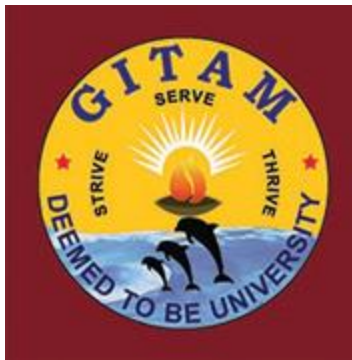


**GANDHI INSTITUTE OF TECHNOLOGY AND MANAGEMENT  
(GITAM)**

(Deemed to be University, Estd. u/s 3 of UGC Act 1956)

**\*VISA KHAPATNAM \*HYDERABAD \*BENGALURU\***

Accredited by NAAC with 'A+' Grade



**REGULATIONS AND SYLLABUS**

Of

**Bachelor of Science**

(Mathematics, Electronics & Computer Science)

*(W.e.f. 2018-19 admitted batch)*

**Website: [www.gitam.edu](http://www.gitam.edu)**

**B.Sc. REGULATIONS**  
(w.e.f. 2018-19 admitted batch)

**1.0 ADMISSIONS**

Admissions into B.Sc., (M.E.Cs.) program of GITAM University are governed by GITAM University admission regulations.

**2.0 ELIGIBILITY CRITERIA**

**2.1** A pass in Intermediate with Mathematics, Physics and Chemistry and with a minimum aggregate of 50% marks or any other equivalent Examination approved by GITAM University.

**2.2** Admissions into B.Sc., (M.E.Cs.) will be based on the marks obtained in intermediate or equivalent examination and the rule of reservation, wherever applicable.

**3.0 CHOICE BASED CREDIT SYSTEM**

Choice based credit system (CBCS) is introduced with effect from the admitted batch of 2015-16 based on UGC guidelines in order to promote:

- Student centered learning
- Cafeteria approach
- Inter-disciplinary learning

Learning goals/objectives and outcomes are specified leading to what a student should be able to do at the end of the program.

**4.0 STRUCTURE OF THE PROGRAMME**

**4.1** The program consists of:

- (i) Ability enhancement compulsory core courses (AECC)
- (ii) Core Courses (compulsory) (CC)
- (iii) Discipline specific electives (DSE)
- (iv) Discipline Specific Core (DSC)
- (v) Open electives are of general nature either related or unrelated to the discipline
- (vi) Practical Proficiency Courses: Laboratory and Project work

**4.2** Each course is assigned a certain number of credits depending upon the number of contact hours (lectures/tutorials/practical) per week.

**4.3** In general, credits are assigned to the courses based on the following contact hours per week per semester.

- One credit for each lecture / tutorial hour.
- Two credits for three hours of practicals.

**4.4** The curriculum of six semesters B.Sc., (M.E.Cs.) program is designed to have a total of 140 credits for the award of B.Sc., (M.E.Cs.) degree.

## **5.0 MEDIUM OF INSTRUCTION:**

The medium of instruction (including examinations and project reports) shall be English.

## **6.0 REGISTRATION**

Every student has to register himself/herself for each semester individually at the time specified by the Institute / University.

## **7.0 ATTENDANCE REQUIREMENTS**

**7.1** A student whose attendance is less than 75% in all the courses put together in any semester will not be permitted to attend the end - semester examination and he/she will not be allowed to register for subsequent semester of study. He /She have to repeat the semester along with his / her juniors.

**7.2** However, the Vice Chancellor on the recommendation of the Principal/ Director of the University College / Institute may condone the shortage of attendance to the students whose attendance is between 66% and 74% on genuine medical grounds and on payment of prescribed fee.

## **8.0 EVALUATION**

**8.1** The assessment of the student's performance in a Theory course shall be based on two components: Continuous Evaluation (40 marks) and Semester-end examination (60 marks).

**8.2** A student has to secure an aggregate of 40% in the course in the two components put together to be declared to have passed the course, subject to the condition that the candidate must have secured a minimum of 24 marks (i.e. 40%) in the theory component at the semester-end examination.

**8.2.1** Practical/ Viva voce/ Seminar etc. course are completely assessed under Continuous Evaluation for a maximum of 100 marks, and a student has to obtain a minimum of 40% to secure Pass Grade. Details of Assessment Procedure are furnished below in Table 1.

**Table 1: Assessment Procedure**

S.No.	Component of assessment	Marks allotted	Type of Assessment	Scheme of Examination
1	Theory	40	Continuous evaluation	(i) Two mid semester examinations shall be conducted for 15 marks each. (ii) 5 marks are allocated for quiz. (iii) 5marks are allocated for assignments.
		60	Semester-end examination	The semester-end examination shall be for a maximum of 60 marks.
	Total	100		
2	Practicals	40	Continuous evaluation	Forty (40) marks for continuous evaluation are distributed among the components: regularity, preparation for the practical, performance, submission of records and oral presentations in the laboratory. Weightage for each component shall be announced at the beginning of the Semester.
		60	Continuous evaluation	Sixty (60) marks for two tests of 30 marks each (one at the mid-term and the other towards the end of the Semester) conducted by the concerned lab Teacher and another faculty member of the department who is not connected to the lab, as appointed by the HoD.
	Total	100		

**9.0 REAPPEARANCE**

**9.1** A student who has secured 'F' grade in a Theory course shall have to reappear at the subsequent semester end examinations held for that course.

**9.1.1** A student who has secured 'F' grade in a Practical course shall have to attend Special Instruction Classes held during summer.

**9.1.2** A student who has secured 'F' Grade in Project work / Industrial Training etc shall have to improve his/her report and reappear for Viva – voce at the time of Special Examination to be conducted in the summer vacation.

**10.0 SPECIAL EXAMINATION**

A student who has completed his/her period of study and still has "F" grade in a maximum of four theory courses is eligible to appear for Special Examination normally held during summer vacation.

## 11.0 BETTERMENT OF GRADES

A student who has secured only a Pass or Second class and desires to improve his/her Class can appear for Betterment Examinations only in Theory courses of any Semester of his/her choice, conducted in Summer Vacation along with the Special Examinations. Betterment of Grades is permitted 'only once' immediately after completion of the program of study.

## 12.0 GRADING SYSTEM

**12.1** Based on the student performance during a given semester, a final letter grade will be awarded at the end of the semester in each course. The letter grades and the corresponding grade points are as given in Table-2.

**Table 2: Grades & Grade Points**

S.No.	Grade	Grade Points	Absolute Marks
1	O (Outstanding)	10	90 and above
2	A+ (Excellent)	9	80 to 89
3	A (Very Good)	8	70 to 79
4	B+ (Good)	7	60 to 69
5	B (Above Average)	6	50 to 59
6	C (Average)	5	45 to 49
7	P (Pass)	4	40 to 44
8	F (Fail)	0	Less than 40
9	Ab. (Absent)	0	-

**12.2** A student who earns a minimum of 4 grade points (P grade) in a course is declared to have successfully completed the course, and is deemed to have earned the credits assigned to that course, subject to securing a GPA of 5 for a pass in the semester.

## 13.0 GRADE POINT AVERAGE

**13.1** A Grade Point Average (GPA) for the semester/trimester will be calculated according to the formula:

$$GPA = \frac{\sum[C \times G]}{\sum C}$$

Where

C = number of credits for the course,

G = grade points obtained by the student in the course.

**13.2** To arrive at Cumulative Grade Point Average (CGPA), a similar formula is used

considering the student's performance in all the courses taken, in all the semesters up to the particular point of time.

- 13.3** CGPA required for classification of class after the successful completion of the program is shown in Table 3.

**Table 3: CGPA required for award of Class**

Distinction	$\geq 8.0^*$
First Class	$\geq 7.0$
Second Class	$\geq 6.0$
Pass	$\geq 5.0$

\* In addition to the required CGPA of 8.0, the student must have necessarily passed all the courses of every semester in first attempt.

#### **14.0 ELIGIBILITY FOR AWARD OF THE B.Sc. DEGREE**

- 14.1** Duration of the program: A student is ordinarily expected to complete B.Sc. program in six semesters of three years. However a student may complete the program in not more than five years including study period.
- 14.2** However the above regulation may be relaxed by the Vice Chancellor in individual cases for cogent and sufficient reasons.
- 14.3** A student shall be eligible for award of the B.Sc. Degree if he / she fulfill the following conditions.
- Registered and successfully completed all the courses and projects.
  - Successfully acquired the minimum required credits as specified in the curriculum corresponding to the branch of his/her study within the stipulated time.
  - Has no dues to the Institute, hostels, Libraries, NCC / NSS etc, and
  - No disciplinary action is pending against him / her.
- 14.4** The degree shall be awarded after approval by the Academic Council

#### **15.0 DISCRETIONARY POWER:**

Notwithstanding anything contained in the above sections, the Vice Chancellor may review all exceptional cases, and give his decision, which will be final and binding.

**B.Sc. – Scheme of Instruction****I Semester****B.Sc. (Mathematics, Electronics & Computer Science)**

Course Code	Subject	Category	Instruction Hours/week		Credits	Scheme of Instruction		
			L	P		CE	SE	Total Marks
SFC 101	English Communication Skills	AECC	3	0	2	40	60	100
SPH 101	Differential Calculus	CC	4	0	4	40	60	100
SPH 107	Basic Circuit Theory	CC	4	0	4	40	60	100
SPH 109	Object Oriented Programming in C++	CC	4	0	4	40	60	100
<b>LABS</b>								
SPH 121	Differential Calculus Tutorial	PPC	2	0	2	100	--	100
SPH 127	Basic Circuits Lab	PPC	0	3	2	100	--	100
SPH 129	Object Oriented Programming in C++ Lab	PPC	0	3	2	100	--	100

**II Semester****B. Sc. (Mathematics, Electronics & Computer Science)**

Course Code	Subject	Category	Instruction Hours/week		Credits	Scheme of Instruction		
			L	P		CE	SE	Total Marks
SFC 102	Environmental Science	AECC	3	0	2	40	60	100
SPH 102	Differential Equations	CC	4	0	4	40	60	100
SPH 108	Electronic Devices & Circuits	CC	4	0	4	40	60	100
SPH 110	Data Structures And File Processing	CC	4	0	4	40	60	100
<b>LABS</b>								
SPH 120	Differential Equations Tutorial	PPC	2	0	2	100	--	100
SPH 126	Electronic Devices & Circuits Lab	PPC	0	3	2	100	--	100
SPH 128	Data Structures And File Processing Lab	PPC	0	3	2	100	--	100

### III SEMESTER

#### B. Sc. (Mathematics, Electronics & Computer Science)

Course Code	Subject	Category	Instruction Hours/week		Credits	Scheme of Instruction		
			L	P		CE	SE	Total Marks
SPH 201	Real Analysis	CC	4	0	4	40	60	100
SPH 207	Digital Electronics	CC	4	0	4	40	60	100
SPH 209	Design and Analysis of Algorithms	CC	4	0	4	40	60	100
<b>LABS</b>								
SPH 221	Real Analysis Tutorial	PPC	2	0	2	100	--	100
SPH 227	Digital Electronics Lab	PPC	0	3	2	100	--	100
SPH 229	Design and Analysis of Algorithms Lab	PPC	0	3	2	100	--	100
<b>Choose any one</b>								
SSE 275	Logic and sets	SEC	2	0	2	100	--	100
SSE 277	Computer Graphics	SEC	2	0	2	100	--	100
SSE 279	Electrical Circuits and Network Skills - I	SEC	2	0	2	100	--	100

### IV SEMESTER

#### B. Sc. (Mathematics, Electronics & Computer Science)

Course Code	Subject	Category	Instruction Hours/week		Credits	Scheme of Instruction		
			L	P		CE	SE	Total Marks
SPH 202	Algebra	CC	4	0	4	40	60	100
SPH 208	Analog & Digital IC Applications	CC	4	0	4	40	60	100
SPH 210	Operating Systems	CC	4	0	4	40	60	100
<b>LABS</b>								
SPH 220	Algebra Tutorial	PPC	2	0	2	100	--	100
SPH 226	Analog & Digital IC Applications Lab	PPC	0	3	2	100	--	100
SPH 228	Operating Systems Lab	PPC	0	3	2	100	--	100
<b>Choose any one</b>								
SSE 276	Vector calculus	SEC	2	0	2	100	--	100
SSE 278	Number theory	SEC	2	0	2	100	--	100
SSE 280	E-Commerce	SEC	2	0	2	100	--	100
SSE 282	Basic Instrumentation Skills - I	SEC	2	0	2	100	--	100



## V SEMESTER

### B. Sc. (Mathematics, Electronics & Computer Science)

Course Code	Subject	Category	Instruction Hours/week		Credits	Scheme of Instruction		
			L	P		CE	SE	Total Marks
<b>Choose any one</b>								
SPH361	Matrices	DSE	4	0	4	40	60	100
SPH363	Statics & Dynamics	DSE	4	0	4	40	60	100
SPH365	Linear Algebra	DSE	4	0	4	40	60	100
<b>Choose any one</b>								
SPH371	Microprocessors (Intel 8085)	DSE	4	0	4	40	60	100
SPH373	Electronic communications	DSE	4	0	4	40	60	100
SPH375	Consumer electronics	DSE	4	0	4	40	60	100
<b>Choose any one</b>								
SPH391	Data Mining	DSE	4	0	4	40	60	100
SPH393	Cryptography	DSE	4	0	4	40	60	100
<b>LABS</b>								
<b>Choose any one (<sup>@</sup> corresponding to theory course)</b>								
SPH333 <sup>@</sup>	Matrices Tutorial	PPC	2	0	2	100	--	100
SPH335 <sup>@@</sup>	Statics & Dynamics Tutorial	PPC	2	0	2	100	--	100
SPH337 <sup>@@@</sup>	Linear Algebra Tutorial	PPC	2	0	2	100	--	100
<b>Choose any one (<sup>\$</sup> corresponding to theory course)</b>								
SPH 327 <sup>\$</sup>	Microprocessors lab	PPC	0	3	2	100	--	100
SPH 329 <sup>\$\$</sup>	Electronic communications lab	PPC	0	3	2	100	--	100
<b>Choose any one (<sup>&amp;</sup> corresponding to theory course)</b>								
SPH343 <sup>&amp;</sup>	Data Mining Lab	PPC	0	3	2	100	--	100
SPH345 <sup>&amp;&amp;</sup>	Cryptography Lab	PPC	0	3	2	100	--	100
<b>Choose any one</b>								
SSE 375	Theory of Equations	SEC	2	0	2	100	--	100
SSE 377	Probability and Statistics	SEC	2	0	2	100	--	100
SSE 379	Combinatorial Optimization	SEC	2	0	2	100	--	100
SSE 381	Electrical Circuits and Network Skills - II	SEC	2	0	2	100	--	100

