Department of Computer Science and Engineering

B. Tech. (Computer Science and Engineering)
Curriculum for Second Year (With effect from academic year 2019-20)
(L-T-P) indicates L-Lecture, T-Tutorial and P-Practical

Program Educational Objectives (PEOs):

PEO1	To create engineering graduates with advanced knowledge of Computer Science and Engineering who can contribute in propagating Computer Science and Technology to the society.
PEO2	To yield engineering graduates with adequate abilities in Computer Science and Technology who can become successful developers, designers and researchers to fulfill the necessities of Computer Industries.
PEO3	To produce graduates who can figure out, formulate, analyze and solve real life problems confronted in Software Enterprises.
PEO4	To produce graduates who can exhibit skills, professionalism, and ethical attitude required for collaboration in their profession and adapt to current trends through lifelong learning.

Program Objectives (POs):

PO1(a)	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals and specialization to solve complex engineering problems.
PO2(b)	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using principles of mathematics, natural and engineering sciences.
PO3(c)	Design/development of solutions: Design and develop solutions by considering the public health and safety, cultural, societal, and environmental considerations to complex multidisciplinary engineering problems.
PO4(d)	Conduct investigations of complex problems: Use research-based knowledge and methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5(e)	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6(f)	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7(g)	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8(h)	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9(i)	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10(j)	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11(k)	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12(l)	Life-long learning: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Objectives (PSOs):

PSO1	Foundation of mathematical concepts: To apply mathematical methodologies to crack the real-world problems using appropriate mathematical analysis, data structure and efficient computer algorithms.
PSO2	Knowledge of recent trends: To provide effective and efficient knowledge of recent technologies such as Artificial Intelligence, Cyber Security, Internet of Things etc.
PSO3	Project based learning: To provide platform to the students to develop a new and innovative multidisciplinary project to cater local industry needs.

3. Table of Correlation:

PO/PSO ➡ ⬇ PEO	a	b	c	d	e	f	g	h	i	j	k	l	PSO1	PSO2	PSO3
I	✓	✓		✓			✓			✓		✓		✓	
II			✓		✓	✓	✓		✓	✓	✓		✓		✓
III		✓		✓		✓				✓		✓	✓		✓
IV					✓	✓		✓		✓		✓		✓	✓

4. Structure of curriculum:

Semester III						
CourseCode	**Course Title**	**Lectures(L)**	**Tutorials(T)**	**Practical(P)**	**Credits**	
					Th.	**Pr.**
BSC273	Mathematics-III: Applied Linear Algebra	03	--	--	03	--
ESC282	Digital Electronics	03	--	02	03	01
PCC-CS201	Discrete Mathematics	03	--	--	03	--
PCC-CS202	Data Structures	03	--	02	03	01
PCC-CS203	Object Oriented Programming with Java	03	--	02	03	01
PCC-CS204	Numerical and Scientific Computing	03	--	02	03	01
HMC278	Human Values and Social Ethics	02	--	--	02	--
BSC261	Mathematical Foundation for Engineers*	02	--	--	Audit	
	Total:	**22**	**--**	**08**	**24**	
Semester IV						
Course Code	**Course Title**	**Lectures (L)**	**Tutorials (T)**	**Practical (P)**	**Credits**	
					Th.	**Pr.**
BSC276	Mathematics-IV: Vector Calculus, Statistical Methods	03	--	--	03	--
PCC-CS205	Microprocessors and Interfacing	03	--	02	03	01
PCC-CS206	Computer Organization and Architecture	03	--	--	03	--
PCC-CS207	Design and Analysis of Algorithms	03	--	02	03	01
PCC-CS208	Python programming	03	--	02	03	01
MAC277	Indian Constitution	02	--	--	Audit	
	Total	**17**		**06**	**18**	

*This audit course is only for direct second year students and a mandatory course.

BSC273	**Mathematics – III:** Applied Linear Algebra	3L:0T:0P	3 credits

Course Objectives:

Objective.1. To understand fields and vector spaces, subspaces, linear independence and dependence.

Objective.2. To find basis and dimension of a vector space and understand change of basis. Find a basis for the row space, column space and null space of a matrix and find the rank and nullity of a matrix.

Objective.3. To compute linear transformations, kernel and range, and inverse linear transformations, and find matrices of general linear transformations.

Objective.4. To understand eigenvalues and eigenvectors and diagonalization process.

Objective.5. To learn inner products on a real vector space and orthogonality in inner product spaces and obtain orthonormal bases using Gram-Schmidt process

Objective.6. To learn the different matrix norms, convergence of matrices and matrix decompositions such as QR, SVD, LU, Cholesky

Course Outcomes: After successful completion of this course student will be able to:

BSC-273.1 Determine whether a given structure is vector space, subspace structure and will be able to determine basis and dimension of vector spaces.

BSC-273.2 Find the null space of a matrix and represent it as the span of independent vectors.

BSC-273.3 Find the matrix representation of a linear transformation given bases of the relevant vector spaces.

BSC-273.4 Find the orthogonalization in inner product spaces and find eigenvalues, eigenvectors and diagonalization and apply diagonalization to find powers of matrices, etc.

BSC-273.5 Calculate Matrix norms and use it in conditioning of numbers and stability problems and convergence of matrices.

BSC-273.6 Calculate SVD and reconstruct a rectangular and square matrix from SVD elements.

iv. Articulation Matrix (as below)

PO → / CO ↓	a	b	c	d	e	f	g	h	i	j	k	l
BSC-273.1	3	3										2
BSC-273.2	3	3										2
BSC-273.3	3	3										2
BSC-273.4	3	3	2									2
BSC-273.5	3	3	2	2	1							2

v. Course contents:

Unit 1: Vector Spaces (06 hours)

Review of vector spaces, Subspaces, Linear dependence and independence, Basis and dimensions.

Unit 2: Linear Transformations (06 hours)

Basic concepts in Linear Transformations, Use of elementary row operations to find coordinate of a vector, change of basis matrix, matrix of a linear transformations and subspaces associated with matrices. LU decomposition

Unit 3: Inner Product Spaces (06 hours)

Inner Product Spaces, Orthogonal Bases, Gram-Schmidt Orthogonalization, QR Factorization, Cholesky Decomposition, Normed Linear Spaces.

Unit 4: Matrix Norms (05 hours)

Matrix Norm, condition numbers and applications, convergent matrices, stability of non-linear system.

