

**FACULTY OF ENGINEERING**  
**Scheme of Instruction & Examination**  
(AICTE Model Curriculum for the Academic Year 2019-2020)

and

**Syllabi**

**B.E. III and IV Semester**

of

**Four Year Degree Programme**

in

**Information Technology**

(With effect from the academic year 2019– 2020)  
(As approved in the faculty meeting held on 25-06-2019)



Issued by

**Dean, Faculty of Engineering**  
**Osmania University, Hyderabad – 500 007**  
**2019**

**SCHEME OF INSTRUCTION & EXAMINATION  
B.E. (Information Technology) III – SEMESTER**

S. No.	Course Code	Course Title	Scheme of Instruction				Scheme of Examination			Credits
			L	T	P/D	Contact Hrs/Wk	CIE	SEE	Duration in Hrs	
<b>Theory Courses</b>										
1	MC111PO	Indian Constitution	2	-	-	2	30	70	3	-
2	HS201EG	Effective Technical Communication in English	3	-	-	3	30	70	3	3
3	HS202CM	Finance and Accounting	3	-	-	3	30	70	3	3
4	BS207MT	Mathematics- III (Probability & Statistics)	3	-	-	3	30	70	3	3
5	ES214EC	Basic Electronics	3	-	-	3	30	70	3	3
6	ES216EC	Digital Electronics	3	-	-	3	30	70	3	3
6	PC221IT	Data Structures	3	-	-	3	30	70	3	3
7	PC222IT	Mathematical Foundations of Information Technology	3	-	-	3	30	70	3	3
<b>Practical/ Laboratory Courses</b>										
8	ES251EC	Basic Electronics Lab	-	-	2	2	25	50	3	1
9	PC252IT	Data Structures Lab	-	-	2	2	25	50	3	1
10	PC253IT	IT Workshop Lab	-	-	2	2	25	50	3	1
			<b>23</b>	<b>-</b>	<b>06</b>	<b>29</b>	<b>285</b>	<b>640</b>		<b>24</b>

HS: Humanities and Social Sciences      BS: Basic Science      ES: Engineering Science  
 MC: Mandatory Course                      PC: Professional Core  
 L: Lecture      T: Tutorial                      P: Practical                      D: Drawing  
 CIE: Continuous Internal Evaluation      SEE: Semester End Evaluation (Univ. Exam)  
 PO: Political Science, EG: English, CM: Commerce, MT: Mathematics,  
 EC: Electronics and Communication Engineering, IT: Information Technology

**Note:**

- Each contact hour is a clock hour
- The duration of the practical class is two hours, however it can be extended wherever necessary, to enable the student to complete the experiment.
- All the mentioned **Mandatory Courses** should be offered either in I–Semester or II–Semester only **from the academic year 2019-2020**.
- For those of the students admitted during the academic year 2018-2019, since the Mandatory Courses were not offered during the I–Semester or II–Semester, they should be offered either in III–Semester or IV–Semester of the **academic year 2019-2020**.

Course Code	Course Title					Core/Elective	
<b>MC111PO</b>	<b>Indian Constitution</b>					<b>Mandatory</b>	
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	2	-	-	-	30	70	-

#### Course Objectives

- To create awareness among students about the Indian Constitution.
- To acquaint the working conditions of union, state, local levels, their powers and functions.
- To create consciousness in the students on democratic values and principles articulated in the constitution.
- To expose the students on the relations between federal and provincial units.
- To divulge the students about the statutory institutions.

#### Course Outcomes

After completing this course, the student will

1. Know the background of the present constitution of India.
2. Understand the working of the union, state and local levels.
3. Gain consciousness on the fundamental rights and duties.
4. Be able to understand the functioning and distribution of financial resources between the centre and states.
5. Be exposed to the reality of hierarchical Indian social structure and the ways the grievances of the deprived sections can be addressed to raise human dignity in a democratic way.

#### UNIT-I

**Evolution of the Indian Constitution:** 1909 Act, 1919 Act and 1935 Act. Constituent Assembly: Composition and Functions; Fundamental features of the Indian Constitution.

#### UNIT-II

**Union Government:** Executive-President, Prime Minister, Council of Minister

**State Government:** Executive: Governor, Chief Minister, Council of Minister

**Local Government:** Panchayat Raj Institutions, Urban Government

#### UNIT-III

**Rights and Duties:** Fundamental Rights, Directive principles, Fundamental Duties

#### UNIT-IV

**Relation between Federal and Provincial units:** Union-State relations, Administrative, legislative and Financial, Inter State council, NITI Ayog, Finance Commission of India

#### UNIT-V

**Statutory Institutions:** Elections-Election Commission of India, National Human Rights Commission, National Commission for Women

***Suggested Readings:***

1. Abhay Prasad Singh & Krishna Murari, Constitutional Government and Democracy in India, Pearson Education, New Delhi, 2019
2. D.D. Basu, Introduction to the constitution of India, Lexis Nexis, New Delhi
3. Subhash Kashyap, Our Parliament, National Book Trust, New Delhi
4. Peu Ghosh, Indian Government & Politics, Prentice Hall of India, New Delhi
5. B.Z. Fadia & Kuldeep Fadia, Indian Government & Politics, Lexis Nexis, New Delhi

Course Code	Course Title				Core/Elective		
<b>HS201EG</b>	<b>Effective Technical Communication in English</b>				<b>Core</b>		
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	<b>3</b>	-	-	-	<b>30</b>	<b>70</b>	<b>3</b>
<p><b>Course Objectives</b>                      To expose the students to:</p> <ul style="list-style-type: none"> <li>➤ Features of technical communication</li> <li>➤ Types of professional correspondence</li> <li>➤ Techniques of report writing</li> <li>➤ Basics of manual writing</li> <li>➤ Aspects of data transfer and presentations.</li> </ul> <p><b>Course Outcomes</b>                      On successful completion of the course, the students would be able to:</p> <ol style="list-style-type: none"> <li>1. Handle technical communication effectively</li> <li>2. Use different types of professional correspondence</li> <li>3. Use various techniques of report writing</li> <li>4. Acquire adequate skills of manual writing</li> <li>5. Enhance their skills of information transfer and presentations</li> </ol>							

#### UNIT I

**Definition and Features of Technical communication:** Definition and features of technical communication (precision, relevance, format, style, use of visual aids), Differences between general writing and technical writing, Types of technical communication (oral and written)

#### UNIT II

**Technical Writing-I (Official correspondence):** Emails, IOM, Business letters, Business proposals.

#### UNIT III

**Technical writing-II (Reports):** Project report, Feasibility report, Progress report, Evaluation report.

#### UNIT IV

**Technical writing- III (Manuals):** Types of manuals, User manual, Product manual, Operations manual.

#### UNIT V

**Information Transfer and Presentations:** Non-verbal (bar diagram, flow chart, pie chart, tree diagram) to verbal (writing), Verbal (written) to non-verbal, Important aspects of oral and visual presentations.

#### **Suggested readings:**

1. Raman, Meenakshi & Sharma, Sangeeta. (2015). *Technical communication: Principles and Practice*, 3<sup>rd</sup> Edition, New Delhi.
2. Rizvi, Ashraf, M. (2017). *Effective Technical Communication* (2nd ed.). New Delhi, Tata McGraw Hill Education.
3. Sharma, R. C., & Mohan, Krishna. (2017). *Business Correspondence and Report Writing: A Practical Approach to Business & Technical Communication* (4th ed.). New Delhi, Tata McGraw Hill Education.
4. Tyagi, Kavita & Misra, Padma. (2011). *Advanced Technical Communication*. New Delhi, PHI Learning.
5. Jungk, Dale. (2004). *Applied Writing for Technicians*. New York, McGraw-Hill Higher Education.

Course Code	Course Title				Core/Elective		
<b>HS202CM</b>	<b>Finance and Accounting</b>				<b>Core</b>		
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	<b>3</b>	-	-	-	<b>30</b>	<b>70</b>	<b>3</b>
<p><b>Course Objectives</b>                      The course is introduced</p> <ul style="list-style-type: none"> <li>➤ To provide basic understanding of Financial and Accounting aspects of a business unit</li> <li>➤ To provide understanding of the accounting aspects of business</li> <li>➤ To provide understanding of financial statements</li> <li>➤ To provide the understanding of financial system</li> <li>➤ To provide inputs necessary to evaluate the viability of projects</li> <li>➤ To provide the skills necessary to analyse the financial statements</li> </ul> <p><b>Course Outcomes</b>                      After successful completion of the course the students will be able to</p> <ol style="list-style-type: none"> <li>1. Evaluate the financial performance of the business unit.</li> <li>2. Take decisions on selection of projects.</li> <li>3. Take decisions on procurement of finances.</li> <li>4. Analyse the liquidity, solvency and profitability of the business unit.</li> <li>5. Evaluate the overall financial functioning of an enterprise.</li> </ol>							

#### UNIT-I

**Basics of Accounting:** Financial Accounting–Definition- Accounting Cycle – Journal - Ledger and Trial Balance-Cash Book-Bank Reconciliation Statement (including Problems)

#### UNIT-II

**Final Accounts:** Trading Account-Concept of Gross Profit- Profit and Loss Account-Concept of Net Profit- Balance Sheet (including problems with minor adjustments)

#### UNIT-III

**Financial System and Markets:** Financial System-Components-Role-Considerations of the investors and issuers- Role of Financial Intermediaries. Financial Markets-Players- Regulators and instruments - Money Markets Credit Market- Capital Market (Basics only)

#### UNIT-IV

**Basics of Capital Budgeting techniques:** Time Value of money- Compounding- Discounting- Future Value of single and multiple flows- Present Value of single and multiple Flows- Present Value of annuities- Financial Appraisal of Projects– Payback Period, ARR- NPV, Benefit Cost Ratio, IRR (simple ratios).