## VI SEMESTER

### B. Sc. (Mathematics, Electronics & Computer Science)

Course Code	Subject	Category	Instruction Hours/week		Credits	Scheme of Instruction		
			L	P		CE	SE	Total Marks
<b>Choose any one</b>								
SPH362	Numerical methods	DSE	4	0	4	40	60	100
SPH364	Complex analysis	DSE	4	0	4	40	60	100
SPH366	Linear programming	DSE	4	0	4	40	60	100
<b>Choose any one</b>								
SPH372	Microcontrollers& Applications	DSE	4	0	4	40	60	100
SPH374	VLSI Design	DSE	4	0	4	40	60	100
<b>Choose any one</b>								
SPH392	Information security	DSE	4	0	4	40	60	100
SPH394	Database applications	DSE	4	0	4	40	60	100
SPH396	Computer networks	DSE	4	0	4	40	60	100
<b>LABS</b>								
<b>Choose any one (@ corresponding to theory course)</b>								
SPH334@	Numerical methods Tutorial	PPC	2	0	2	100	--	100
SPH336@@	Complex analysis Tutorial	PPC	2	0	2	100	--	100
SPH338@@@	Linear programming Tutorial	PPC	2	0	2	100	--	100
<b>Choose any one (\$\$ corresponding to theory course)</b>								
SPH328\$\$	Microcontrollers & Applications Lab	PPC	0	3	2	100	--	100
SPH330\$\$	VLSI design Lab	PPC	0	3	2	100	--	100
<b>Choose any one (&amp; corresponding to theory course)</b>								
SPH346&&	Database applications Lab	PPC	0	3	2	100	--	100
SPH348&&	Computer networks Lab	PPC	0	3	2	100	--	100
<b>Choose any one</b>								
SSE 372	Basic instrumentation skills-II	SEC	2	0	2	100	--	100
SSE 378	Graph theory	SEC	2	0	2	100	--	100
SSE 380	Concepts of Ethical Hacking	SEC	2	0	2	100	--	100

**B.Sc. (Mathematics, Electronics and Computer Science)**

**SEMESTER - I**

**SFC 101: ENGLISH COMMUNICATION SKILLS**

**No. of hours per week: 03**

**Credits: 02**

**Unit- I**

Textual Lessons 1 & 2

Synonyms & Antonyms, One word substitutes, Words often confused, Phrasal Verbs

**Unit- II**

Textual Lesson-3

Foreign Phrases, Tenses, Concord

**Unit –III**

Textual Lesson - 4

Error Analysis, Single Sentence Definition, Paragraph Writing

**Unit -IV**

Textual Lesson - 5

Essay Writing, Dialogue Writing, Reading Comprehension

**Unit - V**

Textual Lesson-6

Note Making, Precise Writing

**Text Books:**

Part – 1 (Communicate Units 1 to 6 only) of Creative English for Communication, N. Krishna Swamy & Sriraman. Macmillan India Ltd (2005 version)

**Supplementary Reading:**

1. Current English for Colleges, N. Krishna Swamy & T. SriRaman, Macmillan.
2. Examine your English Margaret Maison, Macmillan.

**B.Sc. (Mathematics, Electronics and Computer Science)**

**SEMESTER - I**

**SPH 101: Differential Calculus**

**No. of hrs/week: 4**

**Credits: 4**

**Unit-I**

Limit and Continuity ( $\epsilon$  and  $\delta$  definition) - Types of discontinuities - Differentiability of functions - Successive differentiation - Leibnitz's theorem.

**Unit-II**

Partial differentiation and Euler's theorem on homogeneous functions

**Unit-III**

Tangents and Normals, Curvature, Asymptotes, Singular points, Tracing of curves, Parametric representation of curves and tracing of parametric curves, Polar coordinates and tracing of curves in polar coordinates.

**Unit-IV**

Rolle's Theorem, Mean Value theorems, Taylor's theorem with Lagrange's and Cauchy's forms of remainder

**Unit-V**

Taylor's series, Maclaurin's series of  $\sin x$ ,  $\cos x$ ,  $e^x$ ,  $\log(1+x)$ ,  $(1+x)^m$ , Maxima and Minima, Indeterminate forms.

**Books Recommended**

1. "Elements of Real Analysis" by Shanthi Narayan and Dr. M.D. Raisinghania, published by S. Chand & Company Ltd., New Delhi
2. "A Text Book of B.Sc. Mathematics Volume-II" by V. Venkateswara Rao, N Krishna Murthy, B.V.S.S. Sarma and S. Anjaneya Sastry, published by S. Chand & Company Ltd., New Delhi.
3. "Calculus Single Variable" by Howard Anton, Irl Bivens and Stephen Davis, published by John Wiley and Sons, Inc., 2002.
4. "Calculus and Analytic Geometry" by George B. Thomas, Jr. and Ross L. Finney, published by Pearson Education, 2007, 9th edition.

**B.Sc. (Mathematics, Electronics and Computer Science)**

**SEMESTER - I**

**SPH 107: BASIC CIRCUIT THEORY**

**No. of hrs/week: 4**

**Credits: 4**

**Unit- I**

**A.C CIRCUIT FUNDAMENTALS**

The sinusoidal voltage and current-Average and R.M.S values- Phasor representation- T operator, polar and rectangular forms of complex numbers, AC applied to RC, RL and RLC circuits, concept of impedance-power factor in AC circuits, numerical problems.

**Passive Networks:** Concept of ideal as well as practical voltage and current sources, Regulation Kirchhoff's current law – Kirchhoff's voltage law - Method of solving A.C and D.C circuits by Kirchhoff's laws - Loop analysis - Nodal analysis - numerical problems.

**Unit - II**

**NETWORK THEOREMS**

Maximum power transfer theorem - Super position theorem - Thevenin's theorem Norton's theorem– Millman's theorem-Reciprocity theorem- problem solving applications for all the theorems.

**Unit - III**

**RC and RL CIRCUITS**

Transient response of RL and RC circuits with step input, Time constants. Frequency response of RC and RL circuits, their action as low pass and high pass filters, Passive differentiating and integrating circuits, Numerical problems.

**Unit - IV**

**RESONANCE IN ELECTRIC CIRCUITS**

Resonance in series and parallel R- L- C circuits resonant frequency, Q-factor, Bandwidth, selectivity, Comparison of series and parallel resonance, Tank circuit-LC oscillations, Numerical problems.

**Unit - V**

**CATHODE RAY OSCILLOSCOPE**

CRT - its working- Electron gun- electrostatic deflections- magnetostatic deflections. Deflection sensitivity - Fluorescent screen - CRO block diagram- Measurement of voltage - frequency and phase- Function generator-Block diagram and its description.

**TEXTBOOKS:**

1. Electric circuits by David A. Bell 7th edition Oxford higher education
2. Robert L Boylestad, "Introductory circuit analysis", Universal Book Stall Fifth edition, 2003.
3. Circuit analysis by P. Gnanasivam - Pearson education.
4. Networks, lines & fields by Ryder-PHI
5. Circuits and Networks-A. Sudhakar and Shyammohan-TMH
6. Unified electronics (Circuit analysis and electronic devices) by Agarwal-Arora.

**B.Sc. (Mathematics, Electronics and Computer Science)**

**SEMESTER - I**

**SPH 109: Object Oriented Programming in C++**

**No. of hrs/week: 4**

**Credits: 4**

**Unit- I**

Programming Concepts: Algorithm and its characteristics, pseudo code / flow chart Assignment statement, input/output statements, if, if then else statements.

Introduction to structured programming: Data types- simple data types, floating data types, character data types, string data types, arithmetic operators and operator precedence, variables and constant declarations, expressions, operators, preprocessor directives, creating a C++ program.

**Unit- II**

Input/output statements, Expressions, Control Structures if and if ... else statement, switch and break statements. For, while and do – while, break and continue statement, nested control statements.

**Unit -III**

Local and global variables, static and automatic variables, enumeration type, Function Prototyping, Function Overloading, one dimensional array, two dimensional array, character array.

**Unit- IV**

Object Oriented Concepts: objects, classes, methods, constructors, Destructor, Abstraction, encapsulation, Overloading Unary Operators, Rules for Operator Overloading

**Unit- V**

Inheritance – Single, Multiple, Multi Level, Hierarchical, Hybrid Inheritance, static and dynamic binding, Pointers, Virtual Functions and Polymorphism.

**Books Recommended**

1. Object Oriented Programming with C++ by E. Balagurusamy, Tata McGraw Hill, 6th edition, 2013.

**Reference Books:**

1. Mastering C++ by Venugopal K R, Rajkumar Buyya , Tata Mc Graw Hill, 2nd edition, 2013
2. Object Oriented Programming using C++ by B. Chandra, Narosa Publications, 2005.

**B.Sc. (Mathematics, Electronics and Computer Science)**

**SEMESTER - I**

**SPH127: BASIC CIRCUITS LAB**

**No. of hrs/week: 3**

**Credits: 2**

**(Any six experiments should be done)**

1. Measurement of D.C&A.C voltage, frequency using CRO.
2. Thevenin's theorem - Verification.
3. Norton's theorem - Verification.
4. Maximum power transfer theorem - Verification.
5. CR Circuit - Frequency response (Low pass and High pass) 6.LR Circuit- Frequency response ( Low pass and High pass)
6. LCR Series resonance circuit - frequency response, Determination of Q and Band width
7. LCR parallel resonance circuit - frequency response, Determination of Q and Band width.
8. Verification of Kirchhoff's laws.

**LAB MANUAL**

Basic Electronics: A Text-Lab Manual (The Basic Electricity-Electronics) Paul B. Zbar, Tata McGraw Hill.

**B.Sc. (Mathematics, Electronics and Computer Science)**

**SEMESTER – I**

**SPH 129: Object Oriented Programming in C++ Lab**

**No. of hrs/week: 3**

**Credits: 2**

1. Write a C++ program to demonstrate the usage of data types & operators.
2. Write a C++ program to demonstrate Class and Object.
3. Write a C++ program to demonstrate Control structures.
4. Write a C++ program to demonstrate operator overloading.
5. Write a C++ program to demonstrate function overloading using Arrays.
6. Write a C++ program to demonstrate different types of Arrays.
7. Write a C++ program to demonstrate Constructors and Constructor overloading.
8. Write a C++ program to demonstrate Copy constructor and Destructor.
9. Write a C++ program to demonstrate Single Inheritance, Multiple Inheritance.
10. Write a C++ program to demonstrate Multi level Inheritance, Hierarchal Inheritance.
11. Write a C++ program to demonstrate Pointers.
12. Write a C++ program to demonstrate Run time polymorphism and Compile time Polymorphism.

**Books Recommended**

1. Object Oriented Programming with C++ by E. Balagurusamy, Tata McGraw Hill, 6<sup>th</sup> edition, 2013.

**Reference Books:**

1. Mastering C++ by Venugopal K R, Rajkumar Buyya , Tata McGraw Hill, 2<sup>nd</sup> edition, 2013



**B.Sc. (Mathematics, Electronics and Computer Science)**  
**SEMESTER – II**  
**SFC 102: ENVIRONMENTAL SCIENCE**

**No. of hours per week: 03**

**Credits: 02**

**Unit -I**

The multidisciplinary nature of environmental studies – Definition - Scope and Importance, Need for Public awareness. Natural Resources: Classification – Renewable and Non Renewable Resources. Renewable Resources: Forest, Water and Energy Resources Non Renewable Resources: Mineral, Food and Land resources (Uses, reasons for over-utilization and effects)

**Unit -II**

Eco-system: Structure of an Ecosystem, Producers, consumers and de-composers, Structure of Terrestrial Ecosystems (Forest Ecosystem, Grassland Ecosystem, and Desert Ecosystem) and Aquatic Ecosystems (Pond Ecosystem and Ocean Ecosystem). Function of an ecosystem -food chains, food web and ecological pyramids - energy flow in the ecosystem. Environmental Pollution: Causes, effects and control measures of Air, Water, soil pollution, Thermal pollution and nuclear hazards and Municipal solid waste management.

**Unit -III**

Environmental problems: Global Environmental Problems, Green house effect, Ozone layer depletion, acid rains and Climate change. National Environmental Problems: Deforestation – Causes and Effects, Environmental Problems associated with dams, mining and environmental effects.

**Unit -IV**

Social Issues and the Environment: Environmental ethics, Issues and possible solutions. Waste land reclamation, Consumerism and waste products. Environmental Legislation: Environment Protection Act, Air Act, Water Act, Wildlife Protection act and Forest conservation act.

**Unit -V**

Human Population and the Environment: Population growth, variation among nations, Population explosion-Family welfare program. Environment and human health - human rights - value education, HIV/AIDS, Women and Child welfare, Role of information technology in environment and human health.

**Text Books:**

1. Text Book of Environmental studies for Undergraduate courses by Bharucha Erach Published by V.G.C
2. Environmental Science: A Global Concern by William P. Cunningham and Baraba Woodworth Saigo.
3. A text book of Environmental Science by P. C. Joshi
4. A text book of Environmental Science by Arvind Kumar
5. A text book of Environmental Science by S. C. Santra
6. Ecology & Environment by P. D. Sharma

**B.Sc. (Mathematics, Electronics and Computer Science)**

**SEMESTER – II**

**SPH 102: Differential Equations**

**No. of hrs/week: 4**

**Credits: 4**

**Unit-I**

First order exact differential equations. Integrating factors, rules to find an integrating factor. First order higher degree equations solvable for  $x$ ,  $y$ ,  $p$ . Methods for solving higher-order differential equations.

**Unit-II**

Basic theory of linear differential equations - Wronskian theorem and its properties - solving a differential equation by reducing its order, Linear homogenous equations with constant coefficients, linear non-homogenous equations, the method of variation of parameters, The Cauchy-Euler equation, Simultaneous differential equations, total differential equations.