Unit 5: Diagonalization (10 hours)

Eigenvalue and Eigenvectors, Diagonalization and its applications, Positive Definite Matrices and their applications, Computation of Numerical Eigenvalues.

Unit 6: Singular Value Decomposition (SVD) (12 hours)

Singular Value Decomposition, Matrix Properties via SVD, Projections, Least Squares Problems, Application of SVD.

References:

1**.** Gilbert Strang, Linear Algebra and Its Applications, 4th edition, Cengage Publications.
2. Anton and Rorres, Elementary Linear Algebra Applications version, 9th Edition, Wiley India Publications.
3. David C Lay, Linear Algebra and its Applications, Addition-Wesley
4. S. Kumaresan, Linear Algebra – A Geometric Approach, Prentice Hall India
5. D. Poole, Linear Algebra: A Modern Introduction, 2nd edition, Brooks/Cole, 2005.
6. E. Kreyszig, Advanced Engineering Mathematics, 9th edition, John wiley and Sons, 2006.

ESC282	Digital Electronics	3L:0T: 2P	4 credits

ii. Course Objectives:

Objective.1 To understand number representation and conversion between different representation in digital electronic circuits.

Objective.2 To analyze logic processes and implement logical operations using combinational logic circuits.

Objective.3 To understand concepts of sequential circuits and to analyze sequential systems in terms of state machines.

Objective.4 To implement combinational and sequential circuits using VHDL

Objective.5 To understand characteristics of memory and their classification.

iii. Course Outcomes: After successful completion of this course student will be able to:

ESC-CS-201.1 Convert different type of codes and number systems which are used in digital communication and computer systems.

ESC-CS-201.2 Analyze, design and implement combinational logic circuits

ESC-CS-201.3 Analyze, design and implement sequential logic circuits.

ESC-CS-201.4 Classify different semiconductor memories.

ESC-CS-201.5 Simulate and implement combinational and sequential circuits using VHDL systems.

iv. Articulation Matrix

PO/PSO⇒ ⇓ CO	a	b	c	d	e	f	g	h	i	j	k	l	PSO1	PSO2	PSO3
ESC-CS-201.1	3	2	2	2	-	1	2	1	-	1	-	1	3		2
ESC-CS-201.2	3	1	3	2	2		3		1	1	1	1	3	1	
ESC-CS-201.3	3	3	3	2	2	2		3		2		2	3		1
ESC-CS-201.4	1	2	2	2	2	2		3		2		2	3		1
ESC-CS-201.5			3	1	3	2					2	2	1	1	3

V. Course Contents:

Unit-I: Introduction: Number systems, code conversions- binary code to gray code and gray to binary, BCD to Excess –3, Excess–3 to, BCD code, error detecting and correcting codes etc.

Unit-II: Combinational Logic Design: Switching algebra, combinational circuit analysis, combinational circuit synthesis, and combinational circuit minimization, K-Map of three, four, five variable functions, minimizing SOP and POS expressions. Quine-McClusky minimization, timing hazards, combinational PLDs, design of encoders, decoders, multiplexers, comparators, arithmetic circuits- half and full adders, ripple adders, subtractors, carry look ahead adders.

Unit-III: Sequential Logic Design: Latches and flip flops, edge triggered and master-slave flip flops (SR, JK, D, T, etc.), clocked synchronous state machine analysis and design, designing state machines using state diagrams, state machine synthesis using transition lists, decomposing state machines, feedback sequential circuit design.

Unit-IV: Counters and Shift Registers: Asynchronous counters, Synchronous counters, MOD counters, presentable counters, shift counters, Up-down counters, Ripple counters, Shift Registers, Serial in Serial

out, Serial in parallel out, Parallel in Serial out, and Parallel in Parallel out shift Registers, impediments to synchronous design.

Unit-V: Designing using VHDL: Introduction to VHDL, modeling styles, data flow, behavioral, structural and mixed, VHDL description of combinational networks, modeling flip flops using VHDL, VHDL models for multiplexer, compilation and simulation of VHDL code, modeling a sequential machine, variables, signals and constants, arrays, VHDL operators, VHDL functions, VHDL procedures, attributes, multilevel logic and signal resolution.

Unit-VI: Semiconductor Memories: Introduction, memory organization and operation, expanding memory size, classification and characteristics of memories, sequential memory, read-only memory, read and write memory, content addressable memory.

Reference Books:

1. J. F. Wakerly, Digital design - Principles and practices, PH International Pearson India, Third edition.
2. M Morris Mano "Digital Design" 3rd Edition Prentice Hall, 2001, ISBN-10 / ASIN:0130621218 ISBN -13 / EAN:9780130621214
3. R.P. Jain, "Modern Digital Electronics", 3rd Edition, Tata McGraw -Hill, 2003, ISBN 0 –07– 049492 –4\
4. A. P. Malvino, D. P. Leach and G. Saha, "Digital Principles and Applications," 7th Edition, McGraw Hill, 2010.

PCC-CS201	Discrete Mathematics	3L:0T:0P	3 credits

i. Course Objectives:

Objective.1 Use mathematically correct terminology and notation.
Objective.2 Construct correct direct and indirect proofs.
Objective.3 Use division into cases in a proof.
Objective.4 Use counter examples.
Objective.5 Apply logical reasoning to solve a variety of problems.

ii. Course Outcomes:

PCC-CS-201.1 For a given logic sentence express it in terms of predicates, quantifiers, and logical connectives
PCC-CS-201.2 For a given a problem, derive the solution using deductive logic and prove the solution based on logical inference
PCC-CS-201.3 For a given a mathematical problem, classify its algebraic structure.
PCC-CS-201.4 Evaluate Boolean functions and simplify expressions using the properties of Boolean algebra.
PCC-CS-201.5 Develop the given problem as graph networks and solve with techniques of graph theory.

iii. Articulation Matrix

PO/PSO ➡ ⬇ CO	a	b	c	d	e	f	g	h	i	j	k	l	PSO 1	PSO 2	PSO 3
PCC-CS-201.1	3	2	2	2					1			2	3	1	
PCC-CS-201.2	3	2	2	2					1			2	3	1	
PCC-CS-201.3	3	2	2	2					1			2	3	1	
PCC-CS-201.4	3	2	2	2					1			2	3	1	
PCC-CS-201.5	3	2	2	2					1			2	3	1	

iv. Course contents:

UNIT 1:
Sets, Relation and Function: Operations and Laws of Sets, Cartesian Products, Binary Relation, Partial Ordering Relation, Equivalence Relation, Image of a Set, Sum and Product of Functions, Bijective functions, Inverse and Composite Function, Size of a Set, Finite and infinite Sets, Countable and uncountable Sets, Cantor's diagonal argument and The Power Set theorem, Schroeder-Bernstein theorem. **Principles of Mathematical Induction**: The Well-Ordering Principle, Recursive definition, The Division algorithm: Prime Numbers, The Greatest Common Divisor: Euclidean Algorithm, The Fundamental Theorem of Arithmetic.
UNIT 2:
Basic counting techniques-inclusion and exclusion, pigeon-hole principle, permutation and combination.
UNIT 3:
Propositional Logic: Syntax, Semantics, Validity and Satisfiability, Basic Connectives and Truth Tables, Logical Equivalence: The Laws of Logic, Logical Implication, Rules of Inference, The use of Quantifiers. **Proof Techniques:** Some Terminology, Proof Methods and Strategies, Forward Proof, Proof by Contradiction, Proof by Contraposition, Proof of Necessity and Sufficiency.

UNIT 4:

Algebraic Structures and Morphism: Algebraic Structures with one Binary Operation, Semi Groups, Monoids, Groups, Congruence Relation and Quotient Structures, Free and Cyclic Monoids and Groups, Permutation Groups, Substructures, Normal Subgroups, Algebraic Structures with two Binary Operation, Rings, Integral Domain and Fields. Boolean algebra and Boolean Ring, Identities of Boolean Algebra, Duality, Representation of Boolean Function, Disjunctive and Conjunctive Normal Form

UNIT 5:

Graphs: Graphs and their properties, Degree, Connectivity, Path, Cycle, Sub Graph, Isomorphism, Eulerian and Hamiltonian Walks, Graph Coloring, Coloring maps and Planar Graphs, Coloring Vertices, Coloring Edges, List Coloring, Perfect Graph, definition properties and Example.

UNIT 6:

Trees: Introduction, Applications of Trees, Tree Traversal, Trees and Sorting, Spanning Trees, Minimum Spanning Trees.

Text Books:

1. Kenneth H. Rosen, Discrete Mathematics and its Applications, Tata McGraw – Hill
2. Susanna S. Epp, Discrete Mathematics with Applications, 4th edition, Wadsworth Publishing Co. Inc.
3. C L Liu and D P Mohapatra, Elements of Discrete Mathematics A Computer Oriented Approach, 3rd Edition by, Tata McGraw – Hill.

Reference books:

1. J.P. Tremblay and R. Manohar, Discrete Mathematical Structure and Its Application to Computer Science", TMG Edition, Tata Mcgraw-Hill
2. Norman L. Biggs, Discrete Mathematics, 2nd Edition, Oxford University Press.
3. Schaum's Outlines Series, Seymour Lipschutz, Marc Lipson, Discrete Mathematics, Tata McGraw – Hill

PCC-CS202	Data Structures	3L:0T: 2P	4 credits

i. Course Objectives

Objective.1 Understand and remember algorithms and its analysis procedure.
Objective.2 Introduce the concept of data structures through ADT including List, Stack, Queues.
Objective.3 To design and implement various data structure algorithms.
Objective.4 To introduce various techniques for representation of the data in the real world.
Objective.5 To develop application using data structure algorithms.
Objective.6 Study and analyze the complexity of various algorithms.

ii. Course Outcomes:

PCC-CS-202.1 Understand the concept of Dynamic memory management, data types, algorithms, Big O notation.
PCC-CS-202.2 Understand abstract data types, basic data structures such as arrays, linked lists, stacks and queues.
PCC-CS-202.3 Understand non-linear data structures
PCC-CS-202.4 Describe the hash function and concepts of collision and its resolution methods
PCC-CS-202.5 Solve problem involving linear and non-linear data structures
PCC-CS-202.6 Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data

iii. Articulation Matrix

(3) High, **(2)** Medium, **(1)** Low															
PO/PSO→ ↓ CO	a	b	c	d	e	f	g	h	i	J	k	l	PSO1	PSO2	PSO3
PCC-CS-202.1			2	2									2	1	1
PCC-CS-202.2	1		3										3		
PCC-CS-202.3	2		3	2									3	1	
PCC-CS-202.4	1												1		
PCC-CS-202.5	3		3	2									3	1	
PCC-CS-202.6	1		2	3									2		1

iv. Course Contents:

Unit 1: Introduction: Basic Terminologies: Elementary Data Organizations, Data Structure Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Asymptotic Notations, Time-Space trade off. **Searching:** Linear Search and Binary Search Techniques and their complexity analysis.

Unit 2: Stacks and Queues: ADT Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation – corresponding algorithms and complexity analysis. ADT queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each types of Queues: Algorithms and their analysis.

Unit 3: **Linked Lists:** Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and

Queue, Header nodes, doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and the complexity analysis.

Unit 4: **Trees:** Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, Applications of Binary Trees. Tree variants: AVL Tree, B Tree, B+ Tree

Unit 5: Graph: Basic Terminologies and Representations, Graph search and traversal algorithms and complexity analysis.

Unit 6: Sorting and Hashing: Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort; Performance and Comparison among all the methods, Hashing.

Text Books:

1. "Fundamentals of Data Structures", Illustrated Edition by Ellis Horowitz, Sartaj Sahni, Computer Science Press.

Reference Books:

1. Algorithms, Data Structures, and Problem Solving with C++", Illustrated Edition by Mark Allen Weiss, Addison-Wesley Publishing Company
2. "How to Solve it by Computer", 2nd Impression by R. G. Dromey, Pearson Education.

PCC-CS203	Object Oriented Programming with Java	3L:0T:2P	4 credits

i. Course Objectives:

Objective.1 Understand fundamentals of programming such as variables, conditional and iterative execution, methods, etc.

Objective.2 Understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.

Objective.3 Be aware of the important topics and principles of software development.

Objective.4 Have the ability to write a computer program to solve specified problems.

Objective.5 Be able to use the Java SDK environment to create, debug and run simple Java programs.

ii. Course Outcomes:

PCC-CS-203.1 Be able to understand the basics of OOP and Object-oriented approach to design software to solve real world problems based on object-oriented principles.

PCC-CS-203.2 Students be able to think in terms of classes, Objects, Interfaces.

PCC-CS-203.3 Be able to test, document and prepare a professional looking software.