#### UNIT-V

**Financial statement Analysis:** Financial Statement Analysis- Importance-Users-Ratio Analysis-liquidity, solvency, turnover and profitability ratios.

***Suggested Readings:***

1. Satyanarayana. S.V. and Satish. D., Finance and Accounting for Engineering, Pearson Education
2. Rajasekharan, Financial Accounting, Pearson Education
3. Sharma.S.K. and Rachan Sareen, Financial Management, Sultan Chand
4. Jonathan Berk, Fundamentals of Corporate Finance, Pearson Education
5. Sharan, Fundamentals of Financial Management, Pearson Education

Course Code	Course Title				Core/Elective		
<b>BS207MT</b>	<b>Mathematics – III (Probability &amp; Statistics)</b>				<b>Core</b>		
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	<b>3</b>	-	-	-	<b>30</b>	<b>70</b>	<b>3</b>
<b>Course Objectives</b> <ul style="list-style-type: none"> <li>➤ To introduce the solution methodologies for second order Partial Differential Equations with applications in engineering</li> <li>➤ To provide an overview of probability and statistics to engineers</li> </ul> <b>Course Outcomes</b> <p>After completing this course, the student will be able to:</p> <ol style="list-style-type: none"> <li>1. Solve field problems in engineering involving PDEs.</li> <li>2. They can also formulate and solve problems involving random variables and apply statistical methods for analysing experimental data.</li> </ol>							

**UNIT-I:** Introduction of Probability, Conditional probability, Theorem of Total probability, Baye’s Theorem and its applications, Random variables, Types of random variables, Probability mass function and Probability density function, Mathematical expectations.

**UNIT-II:** Discrete probability distributions: Binomial and Poisson distributions, Mean, variance, moment generating function and evaluation of statistical parameters for these distributions, Moments, Skewness and Kurtosis.

**UNIT-III:** Continuous probability distributions, Uniform, Exponential and Normal distributions, Mean, variance, moment generating function and evaluation of statistical parameters for these distributions

**UNIT-IV:** Curve fitting by the method of least squares: Fitting of straight lines, second degree parabolas and more general curves, Correlation, regression and Rank correlation. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.

**UNIT-V:** Test for single mean, difference of means and correlation coefficients, test for ratio of variances, Chi-square test for goodness of fit and independence of attributes.

### Suggested Reading:

1. R.K.Jain & Iyengar, “Advanced Engineering Mathematics”, Narosa Publications.
2. B.S. Grewal, “Higher Engineering Mathematics”, Khanna Publishers, 2000.
3. P.Sivaramakrishna Das & C.Vijaya Kumar, “Engineering Mathematics” , Pearson India Education Services Pvt. Ltd.
4. N.P. Bali & M. Goyal, “A Text Book of Engineering Mathematics”, Laxmi Publications, 2010.
5. S.C.Gupta & V.K.Kapoor, “Fundamentals of Mathematical Statistics” , S.Chand Pub.
6. P. G. Hoel, S. C. Port & C. J. Stone, “Introduction to Probability Theory”, Universal Book Stall, 2003.
7. W. Feller, “An Introduction to Probability Theory and its Applications”, Vol. 1, Wiley, 1968.

Course Code	Course Title				Core/Elective		
<b>ES214EC</b>	<b>Basic Electronics</b>				<b>Core</b>		
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	<b>3</b>	-	-	-	<b>30</b>	<b>70</b>	<b>3</b>

### Course Objectives

The objectives of this course is to impart knowledge of

- To understand the characteristics of diodes and transistor configurations
- To understand the design concepts of biasing of BJT and FET
- To understand the design concepts of feedback amplifiers and oscillators
- To study the design concepts of OP Amp and data converters

### Course Outcomes

After completing this course, the student will be able to:

1. Study and analyse the rectifiers and regulator circuits.
2. Study and analyse the performance of BJTs, FETs on the basis of their operation and working.
3. Ability to analyse & design oscillator circuits.
4. Ability to analyse different logic gates & multi-vibrator circuits.
5. Ability to analyse different data acquisition systems

### UNIT-I

**PN Junction Diode:** Characteristics, Half wave rectifier, Full wave rectifier, filters, ripple, regulation, TIF and efficiency, Zener diode and Zener diode regulators. CRT construction and CRO applications

### UNIT-II

**Transistors:** BJT construction and working, modes of operation, configurations of BJT (CB, CE, CC), small signal h-parameter model of CE, CE amplifier analysis. Construction and working of JFET, V-I characteristics of JFET.

### UNIT-III

**Feedback concepts:** Types of negative feedback – modification of gain, bandwidth, input and output impedances, applications.

**Oscillators:** RC Phase shift, Wein bridge, LC and crystal Oscillators (Qualitative treatment only).

### UNIT-IV

**Operational Amplifier:** OP-AMP Block diagram, Ideal OP-AMP, DC and AC Characteristics, Inverting and Non-Inverting Amplifiers, Adder/Subtractor, Integrator, Differentiator.

**Logic gate circuits** - Introduction to Digital systems- AND, NAND, NOR, XOR gates, Binary half adder, full adder.

### UNIT-V

**Data Acquisition Systems:** Construction and Operation of transducers- Strain guage LVDT, Thermocouple, Instrumentation systems.

**Data Converters:** R-2R Ladder DAC, Successive approximation and Flash ADC.

***Suggested Readings:***

1. Robert Boylestad L. and Louis Nashelsky, *Electronic Devices and Circuit Theory*, PHI, 2007
2. Helfrick D and David Cooper, *Modern Electronic Instrumentation and Measurements Techniques*, 1st edition, Prentice Hall of India, 2006.
3. Salivahanan, Suresh Kumar and Vallavaraj, *Electronic Devices and Circuits*, 2nd edition, Tata McGraw-Hill, 2010.

Course Code	Course Title				Core/Elective		
<b>ES216EC</b>	<b>Digital Electronics</b>				<b>Core</b>		
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	<b>3</b>	-	-	-	<b>30</b>	<b>70</b>	<b>3</b>

**Course Objectives**

- To learn the principles of digital hardware and support given by it to the software.
- To explain the operation and design of combinational and arithmetic logic circuits.
- To design hardware for real world problems.

**Course Outcomes**

At the end of this course the students will be able to

1. Understand the design process of digital hardware, use Boolean algebra to minimize the logical expressions and optimize the implementation of logical functions.
2. Understand the number representation and design combinational circuits like adders, MUX etc.
3. Design Combinational circuits using PLDS and write VHDL code for basic gates and combinational circuits.
4. Analyse sequential circuits using flip-flops and design registers, counters.
5. Represent a sequential circuit using Finite State machine and apply state minimization techniques to design a FSM

**UNIT – I**

**Design Concepts:** Digital Hardware, Design process, Design of digital hardware. Introduction to logic circuits – Variables and functions, Logic gates and networks. Boolean algebra, Synthesis using gates, Design examples. Optimized implementation of logic functions using K-Map and Quine-McCluskey Tabular method

**UNIT – II**

**Number representation:** Addition and Subtraction of signed and unsigned numbers.

**Combinational circuit building blocks:** Half adder, Full adder, Multiplexers. Decoders. Encoders. Code converters, BCD to 7-segment converter, Arithmetic comparator circuits.

**UNIT – III**

**Design of combinational circuits using Programmable Logic Devices (PLDs):** General structure of a Programmable Array Logic (PAL), Programmable Logic Arrays (PLAs), Structure of CPLDs and FPGAs, 2-input and 3-input lookup tables(LUTs)

**Introduction to Verilog HDL:** Verilog code for basic logic gates, adders, decoders

**UNIT – IV**

**Sequential Circuits:** Basic Latch, Gated SR Latch, gated D Latch, Master-Slave edge triggered flip-flops, T Flip-flop, JK Flip-flop, Excitation tables. Registers, Counters, Verilog code for flip-flops

**UNIT – V**

**Synchronous Sequential Circuits:** Basic Design Steps, Finite State machine(FSM) representation using Moore and Mealy state models, State minimization, Design of FSM for Sequence Generation and Detection, Algorithmic State Machine charts.