**Unit -III**

Order and degree of partial differential equations, Concept of linear and non-linear partial differential equations, Formation of first order partial differential equations

**Unit -IV**

Linear partial differential equation of first order, Lagrange's method, Charpit's method

**Unit-V**

Classification of second order partial differential equations into elliptic, parabolic and hyperbolic through illustrations only

**Books Recommended**

1. "A Text Book of B.Sc. Mathematics Volume-I" by V.Venkateswara Rao , N Krishna Murthy, B.V.S.S. Sarma and S. Anjaneya Sastry, published by S.Chand& Company Ltd., New Delhi.
2. "Differential Equations" by Shepley L. Ross 3rd Edition, published by John Wiley and Sons, 1984
3. "Elements of Partial Differential Equations" by Ian N Sneddon, International Edition, 1967, published by Dover Publications.

**B.Sc. (Mathematics, Electronics and Computer Science)**  
**SEMESTER – II**  
**SPH 108: ELECTRONIC DEVICES & CIRCUITS**

**No. of hrs/week: 4**

**Credits: 4**

**Unit - I**

**JUNCTION DIODES:**

PN junction diode - P-N junction theory-depletion region, barrier potential, working in forward & reverse bias condition, Junction capacitance, Diode current equation (no derivation), Effect of temperature on reverse saturation current, V-I Characteristics, Zener and Avalanche Break down, Zener diode - V-I characteristics, regulated power supply using Zener diode, Varactor Diode, Tunnel Diode - Principle, Working & Applications.

**Unit - II**

**BIPOLAR JUNCTION TRANSISTORS (BJT):**

PNP and NPN transistors, current components in BJT, BJT static characteristics (Input and Output), Early effect, CB, CE, CC Configurations (Cut-off, Active and saturation regions) Determination of h-parameters from the characteristics, Concept of amplification-voltage and current amplifier. The C.E amplifier - analysis and parameters, Transistor as a switch

**Unit - III**

**FIELD EFFECT Transistors & UJT:**

FET - Construction - Working – Drain & Transfer characteristics -Parameters of FET - FET as an amplifier -MOSFET-Enhancement MOSFET-Depletion MOSFET-Construction & Working- Drain characteristics of MOSFET -Comparison of FET & BJT and JFET & MOSFET.

UJT Construction-working, V-I Characteristics

**Unit - IV**

**PHOTO ELECTRIC DEVICES:**

Structure and operation, characteristics, spectral response and applications of LDR, Photo Voltaic cell, Photo diode, Photo transistor, LED and LCD.

**Unit - V**

**POWER SUPPLIES**

Rectifiers - Half wave, full wave and bridge rectifiers - Efficiency - Ripple factor – Regulation. Types of filter- Choke input ( Inductor) filter –Shunt capacitor filter -L-Section and  $\pi$  section filters - Three terminal fixed voltage I.C regulators (78XX and 79XX) - Principle and working of switch mode power supplies ( SMPS).

**TEXTBOOKS**

1. David A. Bell, "Electronic Devices and Circuits", Fifth edition. Oxford university press
2. A.P Malvino, "Principles of Electronics", TMH, 7th edition
3. T.F. Bogart, Beasley, "Electronic Devices and circuits", Pearson Education, 6th Edition
4. N.N. Bhargava, D.C Kulshreshta, and S.C Gupta, "Basic Electronics and Linear Circuits" TMH
5. T.L.Floyd, "Electronic Devices and circuits", PHI, fifth edition
6. V.K. Metha, "Principle of Electronics", S CHAND & Co., New edition
7. Godse A.P., Bakshi U.A (1st edition), Electronics Devices, Technical Publications rune.

**REFERENCE BOOKS**

1. Sedha R.S., A TextBook of Applied Electronics, S. Chand & Company Ltd.
2. Jacob Millman and Christos C. Halkias (2008) Integrated Electronics, Tara Mcgraw-Hill
3. Unified Electronics (Circuit analysis and electronic devices) by Agarwal-Arora.

**B.Sc. (Mathematics, Electronics and Computer Science)**  
**SEMESTER – II**

**SPH 110: Data Structures and File Processing**

**No. of hrs/week: 4**

**Credits: 4**

**Unit-I**

Fundamental Concepts: Introduction to Data Structures, Types of Data Structures.

Linear Data Structure Using Sequential Organization: Arrays, Arrays as an Abstract Data Type, Memory Representation and Address Calculation, Class Array, Pros and Cons of Arrays. Searching and Sorting: Sequential Search, Binary Search, Types of Sorting, General Sort Concepts, Bubble Sort, Insertion Sort, Selection Sort.

**Unit-II**

Stacks: Concept of Stacks and Queues, Stacks, Stack Abstract Data Type, Representation of Stacks Using Arrays.

Queues: Concept of Queues, Queue Abstract Data Type, Realization of Queues Using Arrays, Circular Queue, De-queue, Priority Queue.

**Unit-III**

Linked Lists: Introduction, Linked List, Realization of Linked Lists, Dynamic Memory Management, linked list Abstract Data Type, Doubly Linked List, Circular Linked List.

Trees: Introduction, Types of Trees, Binary Tree, Binary Tree Abstract Data Type, Realization of a Binary Tree, Binary Tree Traversal.

**Unit-IV**

Hashing: Introduction, Hash Functions, Collision Resolution Strategies, Extendible Hashing, Dictionary.

Indexing and Multi-way Trees: Introduction, Indexing, Types of Search Trees- Multi way Search Tree, B-Tree, and B+ Tree.

**Unit-V**

Files: Introduction, External Storage Devices, File Organization, Files Using C++, Sequential File Organization, Direct Access File Organization, Indexed Sequential File Organization.

**Text Book:**

1. Data Structures Using C++ by Varsha H. Patil, Oxford University Press, 2012.

**Reference Books:**

1. Data Structures and Algorithms in C++ by Adam Drozdek, Cengage Learning, 3rd Edition, 2006.
2. Data Structures and Algorithms in C++ by Brijendra Kumar Joshi, Tata McGraw Hill, 2010.

**B.Sc., (Mathematics, Electronics and Computer Science)**  
**SEMESTER – II**  
**SPH 126: ELECTRONIC DEVICES & CIRCUITS LAB**

**No. of hrs/week: 3**

**Credits: 2**

1. V-I Characteristics of Junction Diode.
2. V-I Characteristics of Zener Diode.
3. Regulated Power Supply using Zener Diode.
4. IC Regulated Power Supply
5. BJT input and output Characteristics (CE Configuration) and determination of h-parameters.
6. Characteristics of UJT.
7. Characteristics of JFET
8. LDR characteristics
9. Characteristics of L and  $\pi$  section filters using full wave rectifier.

**LAB MANUAL**

1. Zbar, Malvino and Miller, Basic Electronics A Text Lab Manual, Tata McGraw Hill.
2. Sugaraj Samuel R., Horsley Solomon, B.E.S. Practicals.

**B.Sc. (Mathematics, Electronics and Computer Science)**

**SEMESTER – II**

**SPH 128: Data Structures and File Processing Lab**

**No. of hrs/week: 3**

**Credits: 2**

1. Write a C++ program to convert a sentence from lower case to upper case, count number of vowels and delete blank spaces.
2. Write a C++ program to implement Stack operations.
3. Write a C++ program to implement queue operations..
4. Write a C++ program to implement the operations in Linked list
5. Write a C++ program to concatenate two files and copy the contents of one file to another file.
6. Write a C++ program for direct access of records in a file.
7. Write a C++ program to implement field organization using length indicator.
8. Write a C++ program for fixed length field organization.
9. Write a C++ program for index access of records in a file.
10. Write a C++ program for accessing records in a file using index (record organization).
11. Write a C++ program to print a line if it contains more than 80 characters.
12. Write a C++ program for reading and writing contents to a file from console.
13. Write a C++ program to reverse the contents of the given file.
14. Write a C++ program to search for a given record using sequential search
15. Write a C++ program to search for a given record using simple Hashing.
16. Write a C++ program to sort records in a file.

**Text Book:**

1. Data Structures Using C++ by Varsha H. Patil, Oxford University Press, 2012.

**Reference Books:**

1. Data Structures and Algorithms in C++ by Adam Drozdek, Cengage Learning, 3rd Edition, 2006.

**B.Sc. (Mathematics, Electronics and Computer Science)**  
**SEMESTER – III**  
**SPH 201: Real Analysis**

**No. of hrs/week: 4**

**Credits: 4**

**Unit-I**

Finite and infinite sets, examples of countable and uncountable sets, Real line, bounded sets, suprema and infima, completeness property of  $\mathbb{R}$ , Archimedean property of  $\mathbb{R}$ , intervals, Concept of cluster points and statement of Bolzano-Weierstrass theorem

**Unit-II**

Real Sequence, Bounded sequence, Cauchy convergence criterion for sequences, Cauchy's theorem on limits, order preservation and squeeze theorem, monotone sequences and their convergence (monotone convergence theorem without proof).

**Unit-III**

Infinite series, Cauchy convergence criterion for series, positive term series, geometric series, comparison test, convergence of p-series

**Unit-IV**

Root test, Ratio test, alternating series, Leibnitz's test (Tests of Convergence without proof). Definition and examples of absolute and conditional convergence

**Unit-V**

Sequences and series of functions, Point wise and uniform convergence, M -test, Statements of the results about uniform convergence and integrability and differentiability of functions, Power series and radius of convergence

**Books Recommended**

1. "Calculus Vol.1: One Variable Calculus, with an Introduction to Linear Algebra" by Tom. M. Apostol, published by John Wiley and Sons (Asia) P. Ltd., 2002.
2. "Introduction to Real Analysis" by Robert. G. Bartle and Donald. R Sherbert, published by John Wiley and Sons (Asia) Ltd., 2000.
3. "Intermediate Real Analysis" by Emanuel Fischer published by Springer Verlag, 1983.
4. "Elementary Analysis: The Theory of Calculus" by Kenneth A. Ross, published by Springer Verlag, 2003.

**B.Sc. (Mathematics, Electronics and Computer Science)**  
**SEMESTER – III**  
**SPH 207: DIGITAL ELECTRONICS**

**No. of hrs/week: 4**

**Credits: 4**

**Unit-I**

**NUMBER SYSTEMS AND CODES**

Decimal, Binary, Octal, Hexa Decimal numbers, conversion from one to another-codes, BCD, excess 3, gray codes conversion from one to another - Error detection codes.

**Unit- II**

**BOOLEAN ALGEBRA AND THEOREMS**

Basic & Universal logic gates - Boolean Identities - Boolean theorems De Morgan's Theorem - sum of products, products of sums expressions, simplification by Karnaugh Map method, simplification based on basic Boolean theorems - don't care conditions.

**Unit- III**

**COMBINATIONAL DIGITAL CIRCUITS**

Arithmetic Building blocks, Half & Full Adders and Half & Full Subtractions, BCD adders - multiplexers, De-multiplexers, encoders, decoders - Characteristics for Digital ICs -RTL, DTL, TTL, ECL CMOS (NAND & NOR Gates).

**Unit- IV**

**SEQUENTIAL DIGITAL CIRCUITS**

Flip-flops, RS, Clocked SR, JK, D, T, Master-Slave Flip flop -Conversion of Flip flops - shift registers - ripple counters - synchronous counters and asynchronous counters (4-bit counter).

**Unit- V**

**MEMORY DEVICES**

ROM Organization - PROM Organization – PLA (Programmable Logic Array) - PAL (Programmable Array Logic) - Realization of functions using PROM

**TEXTBOOKS**

1. G. K. Kharate-Digital electronics-Oxford university press
2. R.P. Jain, "Modern digital Electronics", 3rd Edition, TMH, 2003.
3. Puri, V.K., Digital Electronics, Tata McGraw Hill
4. Marris Mano M., Computer System Architecture, 2nd Edition, Prentice Hall, 1998
5. Malvino and Leach, Digital Principles and applications, McGraw Hill, 1996, IV Edition

**REFERENCE BOOKS**

1. Millman, Micro Electronics, McGraw Hill International Book Company, New Delhi 1990 Edition.
2. Morris Mano M., "Digital Logic and Computer Design" PHI, 2005. 3. Godse A.P., Digital Electronics, Technical Publications.
4. Unified Electronics (Digital Electronics and Microprocessors) by Agarwal- Agarwal



**B.Sc. (Mathematics, Electronics and Computer Science)**

**SEMESTER – III**

**SPH 209: Design and Analysis of Algorithms**

**No. of hrs/week: 4**

**Credits: 4**

**Unit –I**

Introduction: Algorithm Specification, Performance Analysis, Randomized Algorithms- Las Vegas, Monte Carlo Algorithm Definition, R Quick Sort.

Sorting Techniques: Selection Sort, Bubble Sort, Insertion Sort, Heap Sort, Shell Sort, Linear Search

**Unit - II**

Divide and Conquer: General Method, Binary Search, Finding maximum and minimum, Merge Sort, Quick Sort, Strassen's Matrix Multiplication.

Basic Graph Traversal Techniques- Breadth First Search, Depth-First Search.

**Unit- III**

Greedy Method: General Method, Knapsack Problem, Minimum Cost Spanning Trees- Kruskal's Prim Algorithms, Single Source Shortest Paths

**Unit – IV**

Dynamic Programming: General Method, All pairs Shortest Paths, Travelling Salesperson Problem.

Transform and Conquer: Multiplication of Large Integers, Horner's Rule and Binary Exponentiation, Computing the least common multiple, counting paths in a graph, Reduction of Optimization Problem. (Anany Levitin chapter -6)

**Unit – V**

Input Enhancement in String Matching: Horspool Algorithm, Boyer- Moore Algorithm. Limitations of Algorithm Power: Lower-Bound Arguments, Trivial Lower Bounds, Information-Theoretic Arguments, Adversary Arguments, Problem Reduction

Decision Trees: Decision Trees for Sorting, Decision Trees for Searching a sorted Array

P, NP, and NP-Complete Problems: Basic Concepts, P and NP Problems, NP-Complete Problems, Challenges in Numeric Algorithms ( Anany Levitin – 11th chapter)

**Text Books:**

1. Fundamentals of Computer Algorithms – Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, Second Edition, 2008, University Press,
2. Introduction to the Design and Analysis of Algorithms, Anany Levitin, 3rd Edition 2012, Pearson (Unit- IV, V)

**B.Sc. (Mathematics, Electronics and Computer Science)**  
**SEMESTER – III**  
**SPH 227: DIGITAL ELECTRONICS LAB**

**No. of hrs/week: 3**

**Credits: 2**

1. Verification of IC (basic) logic Gates
2. Universality of NAND & NOR Gates.
3. Verification of Boolean laws using NAND Gates (Associative, Commutative & Distributive Laws)
4. Study of RS, D, T and JK Flip-Flops with IC's
5. Half and Full Adders using Simple & NAND Gates.
6. 4-bit binary parallel adder and subtractor IC 7483 using PSPICE simulation
7. Study of 7490 BCD Counter - MOD Counters using PSPICE simulation.
8. BCD to Seven segment decoder 7447/7448 using PSPICE simulation.