PCC-CS-203.4 To be able to apply an object-oriented approach to programming and identify potential benefits of object-oriented programming over other approaches.

iii. Articulation Matrix

PO/PSO➡ ⬇ CO	a	b	c	d	e	f	g	h	i	J	k	l	PSO 1	PSO 2	PSO 3
PCC-CS-203.1	2	3	3	3	3	1			3		2	2	1	3	3
PCC-CS-203.2	1	3	3	3	3				2		1	3	1	3	3
PCC-CS-203.3	1	2	2	2	3				2		1	3	1	3	3
PCC-CS-203.4	1	2	3	3	3	1			2		1	2	1	3	3

iv. Course Contents:

Unit 1

Fundamentals of Object-oriented Programming: Introduction, Differences with Procedural Languages, Object Oriented Paradigm: Objects and classes, Data abstraction and Encapsulation, Inheritance and Polymorphism, Function overloading, Exceptions.

Unit 2

Java Evolution: Features of java, Java Environment, Java Virtual Machine. Constants, variables and Data types, Arrays, Stings and vectors, Operators & Expressions and Control Structures.

Unit 3

Java Classes, Objects and methods: Abstract classes, Static methods, Inner classes, Packages, Wrapper classes, Interfaces: Multiple Inheritance, Putting Classes together.

Unit 4
Exception handling: Exception as objects, Exception hierarchy, Try catch finally Throw, throws

Unit 5
IO package: Input streams, Output streams, Object serialization, Deserialization, Sample programs on io files, Filter And Pipe Streams.

Unit 6
Multi-Threading: Thread life cycle, Multi-threading advantages and issues, Simple thread program, Thread synchronization.

Reference Books:
1. E. Balagurusamy, Programming with Java A Primer, TMH, 1998.
2. Herbert schildt, The Complete Reference JAVA2, 2nd ed., TMH, 2002.
3. Horstmann, Cornell, Core Java 2: Volume 1-Fundanmentals, Pearson Education, 2000.
4. Kathy Sierra & Bert Bates Head First Java, 2nd edition O'RELLY 2015.

Note: Student will perform at least 12 Practical's based upon above syllabus.

PCC-CS204	Numerical and Scientific Computing	3L:0T:2P	4 credits

i. Course Objectives:

Objective.1 To provide suitable and effective methods called Numerical Methods, for obtaining approximate representative numerical results of the problems.

Objective.2 To solve problems in the field of Applied Mathematics, Theoretical Physics and Engineering which requires computing of numerical results using certain raw data.

Objective.3 To solve complex mathematical problems using only simple arithmetic operations. The approach involves formulation of mathematical models of physical situations that can be solved with arithmetic operations.

Objective.4 To deal with various topics like finding roots of equations, solving systems of linear algebraic equations, interpolation and regression analysis, numerical integration & differentiation, solution of differential equation, boundary value problems, solution of matrix problems.

Objective.5 To facilitate numerical computing.

ii. Course Outcomes: On completion of the course students will be able to

PCC-CS-204.1. Apply Numerical analysis which has enormous application in the field of Science and some fields of Engineering.

PCC-CS-204.2. Familiar with finite precision computation.

PCC-CS-204.3. Familiar with numerical solutions of nonlinear equations in a single variable.

PCC-CS-204.4. Familiar with numerical integration and differentiation, numerical solution of ordinary differential equations.

PCC-CS-204.5. Familiar with calculation and interpretation of errors in numerical method.

PCC-CS-204.6. Familiar with programming with numerical packages like MATLAB or etc.

iii. Articulation Matrix

(3) High, **(2)** Medium, **(1)** Low															
PO/PSO➡ ⬇ CO	a	b	c	d	e	f	g	h	i	J	k	l	PSO1	PSO2	PSO3
PCC-CS-204.1		3				1	3			2	1	3	3	3	1
PCC-CS-204.2		2			1	2		1	2			1		2	
PCC-CS-204.3		2			1	2		1	2				3		1
PCC-CS-204.4	3			1	2		1	2	2			1		2	
PCC-CS-204.5	3		2		2							2		2	3
PCC-CS-204.6.	3			2				1					1		3

iv. Course Contents:

Unit 1

Introduction: Introduction to Scientific Computing.

Unit 2

Review of matrices and linear systems: Matrices and Matrix Operations**,** vectors in 2D and 3D, Linear Transformations of Euclidean n-Spaces with applications in Computer Graphics and Cryptography, Eigenvalues and Eigenvectors, diagonalization, orthogonal diagonalization, Linear Least Squares.

Unit 3

Iterative Methods: Successive Bisection, Method of False position, Newton Rampson Method, Comparison of Iterative Methods, Solution of Polynomial Equations and Solution of Non Linear Equations.

Unit 4

Interpolation, **Numerical integration and Differentiation**: Solving Initial and Boundary Value Problems for Ordinary Differential Equations. Throughout the course implementation of the various methods and their comparisons with professionally written software such as Matlab, Scilab, LINPACK, Mathematica, will be emphasized with the understanding of various data
structures, storage schemes etc.

Reference Books:

1. Samuel Conte and Carl De Boor, Elementary Numerical Analysis, McGraw Hill International Edition.
2. V. Rajaraman, Computer Oriented Numerical Methods, PHI, 1994.
3. H. Anton and C. Rorrers, Elementary Linear Algebra (applications version), 9th ed., Willey India Pvt. Ltd., 2009.
4. W. Press, W. Vetterling, B. Flannery, S. Teukolsky, Numerical recipes in C: The Art of Scientific Computing, 2nd ed., Cambridge University Press, 1992.
5. Gilbert Strang, Linear Algebra and its applications, Wellesley-Cambridge Press, 2003.
6. Ralph G. Stanton, Numerical Methods for Science and Engineering, PHI.

Note: Student will perform at least 12 Practical based upon above syllabus.