***Suggested Readings:***

1. Moris Mano and Michael D Ciletti, Digital Design, Pearson, fourth edition,2008
2. Zvi Kohavi, Switching and Finite Automata Theory, 3<sup>rd</sup> ed., Cambridge University Press-New Delhi, 2011.
3. R. P Jain, Modern Digital Electronics,4<sup>th</sup> ed., McGraw Hill Education (India) Private Limited, 2003
4. Ronald J.Tocci, Neal S. Widmer &Gregory L.Moss, “Digital Systems: Principles and Applications,” PHI, 10/e, 2009.
5. Samir Palnitkar, “Verilog HDL A Guide to Digital Design and Synthesis,” 2nd Edition, Pearson Education, 2006.

Course Code	Course Title				Core/Elective		
<b>PC221IT</b>	<b>Data Structures</b>				<b>Core</b>		
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	<b>3</b>	-	-	-	<b>30</b>	<b>70</b>	<b>3</b>
<p><b>Course Objectives</b></p> <ul style="list-style-type: none"> <li>➤ To develop proficiency in the specification, representation, and implementation of abstract data types and data structures.</li> <li>➤ To discuss the linear and non-linear data structures and their applications.</li> <li>➤ To introduce the creation, insertion and deletion operations on binary search trees and balanced binary search trees.</li> <li>➤ To introduce various internal sorting, searching techniques and their time complexities</li> </ul> <p><b>Course Outcomes</b></p> <p>After completing this course, the student will be able to:</p> <ol style="list-style-type: none"> <li>1. Implement linear, non-linear data structures and balanced binary trees</li> <li>2. Understand the basic data structures arrays and linked lists.</li> <li>3. Analyse time complexity of both iterative and recursive functions.</li> <li>4. Define ADT necessary for solving problems based on Stacks and Queues.</li> <li>5. Develop solutions using binary trees, advanced search trees, tries and graphs.</li> <li>6. Use hash functions and handle collisions.</li> <li>7. Understand various kinds of sorting techniques and apply appropriate techniques for solving a given problem.</li> </ol>							

#### UNIT-I

**Introduction to C++ and Algorithms:** Object oriented Design, Data Abstraction and Encapsulation, Basics of C++: Program organization in C++, Input/output in C++, Classes and Constructors, Access Modifiers, Dynamic Memory Allocation in C++, Templates in C++, Exception Handling.

**Algorithms:** Introduction, Algorithm Specifications, Recursive Algorithms, Performance Analysis of an algorithm- Time and Space Complexity, Asymptotic Notations.

#### UNIT-II

**Arrays:** Abstract Data Types and the C++ Class, Array as an Abstract Data Type, Polynomial Abstract Data Type, Sparse Matrices, Representation of Arrays, String Abstract Data Type.

**Stacks and Queues:** Templates in C++, Stack Abstract Data Type, Queue Abstract Data type, Sub typing and Inheritance in C++, Evaluation of Expressions.

#### UNIT-III

**Linked Lists:** Singly Linked Lists and Chains, Representing Chains in C++, Template Class Chain, Circular Lists, Available Space Lists, Linked Stacks and Queues, Polynomials, Doubly Linked Lists.

**Hashing:** Static Hashing, Hash Tables, Hash Functions, Overflow Handling, Theoretical Evaluation of Overflow Techniques

#### UNIT-IV

**Trees:** Introduction, Binary Trees, Binary Tree Traversal and Tree Iterators, Copying Binary Trees, Threaded Binary Trees, Heaps, Efficient Binary Search Trees: AVL Trees.

**UNIT-V**

**Sorting and Searching:** Insertion sort, Quick sort, Best computing time for Sorting, Merge sort, Heap sort, shell sort, Sorting on Several Keys, List and Table Sorts, Summary of Internal Sorting, Linear and Binary Search algorithms

**Graphs:** Graph Abstract Data Type, Elementary Graph operations (DFS and BFS), Minimum Cost Spanning Trees (Prim's and Kruskal's Algorithms).

***Suggested readings:***

1. Ellis Horowitz, Dinesh Mehta, S. Sahani. Fundamentals of Data Structures in C++, Universities Press. 2007.
2. Data Structures with C++ by John R. Hubbard (Schaum's Outlines Series) 2001
3. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, Pearson Education 2006.
4. Michael T. Goodrich, Roberto Tamassia, David Mount, Data Structures and Algorithms in C++, Wiley India Pvt. Ltd, 2004.

Course Code	Course Title				Core/Elective		
<b>PC222IT</b>	<b>Mathematical Foundations of Information Technology</b>				<b>Core</b>		
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	<b>3</b>	-	-	-	<b>30</b>	<b>70</b>	<b>3</b>

### Course Objectives

- To explain with examples, the basic terminology of functions, relations, and sets.
- To perform the operations associated with sets, functions, and relations.
- To relate practical examples to the appropriate set, function, or relation model, and interpret the associated operations and terminology in context.
- To describe the importance and limitations of predicate logic.
- To relate the ideas of mathematical induction to recursion and recursively defined structures.
- To use Graph Theory for solving problems.

### Course Outcomes

After completing this course, the student will be able to:

1. Illustrate by examples the basic terminology of functions, relations, and sets and demonstrate knowledge of their associated operations.
2. Understand basics of counting, apply permutations and combinations to handle different types of objects.
3. Describe and use recursively-defined relationships to solve problems using generating functions.
4. Analyse semi group, monoid group and abelian group with suitable examples and appreciate group theory applications in computer arithmetic.
5. Demonstrate in practical applications the use of basic counting principles of permutations, combinations, inclusion/exclusion principle and the pigeonhole methodology.
6. Represent and Apply Graph theory in solving computer science problems

### UNIT-I

**Mathematical Logic:** Statements and notations, Connectives, Well-formed formulas, Truth Tables, tautology, equivalence implication, Normal forms, Quantifiers, universal quantifiers. Predicates: Predicative logic, Free & Bound variables, Rules of inference, Consistency, proof of contradiction, Automatic Theorem Proving.

### UNIT-II

**Relations:** Properties of Binary Relations, equivalence, transitive closure, compatibility and partial ordering relations, Lattices, Hasse diagram. Functions: Inverse Function Composition of functions, recursive Functions, Lattice and its Properties, Algebraic structures: Algebraic systems Examples and general properties, Semi groups and monads, groups sub groups' homomorphism, Isomorphism.

### UNIT-III

**Elementary Combinatorics:** Basis of counting, Combinations & Permutations, with repetitions, Constrained repetitions, Binomial Coefficients, Binomial Multinomial theorems, the principles of Inclusion – Exclusion. Pigeon hole principles and its application.

### UNIT-IV

**Recurrence Relation:** Generating Functions, Function of Sequences Calculating Coefficient of generating function, Recurrence relations, Solving recurrence relation by substitution and Generating funds. Characteristics solution of in homogeneous Recurrence Relation.

**UNIT-V**

**Graph Theory:** Representation of Graph, DFS, BFS, Spanning Trees, planar Graphs. Graph Theory and Applications, Basic Concepts Isomorphism and Sub graphs, Multi graphs and Euler circuits, Hamiltonian graphs, Chromatic Numbers.

***Suggested Readings:***

1. Elements of Discrete Mathematics- A Computer Oriented Approach- C L Liu, D P Mohapatra. Third Edition, Tata McGraw Hill.
2. Discrete Mathematics for Computer Scientists & Mathematicians, J.L. Mott, A. Kandel, T.P. Baker, PHI.
3. Discrete Mathematics and its Applications, Kenneth H. Rosen, Fifth Edition.TMH.
4. Discrete Mathematical Structures Theory and Application-Malik & Sen, Cengage.
5. Discrete Mathematics with Applications, Thomas Koshy, Elsevier
6. Logic and Discrete Mathematics, Grass Man & Trembley, Pearson Education

Course Code	Course Title					Core/Elective	
<b>ES251EC</b>	<b>Basic Electronics Lab</b>					<b>Core</b>	
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	-	-	-	2	25	50	1

**Course Objectives**

- To understand the characteristics of diodes and transistor configurations
- To understand the design concepts of biasing of BJT and FET
- To understand the design concepts of feedback amplifiers and oscillators
- To study the design concepts of OP Amp and data converters

**Course Outcomes**

After completing this course, the student will be able to:

1. Ability to design diode circuits & understand the application of Zener diode.
2. Ability to analyse characteristics of BJTs & FETs.
3. Ability to understand the different oscillator circuits.
4. Ability to understand operation of HWR & FWR circuits with & without filters.
5. Ability to design Analog-to-Digital converters & Digital-to-Analog converters.