**LAB MANUAL**

1. Zbar, Malvino and Miller, Basic Electronics A Text Lab Manual, Tata McGraw Hill.
2. R. Sugaraj Samuel & Horsley Solomon, B.E.S. Practical.

**B.Sc. (Mathematics, Electronics and Computer Science)**

**SEMESTER – III**

**SPH 229: Design and Analysis of Algorithms Lab**

**No. of hrs/week: 3**

**Credits: 2**

1. Write a C++ program to implement Bubble sort.
2. Write a C++ program to implement Insertion Sort.
3. Write a C++ program implement Selection Sort.
4. Write a C++ program to implement Quick Sort.
5. Write a C++ program to implement Merge Sort.
6. Write a C++ program to implement Shell Sort.
7. Write a C++ program to Find Maximum and Minimum using Divide and Conquer.
8. Write a C++ program to implement Strassen's Matrix Multiplication.
9. Write a C++ program to implement Breadth First Search, Depth First Search.
10. Write a C++ program on Knapsack Problem.
11. Write a C++ program to find Minimum Cost Spanning Tree.
12. Write a C++ program to find All pairs Shortest Path.
13. Write a C++ program to find Single Source Shortest Path.
14. Write a C++ program to evaluate an expression using Horner's Rule.
15. Write a C++ program to perform string matching – Horspool or Boyer- Moore algorithm.

**Text Books:**

1. Fundamentals of Computer Algorithms – Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, Second Edition, 2008, University Press,
2. Introduction to the Design and Analysis of Algorithms, Anany Levitin, 3rd Edition 2012, Pearson (Unit- IV,V)

**B.Sc. (Mathematics, Electronics and Computer Science)**  
**SEMESTER – III**  
**SSE 275: Logic and Sets**

**No. of hrs/week: 2**

**Credits: 2**

**Unit-I**

Introduction, propositions, truth table, negation, conjunction and disjunction, Implications, bi conditional propositions, converse, contra positive and inverse propositions and precedence of logical operators

**Unit-II**

Propositional equivalence: Logical equivalences.

**Unit-III**

Predicates and quantifiers: Introduction, Quantifiers, Binding variables and Negations.

**Unit-IV**

Sets, subsets, set operations, the laws of set theory and Venn diagrams, Examples of finite and infinite sets, Finite sets and counting principle, Empty set, properties of empty set, Standard set operations. Classes of sets, Power set of a set.

Difference and Symmetric difference of two sets, Set identities, generalized union and intersections

**Unit-V**

Relation: Product set, Composition of relations, Types of relations, Partitions, Equivalence Relations with example of congruence modulo relation.

**Book Recommended**

1. “Discrete and Combinatorial Mathematics” by Ralph P. Grimaldi and B.V. Ramana published by Pearson Education, 1998.
2. “Naïve Set Theory” by Paul R. Halmos published by Springer, 1974.
3. “Theory of Sets” by E. Kamke published by Dover Publications, 1950.

**B.Sc. (Mathematics, Electronics and Computer Science)**  
**SEMESTER – III**  
**SSE 277: Computer Graphics**

**No. of hrs/week: 2**

**Credits: 2**

**Unit- I**

Development of Computer Graphics, Raster Scan and Random Scan graphics storages, display processor and character generators, color display techniques

**Unit- II**

Cathode Ray Tube (CRT) basics, Refresh Display, Direct View Storage Tube (DVST, Interactive input/output devices)

**Unit-III**

Points, lines and curves, Scan conversion, Line-Drawing Algorithms, Circle and Ellipse Generation

**Unit- IV**

Conic-section generation, polygon filling, anti aliasing

**Unit- V**

Two-dimensional viewing, Coordinate systems, linear transformations, line and polygon clipping algorithms

**Text Book:**

1. Computer Graphics by Amarendra N Sinha, Arun D Udai, Tata McGraw Hill, 2008.

**Reference Books:**

1. Computer Graphics by D. Hearn and M.P. Baker, Prentice–Hall of India, 2nd Ed., 2004.
2. Procedural Elements in Computer Graphics by D.F. Rogers, TMH, 2nd Ed., 2001.

**B.Sc. (Mathematics, Electronics and Computer Science)**  
**SEMESTER – III**  
**SSE 279: ELECTRICAL CIRCUITS AND NETWORK SKILLS - I**

**No. of hrs/week: 2**

**Credits: 2**

**Unit - I**

Basic Electricity Principles: Voltage, Current, Resistance, and Power. Ohm's law, Series, parallel, and series-parallel combinations, AC Electricity and DC Electricity, Familiarization with multimeter, voltmeter and ammeter

**Unit – II**

Understanding Electrical Circuits: Main electric circuit elements and their combination Rules to analyze DC sourced electrical circuits. Current and voltage drop across the DC circuit elements.

**Unit – III**

Current Sources: Single-phase and three-phase alternating current sources. Rules to analyze AC sourced electrical circuits. Real, imaginary and complex power components of AC source, Power factor, Saving energy and money

**Unit – IV**

Electrical Drawing and Symbols: Drawing symbols. Blueprints, Reading Schematics, Ladder diagrams, Electrical Schematics, Power circuits, Control circuits, Reading of circuit schematics. Tracking the connections of elements and identify current flow and voltage drop.

**Unit - V**

Generators and Transformers: DC Power sources. AC/DC generators, Inductance, capacitance, and impedance, Operation of transformers

**Reference Books:**

1. A text book in Electrical Technology- B L Theraja -S Chand & Co.
2. A text book of Electrical Technology -A K Theraja
3. Performance and design of AC machines -M G Say ELBS Edition.

**B.Sc. (Mathematics, Electronics and Computer Science)**  
**SEMESTER – IV**  
**SPH 202: Algebra**

**No. of hrs/week: 4**

**Credits: 4**

**Unit– I GROUPS:**

Binary Operation – Algebraic structure – semi group - monoid – Group definition and elementary properties Finite and Infinite groups – examples – order of a group, Composition tables with examples.

**Unit– II**

**SUBGROUPS:**

Complex Definition – Multiplication of two complexes Inverse of a complex-Subgroup definition – examples-criterion for a complex to be a subgroup, Criterion for the product of two subgroups to be a subgroup-union and Intersection of subgroups

**Co-sets and Lagrange's Theorem:**

Co-sets Definition – properties of Co-sets–Index of subgroups of a finite groups–Lagrange's Theorem

**Unit –III**

**NORMAL SUB-GROUPS:**

Definition of normal subgroup – proper and improper normal subgroup–Hamilton group – criterion for a subgroup to be a normal subgroup – intersection of two normal subgroups – Sub group of index 2 is a normal sub group – simple group – quotient group – criteria for the existence of a quotient group.

**Unit – IV**

**HOMOMORPHISM:**

Definition of homomorphism – Image of homomorphism elementary properties of homomorphism – Isomorphism – automorphism definitions and elementary properties–kernel of a homomorphism – fundamental theorem on Homomorphism and applications

**Unit –V**

**PERMUTATIONS AND CYCLIC GROUPS:**

Definition of permutation – permutation multiplication – Inverse of a permutation – cyclic permutations – transposition – even and odd permutations – Cayley's theorem

**Cyclic Groups:**

Definition of cyclic group – elementary properties – classification of cyclic groups

**Books Recommended**

1. “A Text Book of B.Sc. Mathematics Volume-I” by V.Venkateswara Rao , N Krishna Murthy, B.V.S.S. Sarma and S. Anjaneya Sastry, published by S.Chand& Company Ltd., New Delhi.
2. “A First Course in Abstract Algebra” by John B. Fraleigh published by Narosa Publishing house.
3. “Modern Algebra” by M.L. Khanna published by Jai Prakash Nath.
4. “A First Course in Abstract Algebra” by John B. Fraleigh ,7th Edition published by Pearson, 2002.
5. “Algebra” by Micheal Artin, 2nd Edition, published by Pearson, 2011.

**B.Sc. (Mathematics, Electronics and Computer Science)**  
**SEMESTER – IV**  
**SPH 208: ANALOG & DIGITAL IC APPLICATIONS**

**No. of hrs/week: 4**

**Credits: 4**

**Unit- I**

**OPERATIONAL AMPLIFIERS**

Basic differential amplifier-Op-Amp supply voltages - IC identification - Internal blocks of Op-Amp, Op-Amp parameters-offset voltages and currents-CMRR-Slew rate, Virtual ground, Op-Amp as a voltage amplifier - Inverting amplifier - non-inverting amplifier - Voltage follower.

**IC 555 timer** - pin functions - internal architecture

**Unit - II**

**OP-AMP CIRCUITS**

Summing amplifier - Differential amplifier - Op-amp frequency response - Comparator-Integrator - Differentiator - Triangular Wave generators - Square Wave generators - Active filter (Basics) – Low pass filter - High pass filter - Band pass filter, IC 555 applications - Astable, Mono stable and Schmitt trigger.

**Unit- III**

**COMBINATIONAL & SEQUENTIAL CIRCUITS**

Design of code converter: BCD to 7 segments, Binary/ BCD to Gray, Gray to Binary / BCD, Design of counters using state machine: asynchronous and synchronous counters, Modulo-n counter, presettable binary up/down counter, Design of Universal shift register.

**Unit - IV**

**DATA CONVERTERS**

Key Features, Advantages and applications of Digital to Analog Converters: Weighted resistive network and R-2R ladder type. Key Features, Advantages and Applications Specific selection of Analog to Digital Converters: Staircase, Ramp Type, Single Slope and dual slope, Successive approximation and Flash type.

**Unit - V**

**DIGITAL SYSTEM INTERFACING AND APPLICATIONS**

Digital system interfacing of LEDs and Multi digit Seven segment LED display Driver. Interface considerations for ADC / DAC with digital systems.

**Applications of counters:** Digital clock, Auto-parking system, Applications of shift registers: Time delay generator, parallel to serial converter, serial to parallel converter, UART and serial Key board encoder.



## **TEXT BOOKS DIGITAL**

1. G.K. Kharate - Digital electronics-Oxford university press
2. Floyd Thomas L Digital Fundamentals Pearson Education
3. Raj Kamal Digital System Principles and Design Wheeler
4. Moriss Mano Digital Circuit Design PHP.
5. Malvino Leach Digital Principles and Applications TMH.
6. Strangio Digital Electronics TMH
7. Floyd, Jain Digital Fundamentals TMH
8. Anand Kumar A. Switching Theory and Logic design PHI
9. Unified electronics (Digital electronics and Microprocessors) by Agarwal- Agarwal
10. Unified electronics (Analog circuits and communication) by Agarwal- Agarwal

## **ANALOG**

1. Microelectronic circuits by Sedra&Smith-6th'edition-Oxford
2. Electronic Devices and Circuits David A. Bell, Fifth edition, Oxford University press
3. Jacob Millman and Christos C. Halkias, Integrated Electronics, McGraw Hill
4. D. Roy Choudary, Shail Jain, Linear integrated Circuits, New Age International Pvt. Ltd., 2000.
5. Operational Amplifiers and Linear ICs-by David A. Bell 3rdedition, Oxford university press.
6. Sedha, R.S. A TextBook of Applied Electronics, S. Chand & company Ltd.
7. Ramakant A. Gayakwad, OP-AMP and Linear ICs, 4th Edition, Prentice Hall/Pearson Education, L 994
8. G.K.Mithal, Basic Electronic Devices and circuits, 2nd Edition, G.K. Publishers Pvt. Ltd.,

## **REFERENCE BOOKS:**

1. Allen Mottershead, Electronic Devices and Circuits-an Introduction - Prentice Hall
2. Mithal G.K., Electronic Devices and Circuits, Khanna Publishers
3. Donald L. Schilling, Charles Belove, Discrete and Integrated Electronic Circuits, McGraw Hill
4. Jacob Millman, Micro Electronics, McGraw Hill

**B.Sc. (Mathematics, Electronics and Computer Science)**  
**SEMESTER – IV**  
**SPH 210: Operating Systems**

**No. of hrs/week: 4**

**Credits: 4**

**Unit-I**

**Introduction:** What Operating Systems do? Computer-System Architecture, Operating-System Structure, Operating-System Operations, Distributed Systems, Special-purpose Systems, Computing Environments.

**System Structures:** Operating-System Services, User Operating-System Interface, System Calls,  
Types of System Calls, System Programs, Operating- System Structure.

**Unit-II**

**Process Management:** Process Concept, Process Scheduling, Operations on Processes.  
Process Scheduling: Basic Concepts, Scheduling Criteria, Scheduling algorithms.

**Unit-III**

**Process Coordination: Synchronization:** Background, The Critical-Section Problem.  
Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention.

**Unit-IV**

**Memory Management**

Memory-Strategies: Background, Swapping, Contiguous memory Allocation, Paging, Segmentation.

**Virtual-Memory Management:** Background, Demand Paging, Copy-on-write, page Replacement.

**Unit-V**

**File Management:** File Systems: File Concept, Access Methods, Directory and Disk Structure.  
Secondary-Storage Structure: Overview of Mass-Storage Structure, Disk Structure, Disk Scheduling.

**Text Book:**

Operating System Concepts by Abraham Silberschatz, PeterB, Galvin, Greg Gagne, 8th Edition, 2011

**Reference Books:**

1. A.S. Tanenbaum, Modern Operating Systems, 3rd Ed., Prentice-Hall of India, 2008
2. Operating Systems: Internals and Design Principles By William Stallings, Prentice Hall Of India, 5<sup>th</sup> Edition, 2006.
3. Operating Systems: A Modern Approach by Gary Nutt, Addison Wesley, 3rd Edition, 2004.
4. Operating Systems: A Concept Based Approach by D.M. Dhamdhare, Tata McGraw- Hill, 2nd Edition, 2007.

