delhi, 2006.
19. Elaine Rich and Kevin Knight: Artificial Intelligence
20. Dan W. Patterson: Introduction to Artificial Intelligence and Expert Systems
21.S. Russel and P. Norvig, "Artificial Intelligence, A modern Approach"
22.Malay Kumar Pakhira, “Computer Graphics and Multimedia” PHI
23.Hearn and Baker, “Computer Graphics” PHI

B.Sc. Computer Science Generic Elective

Course Structure

Sl No	Name of the Course	Semester	Course Code	Credit	Marks in the Course	Course outcome
1	Number System & Boolean Algebra Basic Building Blocks of Computer and Their Implementation	1	CMSGP1T	2	75	i) Creating fundamental background of computer science. ii) Building up fundamental concepts of digital logic design and Boolean algebra.
2	C Programming -I	1	CMSGP1P	1	25	i) Introduction to programming language using C.
3	Algorithms & Data Structure Operating System	2	CMSGP2T	2	50	i) Creating fundamental background data structure and algorithm. ii) Building up concepts of theory of operating system design.
4	C Programming -II	2	CMSGP2P	1	25	i) Implementation of data structures and other algorithm using C.
5	Database Management System Cryptography	3	CMSGP3T	2	50	i) Creating fundamental background database management systems. ii) Implementing theory of RDBMS using SQL package. iii) Building mathematical background and theoretical knowledge of cryptography.
6	Database Lab	3	CMSGP3P	1	25	The student should be familiar with at least one standard commercial RDBMS software under desktop or multiuser environment
7	Computer Network and Internet Technologies Graph Theory	4	CMSGP4T	2	50	i) Creating fundamental background of theory of networking. ii) Introducing the science behind Internet and its technologies. iii) Building up background for graph theoretical approach.
8	Python Programming	4	CMSGP4P	1	25	Introducing students to scripting language using Python.

RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College under University of Calcutta)

Syllabus For B.Sc. Computer Science Generic Elective

Semester-I (July-December)

Paper – *CMSGP1T (Theory)*

MARKS: 50

Revision vide BoS dated 21.12.2015

Course Outcome:

i) Creating fundamental background of computer science.
ii) Introduction to programming language using C.
iii) Building up fundamental concepts of digital logic design and Boolean algebra.

Group A: Number System & Boolean Algebra: (Full Marks: 25)

21. *Number Systems and Codes:* Number representation: Weighted and Non-weighted codes, Positional Number System, Binary, Octal, Hexadecimal, Binary Coded Decimal(BCD), Conversion of bases. Complements: r's and (r-1)'s, Arithmetic, Binary Codes: Gray, Alphanumeric, ASCII; Hamming Codes.

- *Boolean Algebra:* Fundamentals of Boolean Algebra, Logic Gates. Minterm and Maxterm, Truth Table and minimization of function (up to four variables), Universal Logic functions.

- Implementation of Switching Functions, Universal Gates, Code Converters.

Group B: Basic Building Blocks of Computer and Their Implementation: (Full Marks: 25)

- *Combinational Circuits:* Adders, Subtractors, Comparators Decoders/ Demultiplexers, Encoders, Multiplexers.

- *Sequential Circuits:* Study of Clocked Flip Flops SR, JK, D, T. Synchronous & Asynchronous Counters. Registers: Shift and Parallel.

- *Basic building blocks of computer:* Von Neumann Architecture – ALU,CU, Registers, IO, Memory, System Bus.

- *Memory:* Classification, Hierarchy, Performance. Primary Memory- Cache, RAM (SRAM & DRAM),ROM ; Secondary Memory- Hard Disk & Optical Disk

- *Instruction:* Cycle, Format – zero, one , two & three address, Addressing modes, CISC Vs RISC.

References:

1. Digital Logic and Computer Design by M. Morris Mano, PHI
2. Fundamentals Of Digital Circuits 3rd Edition by A. Anand Kumar, PHI
3. Computer Organization and Architecture by William Stallings.
4. Computer system architecture by M. Morris Mano. PHI.