HMC278	Human Values and Social Ethics	2L:0T:0P	2 credits

i. Course objectives:

Objective.1 To create an awareness on Professional Ethics and Human Values.
Objective.2 To help students understand the Harmony for life.
Objective.3 To understand co-existence.
Objective.4 To study the moral issues and decisions confronting individuals and organizations.

ii. Course Outcomes:

After completion of the course the student is able to:

HMC-278.1 Understand the core human values that shape the ethical behavior of a person.
HMC-278.2 Understand how values act as an anchor of actions for life.
HMC-278.3 Learn the need of Human values and Professional ethics in life.
HMC-278.4 Understand Harmony at Four levels of life.
HMC-278.5 Learn the moral issues and problems in profession and find the solution to those problems.
HMC-278.6 Understand the core human values that shape the ethical behavior of a person.

iii. Articulation Matrix:

(3) High, **(2)** Medium, **(1)** Low												
	a	b	c	d	e	f	g	h	i	J	k	l
HMC-278.1			1			2		3				
HMC-278.2								3				
HMC-278.3								3				3
HMC-278.4						2		3				
HMC-278.5			1			2		3	2			3

iv. Course Contents

Unit 1 Course introduction

Need, basic guidelines, content and process for value education, Moral values, Social, Environmental, Economic values, Purusharth, Duty, Justice, Equality.
A look at basic aspirations: self exploration, happiness and prosperity, Fulfillment of human aspirations.

Unit 2 Understanding the harmony

Thoughtful human being harmony, sentient, attitude and its importance in relationship, significance of restraint and health *(Yama and Niyama)*, Egoism, Altruism, Universalism (idea of Sarvodaya and Vasudevkutumbakam), The problem of hierarchy of values and their choice (View of Pt Madan Mohan Malviya and Mahatma Gandhi), human goal settings and life management techniques.

Unit 3 Understanding professional ethics

Harmony at various levels and understanding professional ethics, creating environmentally aware engineers, humanistic universal education, humanistic universal education, natural acceptance of human values, ethical human conduct.

Unit 4 Competence of professional ethics

Management models for present technologies, strategies for integrating humans in family and at all levels of existence, relevance of the above strategies in becoming responsible engineers, technologists and managers.

Unit 5 Motivation

Contribution of ancestors in science and technology development to raise self esteem in Indian context.

Text Books/ Reference Books:

1. R. R. Gaur, R. Sangal, G. P. Bagaria, A Foundation Course in Value Education, 2009.
2. A. Nagraj, Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak, 1998.
3. Sussan George, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
4. P. L. Dhar, R. R. Gaur, Science and Humanism, Commonwealth Purblishers, 1990.
5. A. N. Tripathy, Human Values, New Age International Publishers, 2003.
6. Subhas Palekar, How to practice Natural Farming, Pracheen (Vaidik) Krishi Tantra Shodh, Amravati, 2000.
7. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, Limits to Growth – Club of Rome's report, Universe Books, 1972.
8. E. G. Seebauer & Robert L. Berry, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press, 2000.
9. M. Govindrajran, S. Natrajan & V. S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.
10. Subroto Bagchi, The Professional.
11. B. P. Banerjee, Foundations of Ethics and Management, Excel Books, 2005.
12. B L Bajpai, Indian Ethos and Modern Management, New Royal Book Co., Lucknow, 2004, Reprinted 2008.
13. Dr. Nityanand Mishra Niti Shastra ,Motilal Banarasidas 2005
14. Dr. Avdesh Pradhan Mahatma ke Vichar , BHU Varanasi 2007

BSC261	Mathematical Foundation For Engineering	2L:0T:0P	Audit

i. Course Objectives:

Objective.1 To develop the sound conceptual understanding of Algebra, coordinate geometry, complex numbers , vectors, matrices, Calculus and Differential Equations.

Objective.2 To develop the foundation for engineering mathematics and other engineering courses.

ii. Course Outcomes: At the end of the course student will be able to

BSC-771.1 analyze the structure of complex numbers, quadratic equations, vectors and matrices and their uses.

BSC-771.2 Find the standard and general equations of lines, circles, conic sections, and their properties.

BSC-771.3 Sketch the graphs of functions and can evaluate limit, continuity, derivatives, integrations.

BSC-771.4 Formulate and solve first order differential equations.

iii. Articulation Matrix

PO ➡ / CO ⬇	a	b	c	d	e	f	g	h	i	J	k	l
BSC-771.1	3	3	1	2								2
BSC-771.2	3	3	1	2								1
BSC-771.3	3	3										1
BSC-771.4	3	3	2									2

Note: 1-Low, 2-Medium or 3- High.

iv. Course Contents:

Unit-1 Complex Numbers (05 hours)

Complex numbers as ordered pairs. Argand's diagram. Triangle inequality. Powers and roots of complex numbers, De Moivre's Theorem.

Unit-2 Algebra (05 hours)

Quadratic equations and express-ions. Permutations and Combinations. Binomial theorem for a positive integral index.

Unit-3 Coordinate Geometry (07 hours)

Coordinate Geometry: Locus. Straight lines. Equations of circle, parabola, ellipse and hyperbola in standard forms. Parametric representation.

Unit-4 Vectors and Matrices (08 hours)

Addition of vectors. Multiplication by a scalar. Scalar product, cross product and scalar triple product with geometrical applications. Matrices and Determinants: Algebra of matrices. Determinants and their properties. Inverse of a matrix. Cramer's rule.

Unit-5 Differential Calculus (10 hours)

Function. Inverse function. Elementary functions and their graphs. Limit. Continuity. Derivative and its geometrical significance. Differentiability. Rules of derivatives, Applications of Derivatives: Tangents and Normals, Increasing and decreasing functions. Maxima and Minima

Unit-6 Integral calculus (10 hours)

Integration as the inverse process of differentiation. Integration by parts and by substitution. Definite integral and its application to the determination of areas (simple cases). Solving first order differential equations:Exact differential equations and first order linear differential equations.

References:

1. Bernard and Child, Higher Algebra, Macmillan and Co. Pvt. Ltd, New York.
2. J.V. Uspensky, Theory of equations, macGraw Hill Publications.
3. S. L. Loney, The Elements of Coordinate Geometry, Macmilliams and Co., New York
4. G.B.Thomas, M.D.Weir, J. Hass, Thomas' calculus, 12th edition, Pearson Publications
5. H.Anton, C. Rorrers, Elementary Linear Algebra Applications version, 9th edition, Wiley publications.

SEMESTER-II

BSC276 Mathematics – IV: Vector Calculus and Statistical Methods 3L:0T:0P 3 credits

i. Course objectives:

Objective.1 To Define and compute the line integral, surface integral, volume integral using Green's Theorem, Stokes's Theorem and the Divergence Theorem.

Objective.2 To provide students with the foundations of probabilistic and statistical analysis mostly used in varied applications in engineering and science.