**B.Sc. (Mathematics, Electronics and Computer Science)**  
**SEMESTER – IV**  
**SPH 226: ANALOG & DIGITAL IC APPLICATIONS LAB**

**No. of hrs/week: 3**

**Credits: 2**

1. OP-AMP -Inverting and Non-inverting amplifiers.
2. OP-AMP - Sine Wave Generator (Wien bridge oscillator)
3. Binary to Grey and Grey to binary code converter
4. Design of 4-bit priority encoder
5. OP-AMP - Square wave generator using PSPICE simulation
6. Schmitt Trigger using IC 555 timer using PSPICE simulation
7. Study of pre-settable binary up/down counter using PSPICE simulation.
8. Design and verification of 4-bit ripple counter. Using PSPICE simulation.
9. OP-AMP integrator and differentiator.
10. Astable Multi vibrator –determination of frequency (using IC-555)

**LAB MANUAL**

1. Zbar, Malvino and Miller, Basic Electronics A Text Lab Manual, Tata McGraw Hill.
2. Sugaraj Samuel R., Horsley Solomon, B.E.S. Practicals.

**B.Sc. (Mathematics, Electronics and Computer Science)**  
**SEMESTER – IV**  
**SPH 228: Operating Systems Lab**

**No. of hrs/week: 3**

**Credits: 2**

1. Usage of following commands: ls, pwd, tty, cat, who, who am I, rm, mkdir, rmdir, touch, cd.
2. Usage of following commands: cal, cat(append), cat(concatenate), mv, cp, man, date.
3. Usage of following commands: chmod, grep, tput (clear, highlight), bc.
4. Write a shell script to check if the number entered at the command line is prime or not.
5. Write a shell script to modify “cal” command to display calendars of the specified months.
6. Write a shell script to accept a login name. If not a valid login name display message – “Entered login name is invalid”.
7. Write a shell script to display date in the MM/DD/YY format.
8. Write a shell script to display on the screen sorted output of “who” command along with the total number of users.
9. Write a shell script to display the multiplication table of any number.
10. Write a shell script to find the sum of digits of a given number.
11. Write a shell script to find the factorial of a given number.
12. Write a shell script to check whether the number is Armstrong or not.

**Text Books:**

1. UNIX Shell Programming by Stephan G Kochan, Patrick Wood, Sams, 3rd Edition, 2003.
2. Introduction to UNIX and Shell Programming by M.G. Venkatesh Murthy, Pearson, 1st Edition, 2005.
3. UNIX Concepts and Applications by Sumitabha Das, 4th Edition, TMH, 2006.

**B.Sc. (Mathematics, Electronics and Computer Science)**  
**SEMESTER – IV**  
**SSE 276: Vector Calculus**

**No. of hrs/week: 2**

**Credits: 2**

**Unit-I**

**Limits of vector point functions:**

Scalar valued and vector valued point functions, limits, Directional derivatives along co- ordinate axis, along any line

**Unit –II**

**Vector differentiation:**

Vector Differentiation, Ordinary derivatives of vectors, Differentiability, Tangent vector of a curve, Unit tangent vector, Principle normal, curvature, Bi normal, Torsion, Frenet -Serret formulae and applications

**Unit-III**

**Vector identities**

Gradient, Divergence, Cur, their geometrical interpretations and Successive operations

**Unit-IV**

Line, surface and Volume integrals: Line Integral, Surface Integral, Volume Integral

**Unit-V**

Stokes theorem, Gauss divergence theorem and applications, Greens Theorem and applications

**TEXT BOOK:**

1. “A Text Book of Vector Calculus” by Shanti Narayan published by S. Chand & Company Pvt. Ltd., New Delhi.
2. “Vector Calculus” by R. Gupta published by Laxmi Publications.
3. “Calculus and Analytic Geometry” by George B. Thomas, Jr. and Ross L. Finney, published by Pearson Education, 2007, 9th edition.
4. “Calculus Single Variable” by Howard Anton, Irl Bivens and Stephen Davis, published by John Wiley and Sons, Inc., 2002.
5. “Vector Calculus” by Paul C. Matthews published by Springer Verlag London Limited, 1998.

**B.Sc. (Mathematics, Electronics and Computer Science)**  
**SEMESTER – IV**  
**SSE 278: Number Theory**

**No. of hrs/week: 2**

**Credits: 2**

**Unit-I**

Division algorithm, Lamé's theorem, linear Diophantine equation, fundamental theorem of arithmetic

**Unit-II**

Prime counting function, statement of prime number theorem

**Unit-III**

Goldbach conjecture, binary and decimal representation of integers, linear congruences, complete set of residues.

**Unit-IV**

Number theoretic functions, sum and number of divisors, totally multiplicative functions, definition and properties of the Dirichlet product

**Unit-V**

The Möbius inversion formula, the greatest integer function, Euler's phi-function

**Books Recommended:**

1. "Elementary Number Theory" by David M. Burton published by Tata McGraw- Hill, 2007 6th edition.
2. "Applications of Abstract Algebra with MAPLE" by Richard E. Klima, Neil Sigmon and Ernest Stitzinger published by CRC Press, Boca Raton, 2000.
3. "Beginning Number Theory" by Neville Robbins published by Jones and Bartlett publications, 2nd edition.

**B.Sc. (Mathematics, Electronics and Computer Science)**  
**SEMESTER – IV**  
**SSE 280: E-Commerce**

**No. of hrs/week: 2**

**Credits: 2**

Introduction to E-commerce- E-Commerce Business models and Concepts-Technology Infrastructure for E-commerce, The Internet and World Wide Web, E-Commerce Infrastructure, Building an E-Commerce website, Security and Payment

Business Concepts and Social Issues-E-Commerce marketing Concepts, E-Commerce Marketing Communications, Ethical ,Social and Political Issues in E-commerce

E-Commerce in Action – Online Retailing and Services, Online Content and Media, Social Networks, Auctions and Portals

**Text Books:**

1. Kenneth C. Laudon, Carol Guercio Traverso, E-Commerce: Business, Technology, Society, 4Th Edition, Pearson, 2008
2. P.T. Joseph, E-Commerce: An Indian Perspective, Prentice-Hall of India, 2007.
3. E. M. Awad, Electronic Commerce from Vision to Fulfillment, 3rd Ed., Prentice Hall of India, 2006
4. Scott Bonneau, Tammy Kohl, Jeni Tennison, Jon Duckett and Kevin Williams, XML Design Handbook, Wrox Press Ltd., 2003
5. Michael Chesher, Ricky Kaura, and Peter Linton, Electronic Business and Commerce, Springer, 2003.
6. W.J. Pardi, XML in Action: Learn to Quickly Create Dynamic, Data-driven Sites with the Web's Hottest New Technology, Prentice Hall of India, 1999.
7. P. Weill and M.R. Vitale, Place to Space: Migrating to e-Business Models, Harvard Business School Press, 2001.
8. D. Whiteley, E-commerce: Strategy, Technologies and Applications, Tata McGraw- Hill Edition, 2001.
9. M. Fitzgerald, Building B2B Applications with XML: A Resource Guide, John Wiley and Sons, Inc., 2001.

**B.Sc. (Mathematics, Electronics and Computer Science)**  
**SEMESTER – IV**

**SSE 282: BASIC INSTRUMENTATION SKILLS - I**

**No. of hrs/week: 2**

**Credits: 2**

**Unit - I**

Basic of Measurement: Instruments accuracy, precision, sensitivity, resolution range etc. Errors in measurements and loading effects, Multimeter: Principles of measurement of dc voltage and dc current, ac voltage, ac current and resistance, Specifications of a multimeter and their significance.

**Unit - II**

Electronic Voltmeter: Advantage over conventional multimeter for voltage measurement with respect to input impedance and sensitivity. Principles of voltage, measurement (block diagram only). Specifications of an electronic Voltmeter/Multimeter and their significance

**Unit - III**

AC milli voltmeter: Type of AC milli voltmeters: Amplifier-rectifier, and rectifier-amplifier. Block diagram ac milli voltmeter, specifications and their significance.

**Unit - IV**

Cathode Ray Oscilloscope: Block diagram of basic CRO. Construction of CRT, Electron gun, electrostatic focusing and acceleration (Explanation only–no mathematical treatment), brief discussion on screen phosphor, visual persistence & chemical composition, Time base operation, synchronization. Front panel controls. Specifications of a CRO and their significance

**Unit - V**

Use of CRO: For the measurement of voltage (dc and ac frequency, time period. Special features of dual trace, introduction to digital oscilloscope, probes, Digital storage Oscilloscope: Block diagram and principle of working.

**The test of lab skills will be of the following test items:**

1. Use of an oscilloscope.
2. CRO as a versatile measuring device.
3. Circuit tracing of Laboratory electronic equipment,
5. Circuit tracing of Laboratory electronic equipment,

**Laboratory Exercises:**

1. To observe the loading effect of a multimeter while measuring voltage across a low resistance and high resistance.
2. To observe the limitations of a multimeter for measuring high frequency voltage and currents.
3. Measurement of voltage, frequency, time period and phase angle using CRO.
4. Measurement of time period, frequency, average period using universal counter/ frequency counter.
5. Measurement of rise, fall and delay times using a CRO.
6. Measurement of distortion of a RF signal generator using distortion factor meter.



**Open Ended Experiments:**

1. Using a Dual Trace Oscilloscope

**Reference Books:**

1. A text book in Electrical Technology -B L Theraja -S Chand and Co.
2. Performance and design of AC machines -M G Say ELBS Edition
3. Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.
4. Logic circuit design, Shimon P. Vingron, 2012, Springer.
5. Digital Electronics, Subrata Ghoshal, 2012, Cengage Learning.
6. Electronic Devices and circuits, S. Salivahanan & N. S. Kumar, 3<sup>rd</sup> Ed., 2012, Tata McGraw Hill
7. Electronic circuits: Handbook of design and applications, U. Tietze, Ch. Schenk, 2008, Springer
8. Electronic Devices, 7/e Thomas L. Floyd, 2008, Pearson India

**B.Sc. (Mathematics, Electronics and Computer Science)**  
**SEMESTER – V**  
**SPH 361: MATRICES**

**No. of hrs/week: 4**

**Credits: 4**

**Unit-I**

R, R<sup>2</sup>, R<sup>3</sup> as vector spaces over R. Standard basis for each of them. Concept of Linear Independence and examples of different bases, Subspaces of R<sup>2</sup> and R<sup>3</sup>

**Unit-II**

Translation, Dilation, Rotation, Reflection in a point, line and plane, Matrix form of basic geometric transformations, Interpretation of Eigen values and Eigen vectors for such transformations and Eigen spaces as invariant subspaces

**Unit-III**

Types of matrices and Rank of a matrix, Invariance of rank under elementary transformations, Reduction to normal form, Solutions of linear homogeneous and non-homogeneous equations with number of equations and unknowns up to four

**Unit-IV**

Matrices in diagonal form, Reduction to diagonal form up to matrices of order 3, Computation of matrix inverses using elementary row operations, Rank of matrix

**Unit-V**

Solutions of a system of linear equations using matrices Illustrative examples of above concepts from Geometry, Physics, Chemistry, Combinatorics and Statistics

**Books Recommended**

1. "Introduction to Algebra" by A.I. Kostrikin, published by Springer Verlag, 1984.
2. "Linear Algebra" by Stephen H. Friedberg, Arnold J. Insel, Lawrence E. Spence, Prentice Hall of India Pvt. Ltd., New Delhi, 2004.
3. "Schaum's Outline of Matrix Operations: Theory and Problems of Matrix Operations" by Richard Bronson, published by Tata McGraw Hill, 1989.

**B.Sc. (Mathematics, Electronics and Computer Science)**  
**SEMESTER – V**  
**SPH 363: STATICS & DYNAMICS**

**No. of hrs/week: 4**

**Credits: 4**

**Unit-I**

Conditions of equilibrium of a particle and of coplanar forces acting on a rigid Body

**Unit-II**

Laws of friction, Problems of equilibrium under forces including friction

**Unit-III**

Centre of gravity, Work and potential energy. Velocity and acceleration of a particle along a curve: radial and transverse components (plane curve)

**Unit-IV**

Tangential and normal components (space curve)

**Unit-V**

Newton's Laws of motion, Simple harmonic motion, Simple Pendulum, Projectile Motion

**Books Recommended**

1. "Statics: A Text book for the Use of the Higher Divisions in Schools and for First Year Students at the Universities" by Arthur Stanley Ramsey published by CBS Publishers and Distributors (Indian Reprint), 1998.
2. "Statics and Dynamics with Background Mathematics" by Adrian Roberts published by Cambridge University Press, 2003.

**B.Sc. (Mathematics, Electronics and Computer Science)**  
**SEMESTER – V**  
**SPH 365: LINEAR ALGEBRA**

**No. of hrs/week: 4**

**Credits: 4**

**Unit – I**

**Matrices I**

Rank of a matrix, Elementary transformations, normal form, Echelon form, Rank of product of matrices, System of homogeneous equations, Linear equations, Null space and nullity of matrices

**Unit – II**

**Matrices II**

Condition for consistency, Crammer's rule, Characteristic values and characteristic vectors, Cayley- Hamilton theorem, Inverse of a matrix using Cayley- Hamilton theorem, Minimal polynomial of a matrix.

**Unit – III**

**Linear Algebra -I**

Vector spaces, General properties of vector spaces, Vector subspaces, Algebra of subspaces, linear combination of vectors, Linear span, linear sum of two subspaces, Linear independence and dependence of vectors, Basis of vector space, Finite dimensional vector spaces, Dimension of a vector space, Dimension of a subspace.

**Unit – IV**

**Linear Algebra - II**

Linear transformations, linear operators, Range and null space of linear transformation, Rank and nullity of linear transformations, Linear transformations as vectors, Product of linear transformations, Invertible linear transformation

**Unit – V**

**Inner product spaces**

Inner product spaces, Euclidean and unitary spaces, Norm or length of a vector, Schwartz inequality, Orthogonality, Orthonormal set, complete orthonormal set, Gram - Schmidt orthogonalisation process.