**List of Experiments:**

1. CRO-Applications, Measurements of R, L and C using LCR meter, Colour code method and soldering practice.
2. Characteristics of Semiconductors diode (Ge,Si and Zener)
3. Static Characteristics of BJT-Common Emitter
4. Static Characteristics of BJT-Common Base
5. Static Characteristics of FET
6. RC-Phase Shift Oscillator
7. Hartley and Colpitts Oscillators
8. Common Emitter Amplifier
9. Astable Multivibrator
10. Full-wave rectifier with and without filters using BJT
11. Operational Amplifier Applications
12. Strain Gauge Measurement
13. Analog-to-Digital and Digital to Analog Converters

**Suggested Reading:**

1. Maheshwari and Anand, *Laboratory Experiments and PSPICE Simulations in Analog Electronics*, 1st edition, Prentice Hall of India, 2006.
2. David Bell A., *Laboratory Manual for Electronic Devices and Circuits*, Prentice Hall of India, 2001.

Course Code	Course Title					Core/Elective	
<b>PC252IT</b>	<b>Data StructuresLab</b>					<b>Core</b>	
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	-	-	-	2	25	50	1

### Course Objectives

- To develop skills to design and analyse simple linear and nonlinear data structures, such as stacks, queues and lists and their applications.
- To gain programming skills to implement sorting and searching algorithms.
- To Strengthen the ability to identify and apply the suitable data structures for the given real world problem
- To Gain knowledge in practical applications of data structures

### Course Outcomes

After completing this course, the student will be able to:

1. Implement various data structures using arrays, linked lists.
2. Develop ADT necessary for solving problems based on Stacks and Queues.
3. Implement binary trees, general tree structures, advanced search trees, heaps, graphs.
4. Implement hash functions and handle collisions.
5. Implement various kinds of sorting techniques and apply appropriate techniques for solving a given problem.

### List of Programs:

1. Write a C++ program for the implementation of Array ADT
2. Write a C++ program for the implementation of String ADT
3. Write a C++ program to implement the following using array
  - a) Stack ADT b) Queue ADT
4. Write a C++ program to implement the following using a single linked list
  - a) Stack ADT b) Queue ADT
5. Write a C++ program for evaluation of Infix to postfix conversion, evaluation of postfix expression.
6. Write a C++ program to implement polynomial arithmetic using linked list.
7. Write a C++ program to perform following operations:
  - a) Insert an element into a binary search tree
  - b) Delete an element from a binary search tree
  - c) Search for a key element in a binary search tree
8. Write a C++ program to implement all the functions of a dictionary(ADT) using hashing
9. Write C++ program for the implementation of tree traversals on Binary Trees
10. Write C++ program to perform following operations
  - a) Insertion into B- tree b) Deletion into B- tree
11. Write C++ program to perform following operations
  - a) Insertion into AVL tree b) Deletion into AVL tree
12. Write C++ program for the implementation of bfs and dfs for a given Graph
13. Write C++ program to implement Kruskal's algorithm to generate a minimum spanning tree.
14. Write C++ program to implement Prim's algorithm to generate a minimum spanning tree
15. Write C++ program to implement searching algorithms.
16. Write C++ program for implementing the following sorting methods
  - a) Selection sort b) Quick sort c) shell sort d) Merge sort e) Heap sort

Course Code	Course Title				Core/Elective		
<b>PC253IT</b>	<b>IT Workshop Lab</b>				<b>Core</b>		
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	-	-	-	<b>2</b>	<b>25</b>	<b>50</b>	<b>1</b>
<p><b>Course Objectives</b></p> <ul style="list-style-type: none"> <li>➤ To learn programming of python with a focus of basic structure.</li> <li>➤ To gain programming skills of python using function and OOP concept.</li> <li>➤ To gain practical knowledge of MATLAB toolkit along with operations in matrices and plotting 2D graph.</li> </ul> <p><b>Course Outcomes</b></p> <p>After completing this course, the student will be able to:</p> <ol style="list-style-type: none"> <li>1. Implement basic syntax in python.</li> <li>2. Analyse and implement different kinds of OOP concept in real world problems.</li> <li>3. Implement MATLAB operations and graphic functions.</li> </ol>							

**List of Programming Exercises:**

1. Python Variables, Executing Python from the Command Line, Editing Python Files, Python Reserved Words.
2. Comments, Strings and Numeric Data Types, Simple Input and Output.
3. Control Flow and Syntax, Indenting, if Statement, Relational Operators, Logical Operators, Bit Wise Operators, while Loop, break and continue, for Loop, Lists, Tuples, Sets, Dictionaries.
4. Functions: Passing parameters to a Function, Variable Number of Arguments, Scope, Passing Functions to a Function, Mapping Functions in a Dictionary, Lambda, Modules, Standard Modules.
5. OOP concepts: Classes, File Organization, Special Methods, Inheritance, Polymorphism, Special Characters, Character Classes, Quantifiers, Dot Character, Greedy Matches, Matching at Beginning or End, Match Objects, Compiling Regular Expressions.
6. MATLAB Menus, Toolbars, Computing with MATLAB, Script Files and the Editor/Debugger, MATLAB help System.
7. MATLAB controls: Relational Logical Variables. Conditional Statements: if – else – elseif, switch 2 10. Loops: for – while – break, continue. User-Defined Functions.
8. Arrays, Matrices and Matrix Operations Debugging MATLAB Programs. Working with Data Files, and Graphing Functions: XY Plots – Sub-plots.

**Suggested Readings:**

1. Mark Summerfield,” Programming in Python
2. A Complete introduction to the Python Language”, Addison-Wesley Professional, 2009.
3. Martin C. Brown,” PYTHON: The Complete Reference”, McGraw-Hill, 2001.
4. W.J. Palm III, Introduction to MATLAB 7 for Engineers, McGraw-Hill International Edition, 2005.
5. Wesley J Chun,” Core Python Applications Programming”, Prentice Hall, 2012.
6. Allen B Downey,” Think Python”, O’Reilly, 2012.
7. Stormy Attaway, “MATLAB: A Practical Introduction to Programming and Problem Solving”.3<sup>rd</sup> Edition.

**SCHEME OF INSTRUCTION & EXAMINATION  
B.E. (Information Technology) IV – SEMESTER**

S. No.	Course Code	Course Title	Scheme of Instruction				Scheme of Examination			Credits
			L	T	P/D	Contact Hrs/Wk	CIE	SEE	Duration in Hrs	
<b>Theory Courses</b>										
1	MC112CE	Environmental Sciences	2	-	-	2	30	70	3	-
2	MC113PY	Essence of Indian Traditional Knowledge	2	-	-	2	30	70	3	-
3	HS204ME	Operations Research	3	-	-	3	30	70	3	3
4	BS206BZ	Biology for Engineers	3	-	-	3	30	70	3	3
5	ES215EC	Signals and Systems	3	-	-	3	30	70	3	3
6	PC231IT	JAVA Programming	3	-	-	3	30	70	3	3
7	PC232IT	Database Systems	3	-	-	3	30	70	3	3
8	PC233IT	Computer Organization and Microprocessor	3	-	-	3	30	70	3	3
9	PC234IT	Data Communications	3	-	-	3	30	70	3	3
<b>Practical/ Laboratory Courses</b>										
10	PC261IT	Microprocessor Lab	-	-	2	2	25	50	3	1
11	PC262IT	JAVA Programming Lab	-	-	2	2	25	50	3	1
12	PC263IT	Database Systems Lab	-	-	2	2	25	50	3	1
			<b>25</b>	<b>-</b>	<b>06</b>	<b>31</b>	<b>345</b>	<b>780</b>		<b>24</b>

HS: Humanities and Social Sciences      BS: Basic Science      ES: Engineering Science  
 MC: Mandatory Course                      PC: Professional Core  
 L: Lecture      T: Tutorial                      P: Practical                      D: Drawing  
 CIE: Continuous Internal Evaluation                      SEE: Semester End Evaluation (Univ. Exam)  
 PY: Philosophy, BZ: Biology/ Life Sciences, CE: Civil Engineering, IT: Information Technology  
 EC: Electronics and Communication Engineering, ME: Mechanical Engineering.

**Note:**

- Each contact hour is a clock hour
- The duration of the practical class is two hours, however it can be extended wherever necessary, to enable the student to complete the experiment.
- All the mentioned **Mandatory Courses** should be offered either in I–Semester or II–Semester only **from the academic year 2019-2020**.
- For those of the students admitted during the academic year 2018-2019, since the Mandatory Courses were not offered during the I–Semester or II–Semester, they should be offered either in III–Semester or IV–Semester of the **academic year 2019-2020**.
- The students have to undergo a Summer Internship of two-week duration after IV–Semester and credits will be awarded in V–Semester after evaluation.

Course Code	Course Title				Core/Elective		
<b>MC112CE</b>	<b>Environmental Science</b>				<b>Mandatory</b>		
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	2	-	-	-	30	70	-

#### Course Objectives

- To create awareness and impart basic knowledge about the environment and its allied problems.
- To know the functions of ecosystems.
- To understand importance of biological diversity.
- To study different pollutions and their impact on environment.
- To know social and environment related issues and their preventive measures.