Paper – *CMSGP1P (Practical)*

MARKS: 25

C Programming -I: Basic data types, Operators, Decision Making, Loop control structure, Array: One and Two dimensional.

Text Books and References:

1. Programming with C by Byron Gottfried 3rd Edition, McGraw Hill Education (India) Private Limited.
2. Programming in ANSI C by E. Balaguruswamy 6th Edition, McGraw Hill Education (India) Private Limited

Semester-II (January-June)

Paper – *CMSGP2T (Theory)*
MARKS: 50

Course Outcome:

i) Creating fundamental background data structure and algorithm.
ii) Implementation of data structures and other algorithm using C.
iii) Building up concepts of theory of operating system design.

Group A: Algorithms & Data Structure: (Marks: 25)

Algorithms: Definition, Properties, Time and Space Complexity (Best Case, Average Case, Worst Case). Recursive and Iterative Algorithms.

Data Structure: Definition, Classification- Linear & Non-linear;

Array : Properties, Terminologies, One Dimensional and Multi Dimensional;
Stack & Queue: Concept & Application- Infix , Prefix and Postfix notations.

Searching algorithms: Linear Search & Binary Search (Recursive & Non-recursive). Sorting algorithm : Bubble, Insertion & Selection.

Linked List: Insertion, Deletion & Traversing;

Binary Tree: Definition, Searching (BFS & DFS), Traversal Algorithms- Preorder, Postorder & Inorder (Recursive only). Binary Search Tree: Insertion, Searching.

Group B: Operating System: (Marks: 25)

What is OS? Multiprogramming, Multitasking OS, Concepts of processes.
Concepts of Synchronization: Semaphores, Critical Regions, Inter Process

Communication Mechanism. *Processor Management:* Scheduling and its types, Priority Queue.

Memory Management: Real &Virtual memory ,Swapping , Paging, Segmentation , Page Replacement Techniques. *File Systems:* Files and Directories, File Servers, Security and Protection.

Dead Lock : Definition, Prevention, Avoidance, Detection, Recovery.

Text Books and References:

1. Data Structure and Program Design in C by Robert Kruse, C.L. Tondo; Pearson
2. Fundamentals of Data Structure in C by Ellis Horowitz, Sartaz Sahani; Galgotia
3. Operating System Concepts by A.Silberschatz, Peter B. Galvin, G. Gagne, 6th Edition, John Wiley & Sons, Inc.
4. Modern Operating System by Tanenbaum, 3rd Edition, PHI.

Paper – *CMSGP2P (Practical)*
MARKS: 25

C Programming -II: Functions, Pointers, Structures, File Handling, and Implementation of Data Structures.

Text Books and References:

1. Programming With C by Byron Gottfried 3rd Edition, McGraw Hill Education (India) Private Limited.

2. Programming in ANSI C by E. Balaguruswamy 6th Edition, McGraw Hill Education (India) Private Limited.

Semester-III (July - December)

Paper – *CMSGP3T (Theory)*
MARKS: 50

Course Outcome:

i) Creating fundamental background database management systems.
ii) Implementing theory of RDBMS using SQL package.
iii) Building mathematical background and theoretical knowledge of cryptography.

Group A: Database Management System : (Marks 25)

Overview : Files and database. Data independence. 3-level DBMS architecture, Data Dictionary, Database Languages

Relational Model : Definition and properties, Relational data model. *Relational Algebra :* Operations – select, project, cross product, join,set. *Query Language :* SQL – basic concepts.

Design : ER diagram, ER diagram to relational schema; Keys, Functional Dependency, Normalization (upto 3NF)
File Organizations , Indexing

Group B: Cryptography : (Marks 25)

Foundations of Cryptography and Security. Principles of Security: Confidentiality, Integrity, Authentication, Repudiation.

Mathematics of Cryptography: Modular Arithmetic, Congruence & Residue Matrix.

Symmetric Key Ciphers: Substitution Ciphers – Monoalphabetic ciphers, Polyalphabetic Ciphers; Transposition Ciphers.