Objective.3 To understand probability distributions (univariate and bivariate) and their properties

Objective.4 To learn the statistical parameters for different distributions, correlation and regression

Objective.5 To understand the method of curve fitting, testing of hypothesis, goodness of fit

ii. Course Outcomes: After completion of the course the student is able to:

BSC-276.1 Evaluate line integrals, surface integrals, and volume integrals and convert line integrals into area integrals and surface integrals into volume integrals using integral theorems

BSC-276.2 To develop techniques of data interpretation.

BSC-276.3 Develop problem solving techniques needed to accurately calculate probabilities and describe the properties of discrete and continuous distribution functions.

BSC-276.4 Use statistical tests in testing hypotheses on data.

BSC-276.5 Compute covariances, and correlations, Apply the tests of goodness of fit.

iv. Articulation Matrix:

PO ➡ / CO ⬇	a	b	c	d	e	f	g	h	i	J	k	l
BSC-276.1	3	3	2	2								2
BSC-276.1	3	3										2
BSC-276.1	3	3	2									2
BSC-276.1	3	3	2	3		1						2
BSC-276.1	3	3	2	2		1					1	1

Note: 1-Low, 2-Medium or 3- High.

v. Course contents:

Unit 1: Vector Calculus (10 hours)

Line integrals, surface integrals, Integral Theorems: The divergence theorem of Gauss, Greens theorem, and Stokes theorem

Unit 2: Analysis of Statistical Data (03 hours)

Frequency distribution; Frequency curve and histogram; Measure of central tendency and dispersion.

Unit 3: Random variables and Probability Distributions (08 hrs)
Basic concepts of probability and its properties; Conditional probability and independent events; Random variables, discrete and continuous random variables, Mean and variance of Binomial, Poisson and Normal distributions and applications.

Unit 4: Sampling Distributions and Interval of Estimation (08 hours)
Sampling Distributions: t distribution, Chi-square distribution, F-distribution, Interval of estimation

Unit 5: Testing of Hypothesis-Large sample Tests (08 hours)
Relation between confidence interval and testing of hypothesis; testing of hypothesis, classification of hypothesis tests; large sample tests.

Unit 6: Testing of Hypothesis-Small Samples Tests (08 hours)
t-test for single mean and differences of means, F-test for equality of two population variances,; chi-square test for single variance, Chi-square test for goodness of fit, simple correlation and regression.

References:
1. E. Kreyszig, Advanced Engineering Mathematics, Eighth Edition, John Wiley and Sons, 2015.
2. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, Fifth Edition, Narosa Publishing House, 2016.
3. V. K. Rohatgi and A.K. Md. Ehsanes Saleh, An Introduction to Probability and Statistics, 2nd Edition.
4. D. C. Montgomery and G.C. Runger, "Applied Statistics and Probability for Engineers", 5th edition, John Wiley & Sons, (2009).
5. P. S. Mann, Introductory Statistics, Wiley Publications, 7th edition (2013).

PCC-CS205	Microprocessors and Interfacing	3L:0T:2P	4 credits

i. Course objectives:

Objective.1 The objective of this course is to become familiar with the architecture and the instruction set of an Intel microprocessor.

Objective.2 Assembly language programming will be studied as well as the design of various types of digital and analog interfaces.

Objective.3 The accompanying lab is designed to provide practical hands-on experience with microprocessor software applications and interfacing techniques.

ii. **Course Outcomes: After completion of the course the student is able to:**

PCC-CS-205.1 Understanding of the Intel 8086/8088 architecture.

PCC-CS-205.2 Knowledge of the 8086/8088 instruction set and ability to utilize it in programming.

PCC-CS-205.3 Understanding of the Intel 8086/8088 real mode memory addressing.

PCC-CS-205.4 Ability to interface various devices to the microprocessor.

iii. Articulation Matrix

(3) High, **(2)** Medium, **(1)** Low															
	a	b	c	d	e	f	g	h	i	J	k	l	PSO1	PSO2	PSO3
PCC-CS-205.1	3	2	2						1			3	3		
PCC-CS-205.2	3	3	3										3		3
PCC-CS-205.3	3	3	3						3			3	3	3	2
PCC-CS-205.4	3	3	3	2					1			2		3	2

iv. Course Contents:

Unit 1

Introduction: Internal architecture and pin diagram of 8086/8088 microprocessor, Minimum and maximum mode, Timing Diagrams, Address decoding, even and odd memory banks, Accessing memory and I/O ports.

Unit 2

Programming with 8086/8088: Addressing Modes, Instruction set, Instruction encoding format, Assembler directives, 8086 programming examples, String operations, File I/O processing, Far and Near procedures, Macros, Timing and delay loops, '.EXE' and '.COM' file structures, BIOS calls: INT 10H calls, DOS calls: INT 21H calls, TSRs.

Unit 3

Interrupt Structure: 8086 interrupt structure, 8259 priority interrupt controller, interfacing and programming.

Unit 4

Interfacing with 8086/8088: Memory interfacing, Programmable parallel ports, Intel 8255, Block diagram and interfacing, Keyboard/Display Controller 8279: block diagram, system connections and programming.

Reference Books:

1. Y. Liu, G. Gibson, Microcomputer Systems: The 8086/8088 Family, Architecture, Programming and Design, 2nd ed., Prentice-Hall of India, 1986.

2. A. Ray, K. M. Bhurchandi, Advanced Microprocessors and Peripherals: Architecture, Programming and Interfacing, Tata McGraw-Hill, 2000.

3. J. Uffenbeck, 80x86 Family: Design, Programming, and Interfacing, Prentice Hall, 2003.

4. Barry B. Brey, the Intel Microprocessors: 8086/8088, 80186, 80286, 80386, 80486, Pentium, Pentium Pro, and Pentium II, 5th ed., Prentice-Hall, 2001.

5. Udaykumar, Advanced Microprocessors -Intel 8086/8088 architecture, programming and interfacing, TMH**.**

Note: Student will perform at least 12 Practical's based upon above syllabus.

PCC-CS206	Computer Architecture and Organization	3L:0T:0P	3 credits

i. Course objectives:

Objective.1 To conceptualize the basics of organizational and architectural issues of a digital computer.

Objective.2 To analyze performance issues in processor and memory design of a digital computer.

Objective.3 To understand various data transfer techniques in digital computer.

Objective.4 To analyze processor performance improvement using instruction level parallelism

ii. Course Outcomes: After completion of the course the student is able to:

PCC-CS-206.1 Understand basic structure of a computer.