#### Course Outcomes

After completing this course, the student will be able to:

1. Adopt environmental ethics to attain sustainable development.
2. Develop an attitude of concern for the environment.
3. Conservation of natural resources and biological diversity.
4. Creating awareness of Green technologies for nation's security.
5. Imparts awareness for environmental laws and regulations.

#### UNIT-I

**The Multidisciplinary Nature of Environmental Studies:** Definition, scope and importance, need for public awareness.

**Natural Resources:** Water Resources – Use and over utilization of surface and ground water, flood, drought, conflicts over water, Dams: Benefits and Problems. Food Resources –World Food Problems, effects of modern agriculture, fertilizer-pesticides problems, water logging, salinity, Forest Resources –Use and over exploitation, deforestation & its effect on tribal people. Land Resources –Land Degradation, environmental effect of mining, man induced landslides, soil erosion and desertification. Energy Resources –Growing energy needs, Renewable and Non-renewable energy resources.

#### UNIT-II

**Ecosystems:** Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in ecosystem, food chains, ecological pyramids, ecological succession, types of ecosystems (marine, pond, river, forest, grassland, desert)

#### UNIT-III

**Biodiversity:** Levels of Biodiversity, Bio-geographical classification of India, Value of biodiversity, Threats to biodiversity, endangered and endemic species of India, Conservation of biodiversity, global and national efforts.

#### UNIT-IV

**Environmental Pollution:** Definition, Causes, effects and control measures of air pollution, water pollution, soil pollution, noise pollution, thermal pollution, solid waste management.

**Environment Protection Act:** Air, water, forest and wildlife Acts, issues in the enforcement of environmental legislation.

## **UNIT-V**

**Social Issues and the Environment:** Watershed management and environmental ethics. Climate change, global warming, acid rain, ozone layer depletion.

**Environmental Disaster Management:** Types of disasters, impact of disasters on environment, infrastructure, and development. Basic principles of disaster mitigation, disaster management, and methodology. Disaster management cycle and disaster management in India.

### **Field Work:**

- Visit to a local area to document environmental issues- agricultural area/ pond/lake/terrestrial ecosystem
- Visit to a local polluted area- market/slum area/Industrial area/traffic area

### **Suggested Readings:**

1. A.K. De, *Environmental Chemistry*, Wiley Eastern Ltd.
2. E.P. Odum, *Fundamentals of Ecology*, W.B. Saunders Co., USA.
3. M.N. Rao and A.K. Datta, *Waste Water Treatment*, Oxford and IBK Publications.
4. Benny Joseph, *Environmental Studies*, Tata McGraw Hill, 2005.
5. V.K. Sharma, *Disaster Management*, National Centre for Disaster Management, IIPe, 1999.

Course Code	Course Title				Core/Elective		
<b>MC113PY</b>	<b>Essence of Indian Traditional Knowledge</b>				<b>Mandatory</b>		
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	2	-	-	-	30	70	-

**Course Objectives**  
The course will introduce the students to

- To get a knowledge in Indian Philosophical Foundations.
- To Know Indian Languages and Literature and the fine arts in India & Their Philosophy.
- To explore the Science and Scientists of Medieval and Modern India

**Course Outcomes**  
After successful completion of the course the students will be able to

1. Understand philosophy of Indian culture.
2. Distinguish the Indian languages and literature among difference traditions.
3. Learn the philosophy of ancient, medieval and modern India.
4. Acquire the information about the fine arts in India.
5. Know the contribution of scientists of different eras.
6. The essence of Yogic Science for Inclusiveness of society.

#### UNIT – I

**Introduction to Indian Philosophy:** Basics of Indian Philosophy, culture, civilization, culture and heritage, general characteristics of culture, importance of culture in human literature, Indian culture, Ancient Indian, Medieval India, Modern India.

#### UNIT – II

**Indian Philosophy & Literature:** Vedas Upanishads, schools of Vedanta, and other religion Philosophical Literature. Philosophical Ideas the role of Sanskrit, significance of scriptures to current society, Indian Philosophies, literature of south India.

Indian languages and Literature-II: Northern Indian languages & Philosophical & cultural & literature.

#### UNIT – III

**Religion and Philosophy:** Religion and Philosophy in ancient India, Religion and Philosophy in Medieval India, Religious Reform Movements in Modern India (selected movements only)

#### UNIT – IV

**Indian Fine Arts & Its Philosophy (Art, Technology & Engineering):** Indian Painting, Indian handicrafts, Music, divisions of Indian classic music, modern Indian music, Dance and Drama, Indian Architecture (ancient, medieval and modern), Science and Technology in Indian, development of science in ancient, medieval and modern Indian.

#### UNIT – V

**Education System in India:** Education in ancient, medieval and modern India, aims of education, subjects, languages, Science and Scientists of Ancient India, Scientists of Medieval India, Scientists of Modern India. The role Gurukulas in Education System, Value based Education.

***Suggested Readings:***

1. Kapil Kapoor, "Text and Interpretation: The India Tradition", ISBN: 81246033375, 2005
2. "Science in Samskrit", Samskrita Bharti Publisher, ISBN-13:978-8187276333,2007
3. NCERT, "Position paper on Arts, Music, Dance and Theatre", ISBN 81-7450-494-X, 2006
4. S. Narain, "Examination in Ancient India", Arya Book Depot, 1993
5. Satya Prakash, "Founders of Sciences in Ancient India", Vijay Kumar Publisher, 1989
6. M.Hiriyanna, "Essentials of Indian Philosophy", Motilal Banarsidass Publishers, ISBN-13: 978-8120810990,2014
7. Chatterjee. S & Dutta "An Introduction to Indian Philosophy"

Course Code	Course Title				Core/Elective		
<b>HS204ME</b>	<b>Operations Research</b>				<b>Core</b>		
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	<b>3</b>	-	-	-	<b>30</b>	<b>70</b>	<b>3</b>

**Course Objectives**

- Use variables for formulating complex mathematical models in management science, industrial engineering and transportation models.
- Use the basic methodology for the solution of linear programming problems.
- Understand the mathematical tools that are needed to solve optimization problems like Transportation models and Assignment models.
- Understand the replacement models with change in money value considering with time and without time.
- Model a system as a queuing model and compute important performance measures

**Course Outcomes**

After completing this course, the student will be able to:

1. Prepare the students to have the knowledge of Linear Programming Problem in Operations
2. Research at the end students would be able to understand the concept and develop the models for different applications.
3. Make students understand the concept Replacement models at the end students would able to explain various features and applications of replacement models in real time scenario.
4. Prepare the students to understand theory of Game in operations research at the end students would able to explain application of Game theory in decision making for a conflict
5. Prepare the students to have the knowledge of Sequencing model at the end student would able to develop optimum model for job scheduling.
6. Prepare students to understand Queuing theory concepts and various optimization techniques at the end students would able to develop models for waiting line cases.

**UNIT-I**

**Introduction:** Definition and Scope of Operations Research.

**Linear Programming:** Introduction, Formulation of linear programming problems, graphical method of solving LP problem, simplex method, maximization and minimization, Degeneracy in LPP, Unbounded and, Infeasible solutions.

**UNIT-II**

**Duality:** Definition, Relationship between primal and dual solutions, Economic Interpretation, Post optimal of sensitivity analysis, Dual Simplex Method.

**UNIT-III**

**Transportation Models:** Finding an initial feasible solution - North West corner method, least cost method, Vogel's Approximation method, Finding the optimal solution, optimal solution by stepping stone and MODI methods, Special cases in Transportation problems - Unbalanced Transportation problem.

**Assignment Problems:** Hungarian method of Assignment problem, Maximization in Assignment problem, unbalanced problem, problems with restrictions, travelling salesman problems.

#### **UNIT-IV**

**Replacement Models:** Introduction, replacement of items that deteriorate ignoring change in money value, replacement of items that deteriorate considering change in money value with time, replacement of items that fail suddenly - Individual replacement policy, Group replacement policy.

**Game Theory:** Introduction, 2 person zero sum games, Maximin - Minimax principle, Principle of Dominance, Solution for mixed strategy problems, Graphical method for  $2 \times n$  and  $m \times 2$  games.

#### **UNIT-V**

**Sequencing Models:** Introduction, General assumptions, processing  $n$  jobs through 2 machines, processing 'n' jobs through  $m$  machines, Processing 2 jobs through  $m$  machines

**Queuing Theory:** Introduction, single channel - Poisson arrivals - exponential service times with infinite population & finite population, Multi channel - poisson arrivals - Exponential service times with infinite population.

**Introduction to Optimization Techniques:** Single objective & Multi objective optimization Techniques like G.A, NSGA, P.Q.O & MPSO Techniques.