Block Ciphers – concept, components of block cipher.

Diffie-Hellman Key Exchange Algorithm.

RSA Algorithm.

Text Books and References:

3. Fundamentals of Database Systems by R. Elmasri & S.B. Navathe. TMH.
4. Database System Concepts by Abraham Silberschatz , S. Sudarshan , Henry F. Korth 6th Edition. TMH.
5. Cryptography and Network Security by B. Forouzan, D. Mukhopadhyay, 2nd Edition. TMH

Paper – *CMSGP3P (Practical)*
MARKS: 25

Database Lab :

The student should be familiar with at least one standard commercial RDBMS software under desktop or multiuser environment. Topic of works should include :

Database Design : Data types, creating databases, adding records, edit, browse, delete, save. SQL : Constructs; insert, delete, update, view, temporary tables; nested queries.

Text Books and References:

1. SQL, PL/SQL by Ivan Bayross.

Semester-IV (January-June)

Paper – *CMSGP4T (Theory)*
MARKS: 50

Course Outcome:

i) Creating fundamental background of theory of networking.
ii) Introducing the science behind Internet and its technologies.
iii) Building up background for graph theoretical approach.
iv) Introducing students to scripting language using Python.

Group A: Computer Network and Internet Technologies: (Marks: 25)

Introduction to Data communication system, Fundamental idea of Networking concepts; Network Models: OSI Model, Internet Model.

Network Layer: Logical Addressing, IPv4 (Classless and Classful), NAT, IPv6 (Basic Idea), Basic idea of Routing; Networking Devices.

Distributed and Client-Server Computing.

World Wide Web: Concepts, URL, Browser, Web Documents (Static and Dynamic, Active and Inactive).

Domain Name Server (DNS): Level, Domains, Generic and Country wise domain, Resolution. *E-Mail:* Architecture, User Agent, Case Studies: SMTP, POP3, IMAP4, MIME; Web Based Mail.*Other Protocols:* Remote Login: TELNET, SSH, FTP, HTTP.

Group B: Graph Theory: (Marks: 25)

Graphs-Definitions and related theorems:

Incidence function, Simple graph, Konigsberg problem ,Walks, Paths and Circuits, Euler's graphs, Hamiltonian paths and circuits, Finite and Infinite graphs, Directed and Undirected graphs, Degree, Isolated vertex, Pendant vertex, Null graphs, Subgraph, Connected and Disconnected graphs, Regular graph, Complete graph, Clique, Planar graph, Independence number of a graph, Bipartite graph, Biconnected graph, Graph isomorphism, Chromatic number and Graph coloring problem, Cut vertex, Bridge, Cut set, Weighted graph, Trees, Spanning tree, Radius and Diameter, Eccentricity and center.

Text Books and References:

1. Data Communications and Networking by Behrouz A. Forouzan, 4th Edition, TMH.
2. Computer Networks by Tanenbaum, Pearson Education.
3. Graph Theory With Applications To Engineering And Computer Science by Narsingh Deo, PHI.

Paper – *CMSGP4P (Practical)*
MARKS: 25

Python Programming:

Variables, Values, Expressions; Data types: numbers, strings, lists, dictionaries; Execution control: conditionals, loops; Code abstraction and packaging: functions, objects, and modules.
Installing and configuring additional Python libraries.

Text Books and References:

1. Python Cookbook by David Beazley , Brian K. Jones 3rd Edition. O'Reilly Publication.

B.Sc. Electronics Generic Elective

Course Structure

Sl No	Name of the Course	Semester	Course Code	Credit	Marks in the Course	Course outcome
1	Circuit components and network Physics of semiconductor devices	1	ELTGP1T	2	50	i) Ability to study and identify various circuit elements and electronic devices. ii) Ability to study and analyze different circuits and networks. iii) Ability to obtain theoretical knowledge of construction and characteristics of various electronics devices and also to have the idea of working of those devices.
2	Circuit Theory and Study of Junction Diode & Transistors	1	ELTGP1P	1	25	Ability to design and study circuits based on those devices and motivate the students to do hands on experiments in the laboratory.
3	Transistor circuit – Design and applications Analog integrated circuits – OPAMP and Timer chip:	2	ELTGP2T	2	50	i) Ability to study and identify transistors. ii) Ability to implement practical experiments of transistors. iii) Understanding Operational Amplifier and its applications.
4	Applications of BJT and Analog IC OPAMP & IC 555.	2	ELTGP2P	1	25	Understanding the practical modern application of electronics and related field through industry visit.