**Books Recommended**

1. "A Text Book of B.Sc. Mathematics Volume-III" by V. Venkateswara Rao, N Krishna Murthy, B.V.S.S. Sarma and S. Anjaneya Sastry, published by S. Chand & Company Ltd., New Delhi.
2. "Linear Algebra" by A.R. Vasishtha and J.N. Sharma published by Krishna Prakashan Media (P) Ltd.
3. "Linear Algebra" by Kenneth Hoffman and Ray Alden Kunze published by Pearson Education (low priced edition), New Delhi.
4. "Linear Algebra" by Stephen H. Friedberg, Arnold J. Insel, Lawrence E. Spence, published by Prentice Hall of India Pvt. Ltd., 4th edition New Delhi, 2007.
5. "Rings and Linear Algebra" by Pundir, Pundir published by Pragathi Prakashan

**B.Sc. (Mathematics, Electronics and Computer Science)**  
**SEMESTER – V**

**SPH 371: Microprocessors (Intel 8085)**

**No. of hrs/week: 4**

**Credits: 4**

**Unit- I**

**ARCHITECTURE OF 8085 MICROPROCESSOR**

Functional block diagram of Intel 8085-Register structure-multiplexing & De-multiplexing of address / data bus - Control Signal Generation and status signals - 8085 pin-out diagram & functions - Interrupts - Priority Concept

INSTRUCTION SET OF 8085 -Instruction set classification - addressing modes

**Unit - II**

MEMORY-Instruction cycle - machine cycle - T-state -Timing diagrams for Opcode Fetch Cycle Memory Read, Memory Write, I/O Read, I/O Write, - Functional explanation for RAM, ROM, EPROM, EEPROM.

**Unit- III**

PROGRAMMING 8085- addition & subtraction(16-bit), multiplication, division, largest, smallest, block data transfer (all 8-bit data), Binary to BCD, BCD to Binary, Binary to ASCII, ASCII to Binary, BCD to ASCII, ASCII to BCD (all 8-bit data) - Stack & Subroutines Concept - time delay using single and double register & calculations – Debugging program.

**Unit- IV**

INTERFACING MEMORY - 2K X 8, 4K X 8 ROM, RAM to 8085, interfacing an I/O port in Memory Mapped I/O and I/O Mapped I/O - Difference between I/O mapped and Memory Mapped I/O.

**Unit- V**

MICROPROCESSOR APPLICATIONS - Programmable peripheral devices (8255, 8253) - Pin functions, Different Modes & Block Diagram - Keyboard and Display Interface 8279 (Architecture) - Simple temperature controller- Simple traffic light controller-stepper motor control interface.

**TEXTBOOKS**

1. Ramesh S. Gaonkar, Microprocessor Architecture, Programming and Application with the8085-PenramLnternational Publishing, Mumbai.
2. Ram, Fundamentals of microprocessors and microcomputers - Dhanpat Rai Publications, New Delhi
3. Microprocessors & Microcontrollers by N .Senthilkumar, M. Saravanan & S. Jeevananthan, 1st edition, Oxford press (Helpful for interfacing applications)
4. Microprocessors & Microcontrollers by B. P. Singh, Galgotia publications Pvt. Ltd.

**REFERENCE BOOKS**

1. Mathur A.P., Introduction to Microprocessors. (3rd edition, Tata McGraw, New Delhi
2. Leventhal L.A., Microprocessor Organisation and Architecture, Prentice Hall India.
3. Microprocessor lab premier by K. A. Krishnamurthy

**B.Sc. (Mathematics, Electronics and Computer Science)**  
**SEMESTER – V**  
**SPH 373: ELECTRONIC COMMUNICATIONS**

**No. of hrs/week: 4**

**Credits: 4**

**Unit- I**

**BASICS OF COMMUNICATION SYSTEMS AND NOISE**

Block diagram of communication system. Types of Electronic Communication systems: Simplex, Duplex. Analog / Digital Signals, Noise in communication: External noise- Atmospheric, space noise, man-made noise, internal noise- Thermal, Shot noise Definitions and relationship between Bit rate, Band rate, Bandwidth and signal to Noise Ratio.

**Unit - II**

**AMPLITUDE MODULATION**

Need for modulation. Amplitude modulation, Modulation index, frequency spectrum, generation of AM (balanced modulator,), Amplitude Demodulation (diode detector), other forms of AM: Double side band suppressed carrier, DSBSC generation (Balanced modulator), Single side band suppressed carrier, SSBSC generation (Filter method, phase cancellation method, third method), SSB detection, Introduction to other forms of AM (Pilot carrier modulation, Vestigial side band modulation).

**Unit- III**

**ANGLE MODULATION**

Frequency and phase modulation, modulation index and frequency spectrum, equivalence between FM and PM, Generation of FM (Direct and indirect methods), FM detector (Slope detector, balanced slope detector, PLL). Comparison between AM, FM and PM.

**Unit- IV**

**TRANSMITTERS & RECEIVERS**

**Transmitters:** Communication channels for AM and FM broadcast, AM transmitter: Low level and high level modulation, FM transmitter.

**Receivers:** Receiver parameters, sensitivity, selectivity and fidelity, Super Heterodyne receiver, AM receivers, FM receivers, Frequency division multiplexing.

**Unit - V**

**DIGITAL COMMUNICATION**

Sampling theorem, Pulse Amplitude Modulation (PAM), Time Division Multiplexing (TDM), Pulse Width Modulation (PWM) and Pulse Position Modulation (PPM), Pulse Code Modulation, Differential Pulse Code Modulation, Delta Modulation, Adaptive Delta Modulation

## **TEXTBOOKS**

1. H. Taub and D. Schilling, Principles of Communication Systems, Tata McGraw-Hill (1999)
2. W. Tomasi, Electronic Communication Systems: Fundamental through Advanced, Pearson Education (2004)
3. L. E. Frenzel, Communication Electronics, Principle and Applications, Tata McGraw-Hill (2002)
4. L. W. Couch II, Digital and Analog Communication Systems, Pearson Education (2005)
5. H. P. Hsu, Analog and Digital Communication, Tata McGraw-Hill (2006)

## **REFERENCE BOOKS**

1. S. Haykin, Communication Systems, Wiley India (2006)
2. G. Kennedy and B. Davis, Electronic communication systems, Tata McGraw Hill (1999)
3. R. P. Singh and S. D. Sapre, Communication Systems: Analog and Digital, Tata McGraw Hill (2007)
4. L. E. Frenzel, Communication electronics: Principles and applications. Tata McGraw Hill (2002)
5. T.G. Thomas and S. Chandra Sekhar, Communication theory, Tata McGraw Hill (2006)

**B.Sc. (Mathematics, Electronics and Computer Science)**  
**SEMESTER – V**  
**SPH 375: CONSUMER ELECTRONICS**

**No. of hrs/week: 4**

**Credits: 4**

**Unit-I**

**MICROWAVE OVENS** - Microwaves (Range used in Microwave Ovens) - Microwave oven block diagram -LCD timer with alarm - Single-Chip Controllers - Types of Microwave oven - Wiring and Safety instructions -Care and Cleaning.

**Unit-II**

**WASHING MACHINES** - Electronic controller for washing machines - Washing machine hardware and software- Types of washing machines - Fuzzy logic washing machines Features of washing machines.

**Unit-III**

**AIR CONDITIONERS AND REFRIGERATORS** - Air Conditioning - Components of air conditioning systems - All water air conditioning systems - All air conditioning systems - Unitary and central air conditioning systems -Split air conditioners

**Unit-IV**

**HOME/OFFICE DIGITAL DEVICES** - Facsimile machine - Xerographic copier - Calculators - Structure of a calculator - Internal Organization of a calculator - Servicing electronic calculators - Digital clocks - Block diagram of a digital clock.

**Unit-V**

**DIGITAL ACCESS DEVICES** - Digital computer -Internet access - Online ticket reservation - Functions and networks - Barcode Scanner and decoder - Electronic Fund Transfer - Automated Teller Machines (ATMs) - Set-Top boxes - Digital cable TV - Video on demand.

**TEXT BOOKS**

1. S.P. Bali, Consumer Electronics - Pearson Education, New Delhi, 2005.
2. R. G. Gupta Audio and Video systems Tata McGraw Hill (2004)



**B.Sc. (Mathematics, Electronics and Computer Science)**  
**SEMESTER – V**  
**SPH 391: Data Mining**

**No. of hrs/week: 4**

**Credits: 4**

**Unit-I**

Introduction- Basic Data Mining Tasks, Classification, Regression, Time Series Analysis, Prediction, Clustering, Summarization, Association Rules, Data Mining Versus Knowledge Discovery in Databases

**Unit -II**

The Development of Data Mining: Data Mining Issues, Social Implication of Data Mining, Data Mining from a Database, Perspective Data Mining Techniques, Statistical Perspectives of Data Mining, Similarity Measures, Decision Trees.

**Unit-III**

Classification: Issues in Classification, Statistical Based Algorithms, and Distance Based Algorithms, Decision Tree Based Algorithms.

**Unit-IV**

Clustering- Introduction, Similarity and Distance Measures, Outliers, Hierarchical Algorithms, Partitional Algorithms, Minimum Spanning Tree, Squared Error Clustering Algorithm, K-Means Clustering, Nearest Neighboring Algorithm.

**Unit-V**

Association Rule: Introduction, Large Item Sets, Basic Algorithms, Apriori Algorithm, Sampling Algorithm, Partitioning, Parallel & distributed algorithms, Data parallelism, Task parallelism.

**Text Books:**

1. Data Mining- Introductory and Advanced topics by Margaret H. Dunham, Pearson Education, sixth impression, 2009.
2. Data mining Techniques by Arun K. Pujari, University Press, 2001.
3. Introduction to Data mining with Case Studies by G.K.Gupta, PHI India, 2006.

**B.Sc. (Mathematics, Electronics and Computer Science)**  
**SEMESTER – V**  
**SPH 393: CRYPTOGRAPHY**

**No. of hrs/week: 4**

**Credits: 4**

**Unit - I**

**Introduction :** Security Goals- Confidentiality, Integrity, Availability, Attacks- Attacks Threatening Confidentiality, Attacks Threatening Integrity, Attacks Threatening Availability, Passive Versus Active Attacks, Services And Mechanism - Security Services, Security Mechanisms, Relation Between Services And Mechanisms, Techniques- Cryptography, Steganography .

**Unit - II**

**Traditional Symmetric Key Ciphers:** Introduction- Kerckhoff's Principle, Cryptanalysis, Categories Of Traditional Ciphers, Substitution Ciphers- Mono Alphabetic Ciphers, Poly Alphabetic Ciphers, Transposition Ciphers- Keyless Transposition Ciphers, Keyed Transposition Ciphers, Combining Two Approaches.

**Unit-III**

**Data Encryption Techniques:** Algorithms for Block and Stream Ciphers, Symmetric Key Encryption, Data Encryption Standard (DES), Advanced Encryption Standard.

**Unit-IV**

**Algorithms for Public Key Encryption:** RSA, DH Key Exchange, Digital Signatures.

**Unit –V**

Message Authentication and Hash Functions: SHA, WHIRLPOOL

**Text Books:**

1. Cryptography and Network Security by Behrouz A. Forouzan, TMH, Special Indian Edition, 2007 (Unit I and Unit II)
  2. Cryptography and Network Security Principles and Practices by William Stallings, PHI, 4th Edition, 2006. (Unit III, Unit IV and Unit V)
- Reference Books:
1. Cryptography and Network Security by William Stallings, Pearson Education, 4th Edition, 2006
  2. Cryptography and Network Security by Atul Kahate, Tata McGraw-Hill, New Delhi, 2003

**B.Sc. (Mathematics, Electronics and Computer Science)**  
**SEMESTER – V**  
**SPH 327: MICROPROCESSORS LAB**

**No. of hrs/week: 3**

**Credits: 2**

**Programs using Intel 8085**

1. Addition & Subtraction (8 & 16-bits)
2. Multiplication & Division (8 - bit)
3. Largest & Smallest number in the given array.
4. Ascending & Descending order.
5. Binary to ASCII & ASCII to Binary, BCD to ASCII & ASCII to BCD.
6. Block Transfer of Data.
7. Waveform generation using DAC interface.
8. Stepper motor interface.

**LAB MANUAL**

1. Zbar, Malvino and Miller, Basic Electronics, A Text Lab Manual, Tata McGraw Hill.
2. Sagaraj Samuel R., Horsley Solomon, B.E.S. Practicals.
3. Vijayendran V., Fundamentals of microprocessor-8085, S. Viswanathan publishers Chennai.

**B.Sc. (Mathematics, Electronics and Computer Science)**  
**SEMESTER – V**  
**SPH 329: ELECTRONIC COMMUNICATIONS LAB**

**No. of hrs/week: 3**

**Credits: 2**

1. Study of Amplitude Modulation and Demodulation.
2. Study of Frequency Modulation and Demodulation
3. Study of Pulse Amplitude Modulation
4. Study of Pulse Width Modulation
5. Study of Pulse Position Modulation
6. Study of Pulse Code Modulation
7. Simulation of AM modulation and Demodulation using software.
8. Simulation of FM modulation and Demodulation using software.

**B.Sc. (Mathematics, Electronics and Computer Science)**  
**SEMESTER – V**  
**SPH343: Data Mining Lab**

**No. of hrs/week: 3**

**Credits: 2**

1. Introduction to the Weka machine learning toolkit
2. Performing data preprocessing for data mining in Weka
3. Classification using the Weka toolkit
4. Performing clustering in Weka
5. Association rule analysis in Weka
6. Data mining Case Study

**B.Sc. (Mathematics, Electronics and Computer Science)**  
**SEMESTER – V**  
**SPH 345: CRYPTOGRAPHY LAB**

**No. of hrs/week: 3**

**Credits: 2**

- 1) Study of various cryptographic techniques.
- 2) Problems on Substitution techniques.
- 3) Problems on Transposition techniques.
- 4) Introduction to UNIX, Vi Editor.
- 5) Usage of the following commands in UNIX: ls, pwd, tty, cat, who, who am I, rm, mkdir, rmdir, cd.
- 6) Usage of following commands in Unix: cal, cat (append), cat (concatenate), mv, cp, man, date.
- 7) Implement Substitution technique
- 8) Implement Transposition technique.
- 9) Study of Open SSL.
- 10) Implement Symmetric key Algorithm – DES using open SSL.
- 11) Implement Asymmetric key Algorithm – RSA using open SSL.
- 12) Implement Hash Algorithm – SHA using open SSL.

**Text Books:**

1. Cryptography and Network Security by Behrouz A. Forouzan, TMH, Special Indian Edition, 2007.
2. Unix Concepts and Applications by Sumitabha Das, 4th Edition, TMH, 2006.