#### ***Suggested Readings:***

1. Hamdy, A. Taha, Operations Research-An Introduction, Sixth Edition, Prentice Hall of India Pvt. Ltd., 1997.
2. S.D. Sharma, Operations Research, Kedarnath, Ramnath & Co., Meerut, 2009.
3. Hrvey M. Wagner, Principles of Operations Research, Second Edition, Prentice Hall of India Ltd., 1980.
4. V.K. Kapoor, Operations Research, S. Chand Publishers, New Delhi, 2004.
5. R. Paneer Selvam, Operations Research, Second Edition, PHI Learning Pvt. Ltd., New Delhi, 2008.
6. Data Reconciliation by Prof. Shanker Narasimha

Course Code	Course Title				Core/Elective		
<b>BS206BZ</b>	<b>Biology for Engineers</b>				<b>Core</b>		
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	<b>3</b>	-	-	-	<b>30</b>	<b>70</b>	<b>3</b>

### Course Objectives

Gain vivid knowledge in the fundamentals and uses of biology, human system and plant system.

### Course Outcomes

After completing this course, the student will be able to:

1. Apply biological engineering principles, procedures needed to solve real-world problems.
2. Understand the fundamentals of living things, their classification, cell structure and biochemical constituents.
3. Apply the concept of plant, animal and microbial systems and growth in real life situations.
4. Comprehend genetics and the immune system.
5. Know the cause, symptoms, diagnosis and treatment of common diseases.
6. Apply basic knowledge of the applications of biological systems in relevant industries.

### UNIT-I

**Introduction to Life:** Characteristics of living organisms, Basic classification, cell theory, structure of prokaryotic and eukaryotic cell, Introduction to Biomolecules: definition, general classification and important functions of carbohydrates, lipids, proteins, vitamins and enzymes.

### UNIT-II

**Biodiversity:** Plant System: basic concepts of plant growth, nutrition, photosynthesis and nitrogen fixation. Animal System: Elementary study of digestive, respiratory, circulatory, excretory systems and their functions. Microbial System: History, types of microbes, economic importance and control of microbes.

### UNIT-III

**Genetics and Evolution:** Theories of evolution and Evidences; cell division—mitosis and meiosis; evidence of laws of inheritance; variation and speciation; nucleic acids as a genetic material; central dogma; Mendel laws, gene and chromosomes.

### UNIT-IV

**Human Diseases:** Definition, causes, symptoms, diagnosis, treatment and prevention of diabetes, cancer, hypertension, influenza, AIDS and Hepatitis. Immunity immunization, antigen – antibody immune response.

### UNIT-V

**Biology and its Industrial Applications:** Transgenic plants and animals, stem cell and tissue engineering, bioreactors, bio pharming, recombinant vaccines, cloning, drug discovery, biological neural networks, bioremediation, biofertilizer, biocontrol, biofilters, biosensors, biopolymers, bioenergy, biomaterials, biochips, basic biomedical instrumentation.

***Suggested readings:***

1. A Text book of Biotechnology, R.C.Dubey, S. Chand Higher Academic Publications, 2013
2. Diseases of the Human Body, Carol D. Tamparo and Marcia A. Lewis, F.A. Davis Company, 2011.
3. Biomedical instrumentation, Technology and applications, R. Khandpur, McGraw Hill Professional, 2004
4. Biology for Engineers, Arthur T. Johnson, CRC Press, Taylor and Francis, 2011
5. Cell Biology and Genetics (Biology: The unity and diversity of life Volume I), Cecie Starr, Ralph Taggart, Christine Evers and Lisa Starr, Cengage Learning, 2008
6. Biotechnology Expanding horizon, B.D. Singh, Kalyani Publishers, 2012.

Course Code	Course Title				Core/Elective		
<b>ES215EC</b>	<b>Signals and Systems</b>				<b>Core</b>		
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	<b>3</b>	-	-	-	<b>30</b>	<b>70</b>	<b>3</b>
<p><b>Course Objectives</b></p> <ul style="list-style-type: none"> <li>➤ To explain signals and systems representations/classifications and also describe the time and frequency domain analysis of continuous time signals with Fourier series, Fourier transforms and Laplace transforms.</li> <li>➤ To understand Sampling theorem, with time and frequency domain analysis of discrete time signals with DTFS, DTFT and Z-Transform.</li> <li>➤ To present the concepts of convolution and correlation integrals and also understand the properties in the context of signals/systems and lay down the foundation for advanced courses.</li> </ul> <p><b>Course Outcomes</b></p> <ol style="list-style-type: none"> <li>1. Define and differentiate types of signals and systems in continuous and discrete time</li> <li>2. Apply the properties of Fourier transform for continuous time signals</li> <li>3. Relate Laplace transforms to solve differential equations and to determine the response of the Continuous Time Linear Time Invariant Systems to known inputs</li> <li>4. Apply Z-transforms for discrete time signals to solve Difference equations</li> <li>5. Obtain Linear Convolution and Correlation of discrete time signals with graphical representation</li> </ol>							

#### UNIT-I

**Some useful operations on signals:** Time shifting, Time scaling, Time inversion. Signal models: Impulse function, Unit step function, Exponential function, Even and odd signals. Systems: Linear and Non-linear systems, Constant parameter and time varying parameter systems, Static and dynamic systems, Causal and Non-causal systems, Lumped Parameter and distributed parameter systems, Continuous-time and discrete-time systems, Analog and digital systems.

#### UNIT-II

**Fourier series:** Signals and Vectors, Signal Comparison: correlation, Signal representation by orthogonal signal set, Trigonometric Fourier Series, Exponential Fourier Series, LTI system response to periodic inputs.

#### UNIT-III

**Continuous-Time Signal Analysis:** Fourier Transform: Aperiodic signal representation by Fourier integral, Fourier Transform of some useful functions, Properties of Fourier Transform, Signal transmission through LTI Systems, ideal and practical filters, Signal energy. Laplace transform: Definition, some properties of Laplace transform, solution of differential equations using Laplace transform.

#### UNIT-IV

**Discrete-time signals and systems:** Introduction, some useful discrete-time signal models, Sampling continuous-time sinusoids and aliasing, Useful signal operations, examples of discrete-time systems. Fourier analysis of discrete-time signals, periodic signal representation of discrete-time Fourier series, aperiodic signal representation by Fourier integral.

**UNIT-V**

**Discrete-time signal analysis:** Z-Transform, some properties of Z-Transform, Solution to Linear difference equations using Z-Transform, System realization. Relation between Laplace transform and Z-Transform. DTFT: Definition, Properties of DTFT, comparison of continuous-time signal analysis with discrete-time signal analysis.

***Suggested Readings:***

1. B. P. Lathi, *Linear Systems and Signals*, Oxford University Press, 2<sup>nd</sup> Edition, 2009
2. Alan V O P Penheim, A. S. Wlisky, *Signals and Systems*, 2<sup>nd</sup> Edition, Prentice Hall
3. Rodger E. Ziemer, William H Trenter, D. Ronald Fannin, *Signals and Systems*, 4<sup>th</sup> Edition, Pearson 1998.
4. Douglas K. Linder, *Introduction to Signals and Systems*, McGraw Hill, 1999
5. P. Ramakrishna Rao, *Signals and Systems*, TMH.

Course Code	Course Title				Core/Elective		
<b>PC231IT</b>	<b>JAVA Programming</b>				<b>Core</b>		
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	<b>3</b>	-	-	-	<b>30</b>	<b>70</b>	<b>3</b>

#### Course Objectives

- To understand fundamentals of object-oriented programming in Java which includes defining classes, invoking methods, difference between applet and application programs, using class libraries
- To create Java application programs using sound OOP practices such as interfaces, exception handling, multithreading.
- Use Collection framework, AWT and event handling to solve real world problems.
- Exploring Swing, and implementing Servlets.

#### Course Outcomes

1. Achieve proficiency in object-oriented concepts and also learns to incorporate the same into the Java programming language.
2. Create Java application programs using sound OOP practices e.g. Inheritance, interfaces and proper program structuring by using packages, access control specifiers.
3. Understand and Implement the concepts of Exception Handling in java.
4. Develop the ability to solve real-world problems through software development in high-level programming language using Large APIs of Java as well as the Java standard class library.
5. Understand File, Streams, Input and Output Handling in java.
6. Create graphical user interface and Applets in java as well as apply the knowledge of Event Handling.

#### UNIT- I

**Object Oriented Programming:** Principles, Benefits of Object Oriented Programming.

**Introduction to Java:** Java buzzwords, bytecode, Java Programming Fundamentals: Applet and Application program using simple java program, data types, variables, arrays, operators, expressions, control statements, type conversion and casting, concepts of classes, objects, constructors, methods, access control, this keyword, garbage collection, overloading methods and constructors, introducing access control, static, final, nested and inner classes, exploring string class, using command-line arguments.

**Inheritance:** Inheritance concept, types of inheritance, Member access rules, use of super and final. Polymorphism - dynamic binding, method overriding, abstract classes and methods.