5	Electronic Instrumentation IC Design Technology	3	ELTGP3T	2	50	Ability to identify Integrated Circuits (ICs) and study their characteristics.
6	Simulations with Hardware & Circuit Description Languages	3	ELTGP3P	1	25	To impart the basic concepts of Analog ICs such as Operational Amplifier (OPAMP) and Timer Chip (IC 555), with hands-on experiments using them in the laboratory. Understanding CRO with hands on experiments.
7	Digital Communication and Communication Technology : Optoelectronics and Display Devices:	4	ELTP4T	2	50	i) Ability to understand basics of communication. ii) Ability to understand basics of optics.
8	Project Work	4	ELTGP4P	1	25	Experience of hands on electronics project.

RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College under University of Calcutta)

Syllabus for B.Sc. Electronics Generic Elective

Semester – I (July - December)

Paper – ELTGP1T (Theory)

Revision vide BoS dated 16.08.2017

Course Outcome:

i) Ability to study and identify various circuit elements and electronic devices.
ii) Ability to study and analyze different circuits and networks.
iii) Ability to obtain theoretical knowledge of construction and characteristics of various electronics devices and also to have the idea of working of those devices.
iv) Ability to design and study circuits based on those devices and motivate the students to do hands on experiments in the laboratory.

Marks: 50

A: Circuit components and network:

 Electric Circuit Components: Resistors – types,colour coding, variable resistors, power rating.Capacitors – types, voltage rating, capacitor coding. Inductor coils – self-inductance and mutual-inductance, air-core and iron-core coils, variable inductance. Transformers (basic idea). [4]

2. Network Theorems: Kirchoff's current and voltage laws.**T** to **Pi** and **Pi** to **T** conversions.Thevenin, Norton,

Maximum power transfer and Superposition theorems (no proofs) and applications to simple problems. [6]

3 Transient response and resonance: Charging and discharging of a capacitor in CR circuit.Forced oscillations in a RLC circuit (qualitative), series resonance, Q factor, parallel resonance (basic idea). [5]

B: Physics of semiconductor devices:

4. Semiconductors: Classification of crystals - insulators, metals and semiconductors, energy band theory (brief idea), intrinsic and extrinsic semiconductors, p and n type semiconductors, mechanism of current conduction in semiconductors - drift and diffusion, carrier mobility, current density and conductivity, recombination and generation process, Ohmic contact. [5]

5. PN junction diode: Formation of P-N junction, concept of space-charge region and barrier potential (no derivation), energy band diagram (brief idea).Static V-I characteristic (qualitative), breakdown mechanism: Zener vs. Avalanche. Zener diode (as a voltage regulator),LED, Laser diode. Dynamic characteristics of diode, diode as a rectifier. [6]

6. Bipolar Junction Transistors (BJT): Basic structure and formation of BJT, different current components, input and output characteristics of different configuration of transistors (CB,CE,CC). Transistor parameters α and β and relation between them. h-parameter model of transistor amplifier (qualitative). [7]

7. Field Effect Transistor (FET): Junction Field Effect Transistor (JFET): n and pchannel JFET, Metal OxideSemiconductor Field Effect Transistor (MOSFET), n-channel (NMOS) and p-channel (PMOS), depletion and enhancement type MOSFETs, drain and transfer characteristics of MOSFET, FET parameters. Advantages of FETs over BJTs. [7]

Paper – ELTGP1P (Practical)

Circuit Theory and Study of Junction Diode & Transistors.