PCC-CS-206.2 Understand the organization of the Control unit, Arithmetic and Logical unit, Memory unit and the I/O unit.

PCC-CS-206.3 Become proficient in quantitative performance evaluation of computer systems.

PCC-CS-206.4 Understand how programs and data are stored and represented in a computer system.

PCC-CS-206.5 To be able to design and analyze pipelined control units

PCC-CS-206.6 To be able to understand and design parallel processing architectures.

iii. Articulation Matrix

(3) High, **(2)** Medium, **(1)** Low															
	a	b	c	d	e	f	g	h	i	J	k	l	PSO1	PSO2	PSO3
PCC-CS-206.1		2	2			2			1			3	3		
PCC-CS-206.2	3		3			2							3		3
PCC-CS-206.3						3			3			3		3	
PCC-CS-206.4	3	3		2					1					3	
PCC-CS-206.5	3	3	2			2						3		2	3
PCC-CS-206.6	3	3		2					1			2	3		3

iv. Course contents:

Unit 1: Introduction: Concept of computer organization and architecture, Fundamental unit, Computer function and interconnection, CPU structure and function.

Unit 2: Instruction Sets: Characteristics, Types of operands, Types of operations, Assembly language, Addressing modes, Instruction format, Types of instruction, Instruction execution, Machine state and processor status, Structure of program, Introduction to RISC and CISC architecture.

Unit 3: Computer Arithmetic: The arithmetic and logic Unit, Integer representation, Integer arithmetic, Floating point representation, Floating point arithmetic, Introduction of arithmetic co-processor.

Unit 4: Memory Organization: Internal Memory: Semiconductor main memory, Error correction, Advanced DRAM organization, Virtual memory systems and cache memory systems. External Memory: Organization and characteristics of magnetic disk, Magnetic tape, Optical memory, RAID, Memory controllers.

Unit 5: Control Unit: Control unit operation: Micro-operations, Control of the processor, Hardwired implementation, Micro-programmed Control Unit, Basic concepts, Micro-instruction sequencing, Micro-instruction execution, Applications of micro-programming.

Unit 6: Input/ Output Organization: External devices, I/O module, Programmed I/O, Interrupt driven I/ O, Direct memory access, I/O channels and processors, External interface. Instruction pipe-lining: Concepts. Parallel processing: Multiple processor organization, Symmetric multiprocessor, Cache coherence and the MESI protocol.

Reference Books:

1. Hennessy and Patterson, Computer Architecture: A Quantitative Approach, Morgan and Kaufman Publication, 4th Edition, 2007.
2. Morris Mano, Computer System Architecture, Pearson Education India, 3rd Edition, 2007.
3. Mostafa Abd-El-Barr, Hesham El-Rewini, Fundamentals of Computer Organization and Architecture, Wiley Publication, 1st Edition, 2004.
4. Miles J. Murdocca, Vincent P. Heuring, Computer Architecture and Organization: An Integrated Approach, Wiley Publication, 1st Edition, 2007.
5. Sajjan G. Shiva, Computer Organization, Design, and Architecture, CRC Press, 5th Edition, 2013.

Text Books:

v. William Stalling, Computer Organization and Architecture: Designing for Performance, Prentice Hall Publication, 8th Edition, 2009.

vi. Hayes, Computer Architecture and Organization, McGraw-Hill Publication, 3rd Edition, 2012.

vii. Zaky, Computer Organization, McGraw-Hill Publication, 5th Edition, 2011.

PCC-CS207	Design and Analysis of Algorithms	3L:0T:2P	4 credits

i. Course objectives:

Objective.1 Analyze the asymptotic performance of algorithms.
Objective.2 Write rigorous correctness proofs for algorithms.
Objective.3 Demonstrate a familiarity with major algorithms and data structures.
Objective.4 Apply important algorithmic design paradigms and methods of analysis.
Objective.5 Synthesize efficient algorithms in common engineering design situations.

ii. **Course Outcomes: After completion of the course the student is able to:**

PCC-CS-207.1 For a given algorithms analyze worst-case running times of algorithms based on asymptotic analysis and justify the correctness of algorithms
PCC-CS-207.2 Describe the greedy paradigm and explain when an algorithmic design situation calls for it. For a given problem develop the greedy algorithms.
PCC-CS-207.3 Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Synthesize divide-and-conquer algorithms. Derive and solve recurrence relation.
PCC-CS-207.4 Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it.
PCC-CS-207.5 Develop the dynamic programming algorithms and analyze it to determine its computational complexity.
PCC-CS-207.6 For a given model engineering problem model it using graph and write the corresponding algorithm to solve the problems.
PCC-CS-207.7 Explain the ways to analyze randomized algorithms (expected running time, probability of error).
PCC-CS-207.8 Explain what an approximation algorithm is. Compute the approximation factor of an approximation algorithm (PTAS and FPTAS).

iii. Articulation Matrix

(3) High, **(2)** Medium, **(1)** Low															
	a	b	c	d	e	f	g	h	i	J	k	l	PSO1	PSO2	PSO3
PCC-CS-207.1	3	2	2						1			3	3		
PCC-CS-207.2	3	3	3										3		3
PCC-CS-207.3	3	3	3						3			3	3	3	2
PCC-CS-207.4	3	3	3	2					1			2		3	2
PCC-CS-207.5	3	3	2									3		2	3
PCC-CS-207.6	3	3	3	2					1			2	3		3

iv. Course Contents:

UNIT 1:

Introduction: Characteristics of algorithm. Analysis of algorithm: Asymptotic analysis of complexity bounds – best, average and worst-case behavior; Performance measurements of Algorithm, Time and space trade-offs, Analysis of recursive algorithms through recurrence relations: Substitution method, Recursion tree method and Masters' theorem.

UNIT 2:

Fundamental Algorithmic Strategies: Brute-Force, Greedy, Dynamic Programming, Branch and Bound and backtracking methodologies for the design of algorithms; Illustrations of these techniques for Problem-Solving, Bin Packing, Knap Sack TSP. Heuristics – characteristics and their application domains.

UNIT 3:

Graph: Traversal algorithms: Depth First Search (DFS) and Breadth First Search (BFS); Shortest path algorithms, Transitive closure.

UNIT 4:

Tree Algorithms: Minimum Spanning Tree, Topological sorting, Network Flow Algorithm.