**Reference Books:**

1. Introduction to Unix and Shell Programming by M.G. Venkatesh Murthy, Pearson, 1st Edition, 2005.

**B.Sc. (Mathematics, Electronics and Computer Science)**  
**SEMESTER – V**  
**SSE 375: Theory of Equations**

**No. of hrs/week: 2**

**Credits: 2**

**Unit-I**

General properties of polynomials, Graphical representation of polynomials, maximum and minimum values of polynomials

**Unit-II**

Quadratic Equations, General properties of equations, Descarte's rule of signs positive and negative rule,

**Unit-III**

Relation between the roots and the coefficients of equations, Symmetric functions, Applications symmetric function of the roots

**Unit-IV**

Transformation of equations, solutions of reciprocal and binomial equations

**Unit-V**

Algebraic solutions of the cubic and biquadratic, Properties of the derived functions

**Books Recommended**

1. W.S. Burnside and A.W. Panton, "The Theory of Equations", Dublin University Press, 1954
2. C. C. MacDuffee, Theory of Equations, John Wiley & Sons Inc., 1954

**B.Sc. (Mathematics, Electronics and Computer Science)**  
**SEMESTER – V**  
**SSE 377: Probability and Statistics**

**No. of hrs/week: 2**

**Credits: 2**

**Unit- I**

Meaning and Scope of the Statistics Introduction, Frequency distribution, Graphic representation of a frequency distribution, measures of central tendency, measures of dispersion, coefficients of dispersion, moments, skewness, kurtosis

**Unit-II**

Introduction, meaning of correlation, Karl Pearson's coefficient of correlation, rank correlation, Linear regression, Curve fitting, fitting of straight line, fitting of second degree parabola.

**Unit-III**

Probability : Introduction, definition, axiomatic approach to probability, probability-mathematical notation, probability function, law of addition of probabilities, multiplication law of probability and conditional law of probability, independent events, Bayes' theorem.

**Unit-IV**

Random variables and distribution functions: One and two dimensional random variables (discrete and continuous).

**Unit-V**

Probability distribution: Discrete distributions Binomial, Poisson distributions and their properties and applications.

**Prescribed Text Book:**

1. "Fundamentals of Mathematical Statistics" by S.C. Gupta and V.K. Kapoor published by Sultan Chand & Sons
2. "Statistical Methods Combined Edition (Volumes I & II)" by N G Das published by McGraw Hill, 2008, 1st edition.
3. "Statistical Methods: Concepts, Application and Computation" by Y.P. Aggarwal published by Sterling Publishers, 1998.
4. "Introduction to Mathematical Statistics" by Robert V. Hogg, Joseph W. McKean, Allen Thornton Craig published by Pearson Education, Asia, 2007.
5. "Mathematical Statistics with Applications" by Irwin Miller and Marylees Miller published by Pearson Education, Asia, 2006, 7th edition.
6. "Introduction to Probability Models" by Sheldon M. Ross published by Academic Press, Indian Reprint, 2007, 9th edition.



**B.Sc. (Mathematics, Electronics and Computer Science)**  
**SEMESTER – V**  
**SSE 379: Combinatorial Optimization**

**No. of hrs/week: 2**

**Credits: 2**

**Introduction:** Optimization problems, neighbourhoods, local and global optima, convex sets and functions, simplex method, degeneracy; duality and dual simplex algorithm, computational considerations for the simplex and dual simplex algorithms-Dantzig-Wolfe algorithms.  
Integer Linear Programming: Cutting plane algorithms, branch and bound technique and approximation algorithms for travelling salesman problem.

**Text Books:**

1. Combinatorial Optimization: Algorithms and Complexity by C.H. Papadimitriou and K. Steiglitz, Prentice-Hall of India, 2006
2. Optimization by K. Lange, Springer, 2004.
3. Linear Programming and Network Flows by Mokhtar S. Bazaraa, John J. Jarvis and Hanif D. Sherali, John Wiley and Sons, 2004.
4. Operations Research: An Introduction by H.A. Taha, 8th Ed., Prentice Hall, 2006.

**B.Sc. (Mathematics, Electronics and Computer Science)**  
**SEMESTER – V**  
**SSE 381: Electrical Circuits and Network Skills - II**

**No. of hrs/week: 2**

**Credits: 2**

**Unit – I**

Electric Motors: Single-phase, three-phase & DC motors. Basic design, Interfacing DC or AC sources to control heaters & motors, Speed & power of ac motor.

**Unit – II**

Solid-State Devices: Resistors, inductors and capacitors. Diode and rectifiers, Components in Series or in shunt, Response of inductors and capacitors with DC or AC sources

**Unit – III**

Electrical Protection: Relays. Fuses and disconnect switches. Circuit breakers, Overload devices, Ground-fault protection, Grounding and isolating, Phase reversal. Surge protection, Interfacing DC or AC sources to control elements (relay protection device)

**Unit - IV**

Electrical Wiring: Different types of conductors and cables. Basics of wiring-Star and delta connection, Voltage drop and losses across cables and conductors, Instruments to measure current, voltage

**Unit - V**

Power in DC and AC circuits, Insulation, Solid and stranded cable. Conduit, Cable trays, Splices: wire nuts, crimps, terminal blocks, split bolts, and solder. Preparation of extension board

**Reference Books:**

1. A text book in Electrical Technology- B L Theraja -S Chand & Co.
2. A text book of Electrical Technology -A K Theraja
3. Performance and design of AC machines -M G Say ELBS Ed.,

**B.Sc. (Mathematics, Electronics and Computer Science)**  
**SEMESTER – VI**  
**SPH 362: NUMERICAL METHODS**

**No. of hrs/week: 4**

**Credits: 4**

**Unit- I**

Errors in Numerical computations: Errors and their Accuracy, Mathematical Preliminaries, Errors and their Analysis, Absolute, Relative and Percentage Errors, A general error formula, Error in a series approximation.

**Unit- II**

Solution of Algebraic and Transcendental Equations: The bisection method, the iteration method, the method of false position, Newton Raphson method, generalized

**Unit- III**

System of Simultaneous Equations: Direct methods, Gauss Elimination Method, LU decomposition,  
Iterative Methods: Gauss-Jacobi, Gauss - Siedel and SOR iterative methods.

**Unit- IV**

Lagrange and Newton Divided difference interpolation: linear and higher order, Finite difference Operators: Newton forward and backward Interpolations, Central Difference Interpolation Formulae, Gauss's central difference formulae, Stirling's central difference formula, Bessel's Formula

**Unit- V**

Numerical differentiation: forward difference, backward difference and central Differences.  
Integration: Trapezoidal rule, Simpson's 1/3 rule, Simpson's 3/8 rule

**Recommended Books**

1. "Introductory Methods of Numerical Analysis" by S.S. Sastry published by Prentice Hall of India Pvt. Ltd., New Delhi. (Latest Edition)
2. "Higher Engineering Mathematics" by B.S. Grewal published by Khanna Publishers
3. "Mathematical Methods" by G. Shanker Rao published by I.K. International Publishing House Pvt. Ltd.
4. "Finite Differences and Numerical Analysis" by H.C Saxena published by S. Chand and Company, Pvt. Ltd., New Delhi.

**B.Sc. (Mathematics, Electronics and Computer Science)**  
**SEMESTER – VI**  
**SPH 364: Complex Analysis**

**No. of hrs/week: 4**

**Credits: 4**

**Unit-I**

Limits, Limits involving the point at infinity, continuity, Properties of complex numbers, regions in the complex plane, functions of complex variable, mappings  
Derivatives, differentiation formulas, Cauchy-Riemann equations, sufficient conditions for differentiability

**Unit-II**

Analytic functions, examples of analytic functions, exponential function, Logarithmic function, trigonometric function, derivatives of functions.

**Unit-III**

Definite integrals of functions, Contours, Contour integrals and its examples, upper bounds for moduli of contour integrals

**Unit-IV**

Cauchy- Goursat theorem, Cauchy integral formula, Liouville's theorem and the fundamental theorem of algebra, Convergence of sequences and series, Taylor series and its examples

**Unit-V**

Laurent series and its examples, absolute and uniform convergence of power series

**Books Recommended**

1. "Complex Analysis for Mathematics and Engineering" by John H. Mathews and Russell W. Howell published by Jones and Bartlett publishers, 5th edition.
2. "Complex Variables and Applications" by James Ward Brown and Ruel Vance Churchill published by McGraw-Hill Higher Education, 8th edition.
3. "Complex Analysis" by Joseph Bak and Donald J. Newman published by Springer- Verlag New York, Inc., New York, 1997, 2nd edition.

**B.Sc. (Mathematics, Electronics and Computer Science)**  
**SEMESTER – VI**

**SPH 366: Linear Programming**

**No. of hrs/week: 4**

**Credits: 4**

**Unit-I**

Linear Programming Problems, Graphical Approach for Solving some Linear Programs, Convex Sets, Supporting and Separating Hyper planes.

**Unit-II**

Theory of simplex method, optimality and unboundedness, the simplex algorithm, simplex method in tableau format

**Unit-III**

Introduction to artificial variables, two-phase method, Big-M method and their comparison

**Unit-IV**

Duality, formulation of the dual problem, primal- dual relationships, economic interpretation of the dual

**Unit-V**

Sensitivity analysis

**Recommended Books**

1. "Operations Research" by S.D. Sharma published by Kedarnath and Ramnath Co.
2. "Linear Programming and Network Flows" by Mokhtar S. Bazaraa, John J. Jarvis and Hanif D. Sherali published by John Wiley and Sons, India, 2004, 2nd edition.
3. "Introduction to Operations Research" by Frederick S. Hiller and Gerald J. Lieberman published by Tata McGraw Hill, Singapore, 2004, 8th edition.
4. "Operations Research: An Introduction" by Hamdy A. Taha published by Prentice- Hall India, 2006, 8th edition.

**B.Sc. (Mathematics, Electronics and Computer Science)**  
**SEMESTER – VI**  
**SPH 372: Microcontrollers & Applications**

**No. of hrs/week: 4**

**Credits: 4**

**Unit- I**

**8051 ARCHITECTURE** - Introduction to Microcontroller - Comparison of Microcontroller & Microprocessor-8051 Microcontroller - Block diagram - I/O pins, ports and circuits - External memory - Counter and Timers -Serial data I/O - Interrupts.

**Unit- II**

**8051 INSTRUCTION SET** - Classification of instruction set-Addressing Modes – Logical operation: Byte level - Bit level- Rotate and Swap operation.

**ARITHMETIC OPERATIONS-** Instructions affecting flags - Incrementing and Decrementing - Addition -Subtraction - Multiplication and Division - Example Programs.

**Unit- III**

**JUMP AND CALL INSTRUCTION-** Introduction - The Jump and Call program Range- Jumps: Bit - Byte Unconditional: Calls and Subroutine -Interrupts and Returns – Example programs. Time delay generation and calculation, Timer/Counter programming, accessing a specified port terminal and generating a rectangular waveform

**Unit- IV**

**INTERFACING** - Keyboards - Displays - Stepper motor - ADC & DAC

**Unit- V**

**INTRODUCTION TO OTHER MICROCONTROLLERS** - 6509 - PIC controllers - 6575 series - Introduction to Embedded Systems

**TEXTBOOKS**

1. Kenneth 1. Ayala, "The 8051 Microcontroller, Architecture, Program and Application" Pen ram International.
2. Muhammed Ali Mazidi, Janice GillispieMazidi "The 8051 Microcontroller and Embedded Systems" -Low Price Edition.
3. Microprocessors & Microcontrollers by N. Senthikumar, M. Saravanan & S. Jeevananthan, 1st edition. Oxford press (Helpful for interfacing applications)
4. Microcontrollers: Theory and Applications by Ajay V. Deshmuk Tata McGraw-Hill Education, 2005.

**REFERENCE BOOKS**

1. Programming and customizing the 8051 Microcontroller- by MykePredko-TMH
2. Design with Microcontrollers by- J.B.PeatmaTMH
3. Microcontroller Hand Book, INTEL, 2008.
4. Microprocessor, Microcontroller & Applications by D.A Godse A.P Godse Technical Publications 2008.

**B.Sc. (Mathematics, Electronics and Computer Science)**  
**SEMESTER – VI**  
**SPH 374: VLSI DESIGN**

**No. of hrs/week: 4**

**Credits: 4**

**Unit- I**

**CMOS TECHNOLOGY**

A brief History-MOS transistor, Ideal I-V characteristics, C-V characteristics, Non ideal I-V effects, DC transfer characteristics - CMOS technologies, Layout design Rules, CMOS process enhancements, Technology related CAD issues, Manufacturing issues.

**Unit- II**

**CIRCUIT CHARACTERIZATION AND SIMULATION**

Delay estimation, Logical effect and Transistor sizing, Power dissipation, Interconnect, Design margin, Reliability, Scaling- SPICE tutorial, Device models, Device characterization, Circuit characterization, Interconnect simulation.

**Unit- III**

**COMBINATIONAL AND SEQUENTIAL CIRCUIT DESIGN**

Circuit families -Low power logic design - comparison of circuit families - Sequencing static circuits, circuit design of latches and flip flops, Static sequencing element methodology-sequencing dynamic circuits – synchronizers.

**Unit- IV**

**CMOS TESTING**

Need for testing- Testers, Test fixtures and test programs- Logic verification- Silicon debug principles- Manufacturing test - Design for testability - Boundary scan

**Unit- V**

**SPECIFICATION USING VERILOG HDL**

Basic concepts- identifiers- gate primitives, gate delays, operators, timing controls, procedural assignments conditional statements, Data flow and RTL, structural gate level switch level modeling, Design hierarchies, Behavioral and RTL modeling, Test Benches, Structural gate level description of decoder, equality detector, comparator, priority encoder, half adder, full adder, Ripple carry adder, D latch and D flip flop.

**TEXTBOOKS**

1. Weste and Harris: CMOS VLSI DESIGN (Third edition) Pearson Education
2. Uyemura J.P: Introduction to VLSI circuits and systems, Wiley

**REFERENCE BOOKS**

1. D.A Pucknell & K. Eshraghian Basic VLSI Design, Third edition, PHI
2. Wayne Wolf, Modern VLSI design, Pearson Education
3. M.J.S. Smith: Application specific integrated circuits, Pearson Education
4. J.Bhasker: Verilog HDL primer, BS publication
5. Ciletti Advanced Digital Design with the Verilog HDL, Prentice Hall of India

**B.Sc. (Mathematics, Electronics and Computer Science)**  
**SEMESTER – VI**  
**SPH 392: Information Security**

**No. of hrs/week: 4**

**Credits: 4**

**Unit- I**

**Introduction to Information Security:** Introduction, the History of Information Security, What Is Security? Critical Characteristics of Information, NSTISSC Security Model, Components of an Information System, Securing Components, Balancing Information Security and Access

**Unit– II**

**Approaches to Information Security Implementation:** The Systems Development Life Cycle, the Security Systems Development Life Cycle, Security Professionals and the Organization, Is It an Art Or A Science? Information Security Terminology  
The Need For Security: Introduction, Business Needs First, Threats, Attacks.