Revision vide BoS dated 16.08.2017

Marks: 25

1. Verification of Thevenin's theorem, Norton's theorem and Maximum power transfer theorem using a resistive Wheatstone bridge, dc source and dc meters.
2. To study the series resonant RLC circuit and determine the resonant frequency, bandwidth and the Q factor.
3. To draw the static characteristic of forward-biased p-n junction diode and to determine the saturation current, diode quality factor, the dc and ac resistances at specified voltage.
4. To study the forward and reverse static characteristics of a Zener diode and to determine the breakdown voltage and dynamic resistance after breakdown.
5. To study the load and line regulation of a voltage regulator constructed using Zener diode.
6. To study half-wave, full-wave and bridge-rectifier with and without filter. The waveform to bestudied with the help of a CRO.
7. To study basic characteristics of LED. (Operating Current & Voltage)
8. To study and draw the input and output characteristics of a CE mode transistor.
9. To design basic gates (OR, AND & NOT) using discrete analog components such as junction diodes and transistors. (N.B.: Theoretical knowledge from 10+2 level)

Text / Reference Books:

1. Circuit Theory, A. Chakraborty, Dhanpat Rai & Co. (Pvt.) Ltd.
2. Foundations of Electronics, Chattopadhyay and Rakshit, New Age.
3. Fundamental Principle of Electronics, B. Ghosh, Books & Allied.
4. Basic Electronics, Theraja, S. Chand.
5. Electronic Devices and Circuit Theory, R. L. Boylestad and L. Nashelsky, Pearson Education.
6. Basic Electronics and Linear Circuits, N. N. Bhargava et. al., TMH.
7. Analog and Digital Electronics, Taraprasad Chattopadhyay, CBS Pub and Distributors.
8. Basic Electronics, K.K.Ghosh, Platinum Publisher.
9. *Electronics (Classical and Modern)*, Dr. R. K. Kar, Books & Allied.
10. Electricity and Magnetism, Yearwood.
11. Network Analysis, D. Roychowdhury, New Age.
12. Circuits and Networks, Sudhakar Shyammohan, Tata McGraw Hill.

14.Laboratory Manual for Electronic Devices and Circuits, Bell.
15.Advanced Practical Physics (*Vol 2*), B. Ghosh.
16. An advanced course in Practical Physics, Chattopadhyay and Rakshit, New Central Book Agency.
17.Basic Electronics: A Text Lab Manual,Zbar, TMH.
18. Microelectronic circuit,Sedra and Smith, Oxford University Press.
19. Electricity and Magnetism, Chattopadhyay and Rakshit, New Central.

Semester – II (January - June)

Paper – ELTGP2T (Theory)

Revision vide BoS dated 16.08.2017

Course Outcome:

i) Ability to study and identify transistors.
ii) Ability to implement practical experiments of transistors.
iii) Understanding Operational Amplifier and its applications.
iv) Understanding the practical modern application of electronics and related field through industry visit.

Marks: 50

A: Transistor circuit – Design and applications:

3. Transistor biasing: DC biasing, transistor load-lineand Q-point (concept), operating point and need for biasing. Thermal runaway (brief idea). Stability of transistor biasing: fixed bias, collector to base bias and self-bias. Stability factors. [6]

2 Amplifiers: CE amplifier (small signal low frequency analysis) – current and voltage gain, input and output impedance, power gain. Class A, B, AB and C large-signal amplifiers (concept). [5]

3. Feedback in amplifiers: General theory of feedback, calculation of gain of a feedback amplifier,negative andpositive feedback, feedback topologies, advantages of negative feedback. [5]

4. Oscillators: Barkhausen criterion for oscillation, Hartley and Colpitt oscillator, Wien-bridge oscillator, crystal oscillator. [5]

5. Logic families and circuit design: TTL, ECL, MOS & CMOS, their operation and specification**,** fan-out, power dissipation, propagation delay, noise margin, working of a basic TTL inverter, need for Totem-pole output, MOS as a low power device. CMOS inverter. Simple combinational gates - NAND gate and NOR gate using MOS and CMOS. [7]