UNIT 5:

Tractable and Intractable Problems: Computability of Algorithms, Computability classes – P, NP, NP-complete and NP-hard. Cook's theorem, Standard NP-complete problems and Reduction techniques.

UNIT 6:

Advanced Topics: Approximation algorithms, Randomized algorithms, Class of problems beyond NP – P SPACE

Text Books:

1. Introduction to Algorithms, 4TH Edition, Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, MIT Press/McGraw-Hill.
2. Fundamentals of Algorithms – E. Horowitz et al.

Reference books:

1. Algorithm Design, 1ST Edition, Jon Kleinberg and ÉvaTardos, Pearson.
2. Algorithm Design: Foundations, Analysis, and Internet Examples, Second Edition, Michael T Goodrich and Roberto Tamassia, Wiley.
3. Algorithms -- A Creative Approach, 3RD Edition, UdiManber, Addison-Wesley, Reading, MA.

PCC -CS208	Python Programming	3L:0T:2P	5 credits

i. Course objectives:

Objective.1 Basics of Python programming
Objective.2 Decision Making and Functions in Python
Objective.3 Object Oriented Programming using Python
Objective.4 Files Handling in Python
Objective.5 GUI Programming and Databases operations in Python

ii. Course Outcomes: After completion of the course the student is able to:

PCC-CS-208.1 Describe the Python language syntax including control statements, loops and functions to write programs for a wide variety problem in mathematics, science.
PCC-CS-208.2 Examine the core data structures like lists, dictionaries, tuples and sets in Python to store, process and sort the data.
PCC-CS-208.3 Interpret the concepts of Object-oriented programming as used in Python using encapsulation, polymorphism and inheritance.
PCC-CS-208.4 Discover the capabilities of Python regular expression for data verification and utilize matrices for building performance efficient Python programs.
PCC-CS-208.5 Identify the external modules for creating and writing data to excel files and inspect the file operations to navigate the file systems.
PCC-CS-208.6 To design GUI Applications in Python and different database operations

iii. Articulation Matrix

(3) High, **(2)** Medium, **(1)** Low															
	a	b	c	d	e	f	g	h	i	J	k	l	PSO1	PSO2	PSO3
PCC-CS-208.1	3	3	2			2			1			3	3		
PCC-CS-208.2	3		3			2							3		3
PCC-CS-208.3	3					3			3			3		3	
PCC-CS-208.4	3	3		2					1					3	
PCC-CS-208.5	2	1	2			2						3		2	3
PCC-CS-208.6	2	1		2					1			2	3		3

iv. Course contents:

Unit 1:

Informal introduction to programming, algorithms and data structures, Downloading and installing Python, run a simple program on Python interpreter.

Unit 2:

Variables, operations, control flow – assignments, conditionals, loops, functions: optional arguments, default values, Passing functions as arguments.

Unit 3:

Statements, Expressions, Strings: String processing. Exception handling, Basic input/output, Handling files.

Unit 4:

Class and Object, Data Structure: List, Tuple and Sequences, Set, Dictionaries.

Unit 5:

Using Database and Structured Query Languages (SQL): SQLite manager, Spidering Twitter using a Database, Programming with multiple tables, JOIN to retrieve data.

***Programming assignments are mandatory.**

Reference Books:

1. Mark Lutz, Learning Python, O'Reilly Media, 5th Edition, 2013.
2. Mark Pilgrim, Dive into Python 3, Apress Publication, 2nd Edition, 2009.
3. Allen B. Downey, Think Python, O'Reilly Media, 2nd Edition, 2012.
4. Jon Kleinberg and Eva Tardos, Algorithm Design, Pearson Education, 1st Edition, 2006.

Text Books:

1. Michael Urban and Joel Murach, Murach's Python Programming, Murach's Publication, 2016.
2. Charles Severance, Python for Informatics: Exploring Information, University of Michigan, Version 2.7.0, 2014.
3. Dr. R. Nageswara Rao, Core Python Programming, Dreamtech Press, 1st Edition, 2016.

MAC277	Indian Constitution	2L:0T:0P	Audit

(L - 2, T - 0, P - 0, C - 0 (mandatory Audit Course))

i. Course objectives:

Objective.1 To understand the basic foundation and the basic law for the governance of our nation, the history and the different types of Constitutions.

Objective.2 To understanding the importance and the different aspects of the Constitution.

Objective.3 To understand the basis and procedure of amendments.

Objective.4 To know the different aspects of the Union and the State Executive.

Objective.5 To know how our country was founded, who founded it, what are our rights are, what life was like, how life has changed, how the rights still apply today.

Objective.6 To know and understand the different rights enshrined in the Constitution and understand the rights and duties of the government.

ii. Course Outcomes: After completion of the course the student is able to:

MAC–277.1 Student will be able to understand how India has come up with a Constitution which is the combination of the positive aspects of other Constitutions.

MAC–277.2 Student will be able to understand the interpretation of the Preamble.

MAC–277.3 Student will be able to understand the basics of governance of our nation.

MAC–277.4 It helps in understanding the different aspects covered under the different important articles.

MAC–277.5 Student will be able to understand the basic law and its interpretation. Understand the important amendments which took place and their effects.

MAC–277.6 Student will be able to understand our Union and State Executive better.

MAC–277.7 Student will be able to that along with enjoying the rights one needs to fulfill one's duties.

v. Contents of the Course

1. Meaning of the constitution law and constitutionalism. Historical perspective of the Constitution of India. Salient features and characteristics of the Constitution of India
2. Scheme of the fundamental rights. The scheme of the Fundamental Duties and its legal status
3. The Directive Principles of State Policy –Its importance and implementation. Federal structure and distribution of legislative and financial powers between the Union and States.
4. Parliamentary form of Government in India. The constitution powers and status of the President of India.
5. Amendment of the Constitutional Powers and Procedure. The historical perspectives of the constitutional amendments in India.
6. Emergency Provisions: National Emergency, President Rule, Financial Emergency.
7. Local Self Government – Constitutional Scheme in India.
8. Scheme of the Fundamental Right to Equality. Scheme of the Fundamental Right to certain Freedom under Article 19. Scope of the Right to Life and Personal Liberty under Article 21.

Text Books:

1. Introduction to the Constitution of India by Durga Das Basu (Students Edn.) Prentice-Hall EEE, 19th /20th Edition, 2001.
2. An Introduction to Constitution of India by M. V. Pylee, Vikas Publishing, 2002.

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