#### UNIT - II

**Interfaces:** Defining an interface, implementing interfaces, extending interface.

**Packages:** Defining, Creating and Accessing a Package, importing packages

**Exception handling:** Benefits of exception handling, classification, checked exceptions and unchecked exceptions, usage of try, catch, throw, throws and finally, rethrowing exceptions, built in exceptions, creating own exception sub classes

**Multithreading:** Java Thread Model, The Main Thread, creating a Thread, creating multiple threads, using is Alive() and join(), thread priorities, synchronization, inter thread communication, deadlock

### **UNIT- III**

**Collections:** Overview of Java Collection frame work, commonly used Collection classes – Array List, Linked List, Hash Set, Tree Set, Collection Interfaces – Collection, List, Set. Accessing Collection via iterate, working with Map. Legacy classes and interfaces – Vector, Hashtable, Stack, Dictionary, Enumeration interface.

**Other Utility classes:** String Tokenizer, Date, Calendar, Gregorian Calendar, Scanner

Java Input/Output: exploring java.io, Java I/O classes and interfaces, File, Stream classes, byte stream, character stream, serialization.

### **UNIT- IV**

**GUI Programming with java:** The AWT class hierarchy, MVC architecture. Applet Revisited: Basics, architecture and skeleton, simple applet program.

**Event Handling:** Delegation Event Model, Event Classes, Source of Events, Event Listener Interfaces. Handling mouse and keyboard events, Adapter classes.

**Database Programming using JDBC:** Introduction to JDBC, JDBC Drivers & Architecture, CURD operation Using JDBC, Connecting to non-conventional Databases.

### **UNITV**

**Exploring Swing:** JLabel, ImageIcon, JTextField, the Swing buttons, JTabbedPane, JScrollPane, JList, JComboBox.

**Servlet:** Life cycle, using tomcat, simple servlet, servlet API, javax.servlet package, reading servlet parameters, javax.servlet.http package, handling HTTP requests and responses

### ***Suggested Readings:***

1. Herbert Scheldt, “The Complete Reference Java, 7th Edition, Tata McGraw Hill, 2006.
2. James M Slack, Programming and Problem Solving with JAVA, Thomson Learning, 2002.
3. C Thomas Wu, An Introduction to Object Oriented Programming with Java 5th Edition, McGraw Hill Publishing, 2010.
4. H. M. Dietel and P. J. Dietel, Java How to Program, Sixth Edition, Pearson Education / PHI.

Course Code	Course Title				Core/Elective		
<b>PC232IT</b>	<b>Database Systems</b>				<b>Core</b>		
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	<b>3</b>	-	-	-	<b>30</b>	<b>70</b>	<b>3</b>

#### Course Objectives

- To get familiar with fundamental concepts of database management which includes database design, database languages, and database-system implementation.
- To get familiar with data storage techniques and indexing.
- To impart knowledge in transaction Management, concurrency control techniques and recovery techniques.
- To master the basics of SQL and construct queries using SQL.
- To become familiar with database storage structures and access techniques.

#### Course Outcomes

1. Develop the knowledge of fundamental concepts of database management and Designing a database using ER modelling approach.
2. Implement storage of data, indexing, and hashing.
3. Apply the knowledge about transaction management, concurrency control and recovery of database systems.
4. Ability to design entity relationship model and convert entity relationship diagrams into RDBMS and formulate SQL queries on the data.
5. Apply normalization for the development of application software.

#### UNIT-I

**Introduction to Database:** File System Organization: Sequential - Pointer - Indexed – Direct. Purpose of Database System - Database Characteristics - Users of Database System - Advantages of DBMS Approach - Schemas and Instances - Three Schema Architecture and Data Independence - The Database System Environment - Relational Algebra.

#### UNIT-II

**Logical Database Design:** Relational DBMS - Codd's Rule - Entity-Relationship model - Extended ER Normalization - Functional Dependencies - Anomaly - 1NF to 5NF - Domain Key Normal Form – Denormalization.

#### UNIT-III

**Indexing:**Types of Single Level Ordered Indexes - Multilevel Indexes - Dynamic Multilevel Indexes.  
**Transaction Processing and Concurrency Control:** Transaction Concepts - ACID Properties - Transaction States - Concurrency Control Problems - Serializability - Recoverability - Pessimistic and Optimistic Concurrency Control Schemes.

#### UNIT-IV

**Introduction to the Relational Model** – Integrity Constraint Over relations – Enforcing Integrity constraints – Querying relational data – Logical data base Design – Introduction to Views – Destroying /altering Tables and Views.

Relational Algebra – Selection and projection set operations – renaming – Joins – Division – Examples of Algebra overviews – Relational calculus – Tuple relational Calculus – Domain relational calculus – Expressive Power of Algebra and calculus.

**UNIT-V**

Form of Basic SQL Query – Examples of Basic SQL Queries – Introduction to Nested Queries – Correlated Nested Queries Set – Comparison Operators – Aggregative Operators – NULL values – Comparison using Null values – Logical connectivity's – AND, OR and NOT – Impact on SQL Constructs – Outer Joins – Disallowing NULL values – Complex Integrity Constraints in SQL Triggers and Active Data bases.

**Advanced Topics:** Overview: Parallel Database - Multimedia Database - Mobile Database - Web Database - Multidimensional Database. Data Warehouse - OLTP Vs OLAP - NoSQL Database.

***Suggested Readings:***

1. Abraham Silberchatz, Henry F Korth and Sudarshan S, "Database System Concepts", Tata McGraw-Hill, New Delhi, 2010.
2. Ramez Elmasri and Shamkant B Navathe, "Fundamentals of Database Systems", Addison Wesley, USA, 2010.
3. Raghu Ramakrishnan and Johannes Gehrke, "Database Management Systems", Tata McGraw-Hill, New Delhi, 2008.
4. Gupta G K, "Database Management System", Tata McGraw-Hill, New Delhi, 2011.
5. Atul Kahate, "Introduction to Database Management Systems", Pearson Education, New Delhi, 2009

Course Code	Course Title				Core/Elective		
<b>PC233IT</b>	<b>Computer Organization and Microprocessor</b>				<b>Core</b>		
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	<b>3</b>	-	-	-	<b>30</b>	<b>70</b>	<b>3</b>

#### Course Objectives

- To provide in depth knowledge to the students about the design and organization of a digital computer, operation of various functional units, instruction set design and factors that influence the performance of a computer.
- To enable the students with the understanding of basic computer architecture with instruction set and programming of 8085 in particular.
- To learn the functionality and interfacing of various peripheral devices.

#### Course Outcomes

1. To understand the architecture of modern computer, Bus structures.
2. Analyse the Different memories and evaluate the mapping techniques.
3. Discuss the architecture, the instruction set and addressing modes of 8085 processor
4. Analyse Stacks, Subroutine, Interrupts of 8085, different PPI techniques, the uses of interfaces 8259, RS 232C, USART (8251), and DMA controller
5. Design the applications of interfacing circuits 8254/8253timer, A/D and D/A converter, Keyboard/Display controller.

#### UNIT-I

**Basic Structure of Computers:** Computer Types, Functional Units, Basic Operational Concepts, Bus Structures, Performance, Multiprocessors and Multicomputers, Historical perspective.

Input/output Organization: Accessing I/O devices, Interrupts, Processor examples, Direct memory access, parallel interface and serial interface.

#### UNIT-II

**The Memory System:** Basic concepts, Semiconductor RAM memories, Read-Only memories, Speed, Size and Cost, Cache memories, Performance considerations, Virtual Memories, Memory management requirements, Secondary Storage.

#### UNIT-III

**8085 Architecture:** Introduction to microprocessors and microcontrollers, 8085 Processor Architecture, Internal operations, Instructions and timings. Programming the 8085 - Introduction to 8085 instructions, Addressing modes and Programming techniques with Additional instructions.

#### UNIT-IV

Stacks and subroutines, interfacing peripherals - Basic interfacing concepts, interfacing output displays, Interfacing input keyboards. Interrupts - 8085 Interrupts, Programmable Interrupt Controller (8259A). Direct Memory Access (DMA) - DMA Controller (Intel 8257), Interfacing 8085 with Digital to Analog and Analog to Digital converters.

#### UNIT-V

Programmable peripheral interface (Intel 8255A), Programmable communication interface (Intel 8251), Programmable Interval timer (Intel 8253 and 8254), Programmable Keyboard /Display controller (Intel 8279). Serial and parallel bus standards RS 232 C, IEEE 488.

***Suggested Readings:***

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Computer Organization, 5th Edition, McGraw Hill, 2002.
2. Ramesh S Gaonkar, Microprocessor Architecture, Programming, and Applications with the 8085, 5/E Prentice Hall, 2002.
3. Pal Chouduri, Computer Organization and Design, Prentice Hall of India, 1994.
4. M. M. Mano, Computer System Architecture, 3rd Edition, Prentice Hall.