B: Analog integrated circuits – OPAMP and Timer chip:

6. OPAMP and its applications: Open loop voltage gain, input impedance, output impedance, input bias current, input offset current, input offset voltage, common mode rejection ratio (CMRR), Slew-rate. Inverting amplifier, concept of virtual ground, non-inverting amplifier, concept of virtual short, unity gain buffer, adder, differential amplifier, differentiator, integrator, comparator, Schmitt-trigger. IC 741 and CA3130. [7]

7. Timer IC 555:IC 555 properties. Astable, Monostable and Bistablemultivibrators. Application as a pulse generator and rectangular/square wave generator. [5]

Paper – ELTGP2P (Practical)

Applications of BJT and Analog IC OPAMP & IC 555.

Revision vide BoS dated 16.08.2017

Marks: 20+5*

[12X3]

13. To design and study a Wien bridge oscillator.
14. To study the offset voltage, offset current and input bias current of a given OPAMP IC 741. Also, determine its CMRR.
15. To design and study the inverting amplifier, non-inverting amplifier, unity gain buffer, adder and difference circuit using IC OPAMP.
16. To design and study the differentiator circuit using IC OPAMP. Use a CRO to study the input and output waveforms using saw-tooth/triangular waves as input. Study output waveforms for various types of input signals.
17. To design and study the integrator circuit using IC OPAMP. Use a CRO to study the input and output waveforms using a square wave as input. Study output waveforms for various types of input signals.
18. To design and studyvoltage comparator andSchmitt trigger circuit using IC OPAMP.Use these circuits for generating rectangular waveform from a sinusoidal waveform.
19. To design and study a square wave generating circuit using IC 555 as an astablemultivibrator. Study the waveform with the help a CRO.
20. To design and study a rectangular pulse generating circuit using IC 555 as a monostable multivibrator. Study effect of trigger switch on the generated pulse by a CRO.
21. To design and study a SR flipflop circuit using IC 555 as a bistable multivibrator.

20. **N.B.:** An industrial visit will be conducted during this semester. Students are required to submit a report on that visit. The involvement of the students and submitted report will be evaluated by concerned teacher/demonstrator. **Maximum marks: 05**.

Text / Reference Books:

1. Integrated Electronics, Millman and Halkias , TMH.
2. OP-Amp and Linear Integrated circuits, Gaykwad, Pearson.
3. OP-Amp and Linear Integrated circuits, Coughlin and Driscoll, PHI.
4. *OP-Amp and Linear Integrated Circuits*, Roychodhury and Jain , New Age
5. Electronic Devices and Circuit Theory, R. L. Boylestad and L. Nashelsky, Pearson Education.
6. Basic Electronics and Linear Circuits, N. N. Bhargava et. al., TMH.
7. Basic Electronics, Theraja, S. Chand.
8. Digital Circuits (Vol-I&II), D. Roychaudhuri, Platinum Publisher.
9. Digital Logic and Computer Design, Mano, Pearson.
10. Digital computer electronics, Malvino and Brown, Tata McGraw Hill.
11. Electronics o BetarBigyanPorichoy (Bengali), Animesh Roy and Pradip Kr. Dutta, PoschimbongoRajyoPustokParsat.
12. Laboratory Manual for Electronic Devices and Circuits, Bell.
13. Advanced Practical Physics (*Vol 2*), B. Ghosh.
14. An advanced course in Practical Physics, Chattopadhyay and Rakshit, New Central Book Agency.

15. Basic Electronics: A Text Lab Manual, Zbar, TMH.
16. Electronic Devices and Circuits, Salivahanan , TMH.
17. Basic Electronics, Ghatak and De, Pearson.
18. CMOS Digital Integrated Circuit, S.M.Kang & Y.Leblebici, TMH.
19. Microelectronic circuit,Sedra and Smith, Oxford University Press.