**Unit– III**

**Overview of Security:** Protection versus Security, Aspects of Security – Data Integrity, Data Availability, Privacy, Security Problems, User Authentication.  
Security Threats: Program Threats, Worms, Viruses, Trojan horse, Trap Door, Stack and Buffer Overflow.  
System Threats: Intruders, Communication Threats-Tapping and Piracy.

**Unit-IV**

**Cryptography:** Classical Encryption Techniques, Substitution and Transposition Techniques.  
Symmetric Key Algorithms: Data Encryption Standard, Advanced Encryption Standards.

**Unit-V**

**Public Key Encryption:** RSA, Diffie Hellman Key Exchange, ECC Cryptography, Digital Signatures.  
**Message Authentication:** MAC, Hash Functions. Message Digests, SHA, WHIRLPOOL.

**Text Books:**

1. Principles of Information Security by Michael E. Whitman and Herbert J. Mattord, Thomas India Edition, 2011.
2. Cryptography and Network Security Principles and Practices by William Stallings Prentice-Hall of India, 4th Ed, 2006.

**Reference Books:**

1. Computer Security: Art and Science, Mathew Bishop, Addison-Wesley, 2003.
2. Computer Security Principles and Practice by William Stallings, Lawrie Brown, 2/E, Pearson, 2012.



**B.Sc. (Mathematics, Electronics and Computer Science)**  
**SEMESTER – VI**  
**SPH394 Database Applications**

**No. of hrs/week: 4**

**Credits: 4**

**Unit- I**

**Introduction:** Database-Systems Applications, Purpose of Database Systems, View of Data, Database Languages, Relational Databases, Database Design, Data Storage and Querying, Transaction Management, Database Architecture.

**Unit - II**

**Database Design and E-R Model:** Overview, Entity-Relationship Model, Constraints, Removing Redundant Attributes in Entity Sets, Entity Relationship Diagrams, Reduction to Relational Schemas, Entity-Relationship Design Issues, Extended E-R Features, Other Aspects of Data Design. Introduction to Relational Model: Structure of Relational Databases, Database Schema, Keys, Schema Diagrams, Relational Operations.

**Unit -III**

**SQL:** Data Definition, Basic Structure of SQL Queries, Additional Basic Operations, Set Operations, Null Values, Aggregate Functions, Nested Sub queries, Modification of the Database. Intermediate SQL: Join Expressions, Views, Transactions, Integrity Constraints, SQL Data Types and Schemas, Authorization.

**Unit – IV**

**Advanced SQL:** Functions and Procedures, Triggers, Advanced Aggregate Features. Query **Processing:** Steps In Query Processing, Measures Of Query Cost, Selection Operation – Basic Algorithm, Selection Using Indices, Selections Involving Comparisons, Implementation of Complex Selections, Sorting, Join Operation – Nested Loop Join, Block Nested Loop Join, Evaluation of Expressions.

**Unit – V**

**Application Design and Development:** Application Programs and User Interfaces, Web Fundamentals, Servlets and JSP, Application Architecture, Rapid Application Development, Application Security, Encryption and its applications.

**Text Book:**

1. Database System Concepts, Sixth Edition by Avi Silberschatz, Henry F. Korth ,S. Sudarshan Tata McGraw-Hill,2011.

**References:**

1. SQL, PL/SQL- The Programming Language of Oracle By Ivan Bayross , BPB, 4th Edition, 2010.
2. Fundamentals of Database Systems by Ramez Elmasri, Shamkant B Navathe, 7th Edition, Pearson, 2015.

**B.Sc. (Mathematics, Electronics and Computer Science)**  
**SEMESTER – VI**  
**SPH 396: Computer Networks**

**No. of hrs/week: 4**

**Credits: 4**

**Unit – I**

**Connecting Devices:** Passive Hubs, Repeaters, Active Hubs, Bridges, Two-Layer Switches, Routers, Three-Layer Switches, Gateway, Backbone Networks – Bus Backbone, Star Backbone, Connecting Remote LANs, Virtual LANs : Membership, Configuration, Communication Between Switches, IEEE Standard, Advantages.

**Unit – II**

**Digital Transmission:** Transmission Modes - Parallel Transmission, Serial Transmission. Multiplexing: Frequency Division Multiplexing, Wavelength Division Multiplexing, Synchronous Time Division Multiplexing, Statistical Time Division Multiplexing

**Unit – III**

**Network Layer:** Logical Addressing – IPv4 Addresses: Address Space, Notations, Classful Addressing, Classless Addressing, Network Address Translation. IPv6 Addresses: Structure, Address Space.

**Internet Protocol:** Internetworking, Need for Network Layer, Internet as a Datagram Network, Internet as a Connectionless Network. IPv4: Datagram, Fragmentation, Checksum, Options.

**Unit – IV**

**Transport Layer:** Process-to-Process Delivery - Client/Server Paradigm, Multiplexing and Demultiplexing, Connectionless versus Connection Oriented Service, Reliable Versus Unreliable, Three protocols.

**User Datagram Protocol:** Well-Known Ports for UDP, User Datagram, Checksum, UDP Operation, Use of UDP.

**Unit – V**

**Congestion Control and Quality of Service:** Data Traffic -Traffic Descriptor, Traffic Profiles.

**Congestion:** Network Performance, Congestion Control - Open Loop Congestion Control, Closed Loop Congestion Control.

**Application Layer:** Domain Name System - Name Space - Flat Name Space, Hierarchical Name Space. Domain Name Space - Label, Domain Name, Domain

**Distribution of Name Space:** Hierarchy of Name Servers, Zone, Root Server, Primary and Secondary Servers.

**Text Book:**

Data Communication and Networking by Behrouz A Forouzan, Tata McGraw Hill, 4th Edition, 2006.

**Reference Books:**

1. Data and Computer Communications by William Stallings, Pearson, 9th Edition, 2013.
2. Computer Networks by Andrew S. Tanenbaum, Prentice Hall, 5th Edition, 2013.

**B.Sc. (Mathematics, Electronics and Computer Science)**  
**SEMESTER – VI**  
**SPH 328: Microcontrollers & Applications Lab**

**No. of hrs/week: 3**

**Credits: 2**

1. Multiplication of two numbers using MUL Command (later using counter method for repeated addition)
2. Division of two numbers using DIV command (later using counter method for repeated subtraction)
3. Pick Largest & smallest number among a given set of numbers
4. Interface a DAC & Generate a stair case wave form with step duration and no. of steps as variables.
5. Interface a stepper motor and rotate Clockwise or anti clockwise through given angle step.
6. Using Keil software, write a program to pick the smallest among a given set of numbers.
7. Using Keil software, write a program to pick the largest among a given set of numbers.
8. Using Keil software, write a program to generate a rectangular wave form at a specified port terminal.

**B.Sc. (Mathematics, Electronics and Computer Science)**  
**SEMESTER – VI**  
**SPH 330: VLSI DESIGN LAB**

**No. of hrs/week: 3**

**Credits: 2**

1. Study of Simulation using tools
2. Design Entry and Simulation of Combinational Logic Circuits
  - a) Basic logic gates
  - b) Half adder and full adder
  - c) Half Subtractor and full sub tractor
  - d) 8 bit adder
3. Design Entry and Simulation of Combinational Logic Circuits
  - a) 4 bit multiplier
  - b) Encoder and Decoder
  - c) Address Decoder
  - d) Multiplexer
4. Design Entry and Simulation of Sequential Logic Circuits
  - a) Flip-Flops b) Counter
5. Study of Synthesis tools
6. Place and Route and Back annotation for FPGAs
7. Schematic Entry and SPICE Simulation
  - a) CMOS Inverter
  - b) Universal Gate
  - c) Differential Amplifier
8. Layout of a CMOS Inverter

**B.Sc. (Mathematics, Electronics and Computer Science)**  
**SEMESTER – VI**  
**SPH 346: Database Applications Lab**

**No. of hrs/week: 3**

**Credits: 2**

1. Perform Table Creation using SQL.
2. Perform Insertion, Deletion, Updation using SQL.
3. Perform Table Creation using Constraints Specification.
4. Perform Simple SQL Queries.
5. Perform Simple Queries using Logical operators.
6. Perform Simple queries using Date functions.
7. Perform Simple queries using String Functions.
8. Perform Simple PL/SQL program
9. Perform PL/SQL programs using if, for, while.
10. Perform Grant, Revoke privileges.
11. Perform Programs on Exception Handling.
12. Create Database- define Procedures, Functions, and Triggers

**Text Books:**

1. SQL, PL/SQL- The Programming Language Of Oracle By Ivan Bayross , BPB, 4th Edition, 2010.
2. Oracle Database 11g- The Complete Reference by Kevin Loney, TMH, Indian Edition, 2008.

**B.Sc. (Mathematics, Electronics and Computer Science)**

**SEMESTER – VI**

**SPH 348: Computer Networks Lab**

**No. of hrs/week: 3**

**Credits: 2**

- 1) Study of Network Devices in detail.
- 2) Study of different types of Network Cables and practically implement the cross-wired cable and straight cabling.
- 3) Study of Network IP.
- 4) Study of Basic Network Commands and Network Configuration commands.
- 5) Network Sharing.
- 6) Connect Two Computers (One to One).
- 7) Connect Computers in a LAN.
- 8) Configuring a Switch.
- 9) Client – Server configuration.
- 10) Study of Network tools.

**B.Sc. (Mathematics, Electronics and Computer Science)**  
**SEMESTER – VI**  
**SSE 372: Basic Instrumentation Skills – II**

**No. of hrs/week: 2**

**Credits: 2**

**Unit - I**

Signal Generators and Analysis Instruments: Block diagram, explanation and specifications of low frequency signal generators. Pulse generator, and function generator. Brief idea for testing, specifications, Distortion factor meter, wave analysis

**Unit - II**

Impedance Bridges: Block diagram of bridge, working principles of basic balancing type) RLC bridge, Specifications of RLC bridge

**Unit - III**

Q-Meters: Block diagram & working principles of a Q-Meter, Digital LCR bridges.

**Unit - IV**

Digital Instruments: Principle and working of digital meters. Comparison of analog & digital instruments, Characteristics of a digital meter, working principles of digital voltmeter

**Unit - V**

Digital Multimeter: Block diagram and working of a digital multimeter working principle of time interval, frequency and period measurement using universal counter/ frequency counter, time-base stability, accuracy and resolution.

**The test of lab skills will be of the following test items:**

1. Use of Digital multimeter/VTVM for measuring voltages
2. Winding a coil / transformer.
3. Study the layout of receiver circuit.
4. Trouble shooting a circuit
5. Balancing of bridges

**Laboratory Exercises:**

1. To observe the loading effect of a multimeter while measuring voltage across a low resistance and high resistance.
2. To observe the limitations of a multimeter for measuring high frequency voltage and currents.
3. To measure Q of a coil and its dependence on frequency, using a Q-meter.
4. Measurement of distortion of a RF signal generator using distortion factor meter.
5. Measurement of R, L and C using a LCR bridge/ universal bridge.

**Open Ended Experiments:**

1. Converting the range of a given measuring instrument (voltmeter, ammeter)

**Reference Books:**

1. A text book in Electrical Technology -B L Theraja -S Chand and Co.
2. Performance and design of AC machines -M G Say ELBS Edn.
3. Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.
4. Logic circuit design, Shimon P. Vingron, 2012, Springer.
5. Digital Electronics, Subrata Ghoshal, 2012, Cengage Learning.
6. Electronic Devices and circuits, S. Salivahanan & N.S. Kumar, 3<sup>rd</sup> Ed., 2012, Tata McGraw Hill.
7. Electronic circuits: Handbook of design and applications, U. Tietze, Ch. Schenk, 2008, Springer
8. Electronic Devices, 7/e Thomas L. Floyd, 2008, Pearson India



**B.Sc. (Mathematics, Electronics and Computer Science)**  
**SEMESTER – VI**  
**SSE 378: Graph Theory**

**No. of hrs/week: 2**

**Credits: 2**

**Unit-I**

Definition, examples and basic properties of graphs, pseudographs

**Unit-II**

Complete graphs, bi-partite graphs, isomorphism of graphs

**Unit-III**

Paths and circuits Eulerian circuits, Hamiltonian cycles, the adjacency matrix

**Unit-IV**

Weighted graph, Spanning trees, Kruskal's algorithm, travelling salesman's problem

**Unit-V**

Shortest path algorithms: Dijkstra's algorithm, Floyd-Warshall algorithm.

**Books Recommended:**

1. "Discrete Mathematics with Graph Theory" by Edgar G. Goodaire and Michael M. Parmenter published by Pearson Education (Singapore) P. Ltd., Indian Reprint, 2003, 2nd edition.
2. "Applied Abstract Algebra" by Rudolf Lidl and Gunter Pilz published by Springer (SIE), Indian reprint, 2004, 2nd edition .

**B.Sc. (Mathematics, Electronics and Computer Science)**  
**SEMESTER – VI**  
**SSE 380: Concepts of Ethical Hacking**

**No. of hrs/week: 2**

**Credits: 2**

Ethical Hacking overview - Hacking Laws - Footprinting - Google Hacking – Scanning – Enumeration -System Hacking - Trojans and Backdoors -Viruses and Worms - Sniffers - Social Engineering -Denial of Service - Buffer Overflows -Web Servers and Applications - Hacking Wireless Networks - Cryptography - Hacking with Linux - IDS, Firewalls, Honeypots - Penetration Testing.

**Text Books:**

1. Hands-On Ethical Hacking and Network Defense – By Michael T. Simpson, Kent Backman, James Corley, Cengage Learning, 2010.
2. Official Certified Ethical Hacker Review Guide – By Steven DeFino, Barry Kaufman, Nick Valenteen, Cengage Learning, 2009.
3. The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy By Patrick Engebretson, Second Edition 2013.