Course Code	Course Title				Core/Elective		
<b>PC234IT</b>	<b>Data Communications</b>				<b>Core</b>		
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	<b>3</b>	-	-	-	<b>30</b>	<b>70</b>	<b>3</b>
<b>Course Objectives</b> <ul style="list-style-type: none"> <li>➤ To understand the basics of data transmission, transmission media, data communications system and its components.</li> <li>➤ To describe various encoding and modulation schemes, various data link protocols for flow control, error detection and correction.</li> <li>➤ To understand different types of multiplexing, spread spectrum techniques, Ethernet, services of WLANs and Bluetooth.</li> </ul> <b>Course Outcomes</b> <ol style="list-style-type: none"> <li>1. Demonstrate systematic understanding of Data Communication Techniques.</li> <li>2. Apply various encoding schemes.</li> <li>3. Understand multiplexing techniques.</li> <li>4. Get acquainted with the concepts of virtual circuit networks.</li> <li>5. Understand various types of switching techniques.</li> <li>6. Understand concepts of wireless LANs.</li> </ol>							

#### UNIT-I

**Introduction:** Communication model and Modulation Techniques (AM, FM and PM), Data Communication networking, Protocols and Architecture, Standards.

**Data Transmission:** Concepts and Terminology, Analog and Digital Transmission, Transmission Impairments, Transmission media.

**Data Encoding:** Digital Data Digital Signals, Digital Data-Analog Signals, Analog Data- Digital Signals, Analog Data-Analog Signals.

#### UNIT-II

**Data Communication Interface:** Asynchronous and Synchronous Transmission, Line Configuration, Interfacing.

**Data Link Control:** Flow Control, Error Detection, Error Control, HDLC, Other Data link Control Protocols, Performance Issues.

#### UNIT-III

**Multiplexing & Switching:** Frequency Division Multiplexing, Wavelength Division Multiplexing, Synchronous Time Division Multiplexing, Statistical Time Division Multiplexing. Asymmetric Digital Subscriber Line, xDSL. Circuit Switching, Packet Switching & Frame Relay. ATM: Architecture, Logical Connection, ATM Cells, Transmission of ATM cells.

#### UNIT-IV

**Ethernets:** Traditional Ethernet Topologies and Transmission Media, LAN protocol architecture, MAC sub layer, CSMA/CD, Physical Layer, Bridged, Switched and Full Duplex Ethernets. Fast Ethernet: MAC sub Layer, Physical layer, Gigabit Ethernet: MAC sub Layer, Physical Layer

**UNIT-V**

**Cellular Wireless Networks:** Principles of Cellular Networks, First Generation Analog, Second Generation CDMA and Third Generation Systems.

**Wireless LANs:** Overview, Wireless LAN Technology, IEEE 802.11 Architecture and Services, IEEE 802.11 Medium Access Control, IEEE 802.11 Physical Layer.

**Bluetooth & Zigbee:** Architecture, Layers and Protocols.

***Suggested Readings:***

1. William Stallings, "Data and Computer Communication", 8th Edition, Pearson Education, Asia- 2004.
2. Behrouz A. Forouzan, "Data Communications and Networking", 4th Edition, Tata McGraw Hill, 2006.
3. Simon Haykins "Communication Systems", 2nd Edition, John Wiley & Sons
4. Drew Gislason "Zigbee Wireless Networking" Elsevier Published: August 2008

Course Code	Course Title					Core/Elective	
<b>PC261IT</b>	<b>Microprocessor Lab</b>					<b>Core</b>	
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	-	-	-	2	25	50	1

### Course Objectives

The objectives of the course are to impart knowledge of the:

- To become familiar with the architecture and Instruction set of Intel 8085 microprocessor.
- To provide practical hands on experience with Assembly Language Programming.
- To familiarize the students with interfacing of various peripheral devices with 8085 microprocessors.

### Course Outcomes

After the completion of the course, the student will be able to:

1. Interpret the principles of Assembly Language Programming, instruction set in developing microprocessor based applications.
2. Develop Applications such as: 8-bit Addition, Multiplication, Division, array operations, swapping, negative and positive numbers.
3. Analyse the interfaces like serial ports, digital-to-analog Converters and analog-to-digital converters etc.
4. Build interfaces of Input-output and other units like stepper motor with 8085.
5. Analyse the function of traffic light controller.

### List of Experiments

1. Tutorials on 8085 Programming.
2. Interfacing and programming of 8255. (E.g. traffic light controller).
3. Interfacing and programming of 8254.
4. Interfacing and programming of 8279.
5. A/D and D/A converter interface.
6. Stepper motor interface.
7. Display interface

**Note:** Adequate number of programs covering all the instructions of 8085 instruction set should be done on the 8085 microprocessor trainer kit

Course Code	Course Title					Core/Elective	
<b>PC262IT</b>	<b>JAVA Programming Lab</b>					<b>Core</b>	
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	-	-	-	2	25	50	1
<p><b>Course Objectives</b></p> <ul style="list-style-type: none"> <li>➤ To build software development skills using java programming for real world applications.</li> <li>➤ To implement frontend and backend of an application</li> <li>➤ To implement classical problems using java programming.</li> </ul> <p><b>Course Outcomes</b></p> <p>After completing this course, the student will be able to:</p> <ol style="list-style-type: none"> <li>1. Develop Java applications using the concepts of Inheritance, interfaces, packages, access control specifiers.</li> <li>2. Implement the concepts of Exception Handling in java Applications.</li> <li>3. Read and write data using different Java I/O streams.</li> <li>4. Create graphical user interfaces and Applets by applying the knowledge of Event Handling.</li> <li>5. Create robust applications using Java standard class libraries and retrieve data from a database with JDBC.</li> <li>6. Ability to solve real-world problems by designing user friendly GUI with befitting backend through the APIs of Java.</li> </ol>							

### List of Experiments

- 1) Write a Java program to illustrate the concept of class with method overloading
- 2) Write a Java Program that reads a line of integers, and then displays each integer, and the sum of all the integers (Use String Tokenizer class of java. util)
- 3) Write a Java program to illustrate the concept of Single level and Multi level Inheritance.
- 4) Write a Java program to demonstrate the Interfaces & Abstract Classes.
- 5) Write a Java program to implement the concept of exception handling.
- 6) Write a Java program to illustrate the concept of threading using Thread Class and runnable Interface.
- 7) Write a Java program to illustrate the concept of Thread synchronization.
- 8) Write a Java program that correctly implements producer consumer problem using the concept of inter thread communication.
- 9) Write a Java program to illustrate collection classes like Array List, Linked List, Tree map and Hash map.
- 10) Write a Java program to illustrate Legacy classes like Vector, Hashtable, Dictionary & Enumeration interface
- 11) Write a Java program to implement iteration over Collection using Iterator interface and List Iterator interface
- 12) Write a Java program that reads a file name from the user, and then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes.
- 13) Write a Java program to illustrate the concept of I/O Streams
- 14) Write a Java program to implement serialization concept
- 15) Write a Java applet program to implement Colour and Graphics class
- 16) Write a Java applet program for handling mouse & key events
- 17) Write a Java applet program to implement Adapter classes

- 18) Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -, \*, % operations. Add a text field to display the result.
- 19) Write an example for JDBC prepared statement with Result Set
- 20) Program to get primary key value (auto-generated keys) from inserted queries using JDBC
- 21) Program to create a simple JList
- 22) java Program to create a simple checkbox using JCheckBox
- 23) Program to create a checkbox and ItemListener to it.
- 24)
  1. Write Servlet application to print current date & time
  2. Html & Servlet Communication
  3. Auto refresh a page
  4. Demonstrate session tracking
  5. Select record from database
  6. Application for login page
  7. Insert record into database
  8. Count the visits on web page
  9. Insert teacher record in Database

Course Code	Course Title					Core/Elective	
<b>PC263IT</b>	<b>Database Systems Lab</b>					<b>Core</b>	
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	-	-	-	2	25	50	1

### Course Objectives

The objectives of the course are to impart knowledge of:

- To practice various DDL commands in SQL
- To write simple and Complex queries in SQL
- To familiarize PL/SQL

### Course Outcomes

After the completion of the course, the student will be able to:

1. Design and implement a database schema for a given problem
2. Develop the query statements with the help of structured query language.
3. Populate and query a database using SQL and PL/SQL
4. Develop multi-user database application
5. Design GUI using forms and implement database connectivity.

### List of Programs

1. Creation of database (exercising the commands for creation)
2. Simple condition query creation using SQL Plus
3. Complex condition query creation using SQL Plus
4. Usage of Triggers and Stored Procedures.
5. Creation of Forms for student Information, library information, Pay roll etc.
6. Writing PL/SQL procedures for data validation
7. Generation using SQL reports
8. Creating Password and Security features for applications.
9. Usage of File locking table locking, facilities in applications.
10. Creation of small full pledged database application spreading over to 3 sessions.

**Note:** The creation of sample database for the purpose of the experiments is expected to be pre-decided by the instructor.

### Suggested Readings:

1. Nilesh Shah, Database System Using Oracle, PHI, 2007.
2. Rick F Vander Lans, Introduction to SQL, Fourth edition, Pearson Education, 2007.
3. Benjamin Rosenzweig, Elena Silvestrova, Oracle PL/SQL by Example, Third edition, Pearson Education, 2004.
4. Albert Lulushi, Oracle Forms Developer's Handbook, Pearson Education, 2006.