Semester – III (July - December)

Paper – ELTGP3T (Theory)

Revision vide BoS dated 16.08.2017

Course Outcome:

i) Ability to identify Integrated Circuits (ICs) and study their characteristics.
ii) To impart the basic concepts of Analog ICs such as Operational Amplifier (OPAMP) and Timer Chip (IC 555), with hands-on experiments using them in the laboratory.
iii) Understanding CRO with hands on experiments.

Marks: 50

A: Electronic Instrumentation:

 Cathode Ray Oscilloscope: Block diagram of a CRO. Study of CRT with other different components of a CRO. Display principle of CRO. Measurement of frequency, phase angle and amplitude with CRO. Concept of Sampling, Storage oscilloscope, Double beam CRO, DSO. [6]

 Meters: DC ammeters, voltmeters, ohm meter, analog and digital multimeter (DMM), true RMS ac meter, digital voltmeter (DVM). [4]

4. Sensors & Transducers: Introduction to sensors & transducers, strain gauge, LVDT, thermocouple, thermistor. [5]

B: IC Design Technology:

3 Introduction to chip integration: Moor's law, scale of integration,SSI, MSI, LSI, VLSI, ULSI – basic idea only. [2]

4 Very Large Scale Integration: VLSI design concept,VLSI design steps (basic ideas) – crystal growth, cleaning, oxidation, diffusion, ion implantation, advanced lithography, etching, metallization, vacuum evaporation, DC/RF sputtering, polysilicon and nitride deposition; Fabrication of monolithic integrated circuits – CMOS process (in brief). Types of VLSI chips – Analog, Digital, General purpose, ASIC, PLA, FPGA (conceptual). [8]

C: Analog Communication:

4. Communication signal: Basic characteristics of signal: Periodic and aperiodic signal,power and energy signal, frequency and time domain of signal. [1]

5. Noise: Thermal, shot and flicker noise, Calculation of noise in linear systems, noise bandwidth, Noise in two-port networks-SNR ratio, Noise figure, Noise temperature, Transmission impairments of a signal need of modulation, modulating signal, types of modulation. [4]

6. Amplitude modulation and demodulation: Mathematical representation, modulation index and percentage modulation, frequency spectrum, sideband frequencies, concept of DSB and SSB signal. Generation of AM signal. Demodulation: diode detector. [5]

7. Angle modulation and demodulation: Frequency (FM) and Phase Modulation (PM): Mathematical representation of FM and PM, frequency demodulation. FM to PM conversion and vice-versa. [5]

Paper – ELTGP3P (Practical)

Simulations with Hardware & Circuit Description Languages

Revision vide BoS dated 16.08.2017

Marks: 25

Hardware Description Language –

VHDL or Verilog Combinational & Sequential logiccircuit design.

Circuit Description Language –

Introduction to P-Spice, analog and digitalcircuit design.

N.B.: At least 10 circuits to be simulated (at least 5 with each languages).

Text / Reference Books:

8. Modern Electronic Instrumentation and Measurement Techniques, Helfrik and Cooper, Pearson
9. Elements of Electronic Instrumentation and Measurement, Carr, Pearson
10. Electronic Instrumentation, Kalsi , TMH
11. Electronic Instrumentation and Measurement, Zbar, McGraw Hill
12. *A course on Electrical and Electronic Measurements and Instrumentations*, A.K. Sawhney, Dhanpat Rai & Sons.
13. Semiconductor Devices – Physics and Technology, S. M. Sze, Wiley
*14. Microelectronic circuit,*Sedra and Smith, Oxford University Press. (Appendix A for VLSI)
15. Modern VLSI Design, Wayne Wolf, Pearson Education.
16. Silicon VLSI Technology – Fundamentals, Practice and Modelling, J. D. Plummer, M. D. Deal and P. B. Griffin, Pearson.
17. VLSI Technology – Fundamentals and Applications, Y. Tarui, Springer-Verlag.
18. Modern Digital and Analog Communication Systems, B.P. Lathi, Zhi Ding, Oxford University Press.
19. Electronic communication system, Kennedy, Davis, TMH.
20. Electronic Communications, D. Roddy and J. Coolen, Pearson.
21. VHDL – Programming by Examples, D. L. Perry, TMH.
22. VHDL, Bhaskar, PHI.
23. Circuit Design with VHDL, V. A. Padroni, MIT Press.
24. Advance Digital Design Using Verilog, Michel D. Celliti, PHI.
25. PSpice using OrCAD, Rashid, PHI.

Semester – IV (January - June)

Paper – ELTP4T (Theory)

Revision vide BoS dated 16.08.2017

Course Outcome:

i) Ability to understand basics of communication.
ii) Ability to understand basics of optics.
iii) Experience of hands on electronics project.

Marks: 50

A: Digital Communication and Communication Technology:

- **Pulse modulation:** Pulse amplitude modulation (PAM), pulse width modulation (PWM), pulse position

modulation (PPM) and Pulse Code Modulation (PCM). [3]

 Digital carrier modulation & demodulation: Analog to digital signal conversion. Data encoding, quantization and quantization error. Bit rate, Baud rate, Information capacity, Shanon's limit; Introduction to the different digital modulation techniques – ASK, FSK, PSK. Basic concept of delta modulation, andadaptive delta modulation. Introduction to the concept DPCM. Basic concept of spread spectrum modulation. [8]

 Cellular communication: Multiple access technologies in cellular communication; Time Division Multiple Access (TDMA), Frequency Division Multiple Access (FDMA), Code Division Multiple Access (CDMA). Cellular communication networks and systems – Second generation (2G) network, Global system for mobile communication (GSM), GSM architecture and GPRS (concept only). [6]

5. Radio-wave communication: Characteristics of electromagnetic wave, propagation of radio waves at different frequencies, structure of the atmosphere, ground wave propagation, sky wave, critical frequency and virtual height, maximum usable frequency and skip distance (qualitative discussions only). [5]

B: Optoelectronics and Display Devices:

5 Optoelectronics: Electro-optic, acousto-optic and magneto-optic modulators (basic idea only). Optical sources and detectors: Laser diode, LED, LDR, PIN and Avalanche photodiode, phototransistor, opto-couplers. [6]

5. Optical fiber and Laser: Total internal reflection, propagation of light through a Fiber, step index and graded index fiber – single mode and multimode fiber, acceptance angel and numerical aperture, applications.Structure and principle of LASER, population inversion, optical resonator, He-Ne laser. [7]

6. Display devices: CRT, LED, ELD, PDP, LCD: HPA, TFT, OLED, 7-Segment Display, 9/14/16 Segment Display (basic idea only). [5]

Paper – ELTGP4P (Practical)

Project Work

Marks: 25

Project Work – Implementation of theoretical and practical knowledge/concept to model/develop/study/ design/simulate a Project leading to documentation followed by presentation and viva.

Text / Reference Books:

7. Modern Digital and Analog Communication Systems, B.P. Lathi, Zhi Ding, Oxford University Press.
8. Electronic communication system, Kennedy, Davis, TMH.
9. Wireless Communication and Networks: 3G and Beyond, I. SahaMisra, TMH Education.
10. Wireless Communications: Principles and Practice, T.S., PHI Learning.
11. Wireless Communications, A. Goldsmith, Cambridge University Press.
12. Lee's Essentials of Wireless Communications, MH Prof. Med/Tech.
13. Wireless Digital Communications: Modulations and Spread Spectrum Applications,K. Feher, Prentice Hall.
14. Wireless Communications and Networking, J. W. Mark and W. Zhuang, PHI.
15. Wireless Networks: Applications and Protocols, T. S. Rappaport, Pearson Education.
16. Integrated Electronics, Millman and Halkias, TMH.
17. Foundations of Electronics, Chattopadhyay and Rakshit, New Age.
18. Basic Electronics, Theraja, S. Chand.

19. Optical Electronics, A. K. Ghatak, K. Thaygarajan, Cambridge University Press.
20. Semiconductor Optoelectronic Devices, Bhattacharya, PHI.
21. Microwave Devices and Circuits, Liao, Pearson.
22. Photonics – Optoelectronics, S. L. Kakani and S. Kakani, CBS.