SANJIVANI RURAL EDUCATION SOCIETY'S

SANJIVANI COLLEGE OF ENGINEERING KOPARGAON

(An Autonomous Institute Affiliated to SPPU Pune)

DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE STRUCTURE AND SYLLABUS - 2020 PATTERN

SECOND YEAR B. TECH.

Sanjivani College of Engineering, Kopargaon
(An Autonomous Institute affiliated to SPPU, Pune)

DECLARATION

We, the Board of Studies **INFORMATION TECHNOLOGY**, hereby declare that, We have designed the Curriculum of **S .Y. B Tech.** of Pattern **2020** w.e.f. A.Y **2021-2022** as per the guidelines . So, we are pleased to submit and publish this FINAL copy of the curriculum for the information to all the concerned stakeholders.

Submitted by

BoS Chairman

Head
Department of Information Technology
SRES College of Engineering
Kopargaon MS - 423603

Approved by

Dean Academics

Director

PROFILE

Sanjivani College of Engineering (An Autonomous Institute), Kopargaon is one among the premier technical institutes in Maharashtra state in the un-aided sector established in 1983.Department of Information Technology is established in the year 2001 with an intake of 60 students. Department is acquainted with 8 well equipped laboratories with latest hardware and Software, 3 class rooms and one tutorial Hall equipped with modern teaching aids and computing facilities. UG Program in IT department is accredited by NBA New Delhi for Second time in Academic Year 2019-2020 for three Years.

There are 15 experienced & well qualified teaching staff members & 6 supporting staff members who carry out the regular academic activities as well as curricular & extracurricular activities as per the plans prepared in advance at the beginning of every semester.

In the academic year 2019-2020 strength of students in department is 275. Apart from regular academic activities students take part in curricular & co curricular activities conducted by department organization ITERA as well as other department's organization & professional bodies in the institute like CSI, ISTE, and IEEE etc. Apart from the central library the department has its own library with a very good collection of reference book, text books and CSI magazines, IEEE magazines.

Along with regular academics Department of IT has started value added courses like SAP Certification Training Programme in collaboration with Primus Techsystems Pvt. Ltd. Pune and REDHAT Academy Centre, MBPS Infotech Pune.

IT Department has started capsule courses to improve technical skill sets of students. Department is having very good placements in various renowned and multi-national companies like TCS, Infosys, Persistent, Cognizant Wipro and many more.

Also to form well balanced Industry Interaction connect and bridge the gap between Industry and institution Department of IT has organized different events like Sanjivani Though Leader, Sanjivani I-connect and Sanjivani My Story Board.

Various personal and professional skill development programs like Communication and Soft Skill programs, Aptitude Training, Technical Skill enhancement programs, Foreign Language Certification Courses, Personal and Spiritual Development Programs, Entrepreneurship Development Activities, and Preparation courses for competitive Examinations (Gate/GRE/CAT etc.) are made available in campus. Students are given opportunities to develop and nurture their leadership qualities through Student Associations, Student Council, Professional Body activities and working as volunteers in various events organized at Department/ College level.

VISION AND MISSION

Vision of Institute

To develop world class professionals through quality education.

Mission of Institute

To create Academic Excellence in the field of Engineering and Management through Education, Training and Research to improve quality of life of people.

Vision of Department

To develop world class IT professionals through quality education.

Mission of Department

To create Academic Excellence in the field of Information Technology through Education, Industry Interaction, Training and Innovation to improve quality of life of people.

We are committed to develop industry competent technocrats with life-long learning capabilities and moral values.

PROGRAM EDUCATIONAL OBJECTIVES

PEO 1:

Graduates of IT program should possess knowledge of fundamental concepts in mathematics, science, engineering and technology as well as skills in the field of Information Technology for providing solution to complex engineering problem of any domain by analyzing, designing and implementing.

PEO 2:

Graduates of IT program should possess better communication, presentation, time management and teamwork skills leading to responsible and competent research, entrepreneurship and professionals, will be able to address challenges in the field of Information Technology at global level.

PEO 3:

Graduates of IT program should have commitment to societal contributions through communities and life-long learning.

PROGRAM OUTCOMES
PO1:Engineering knowledge
Apply the knowledge of mathematics, science,engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis
Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3:Design/development of solutions
Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4:Conduct investigations of complex problems
Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5: 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: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: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: Ethics
Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9:Individual and team work
Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10: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: 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: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 OUTCOMES
PSO1:
Attain the ability to provide software solutions by applying knowledge of Data Structures & Algorithms, Databases, Web Technology, System Software, Soft Computing and Cloud Computing.
PSO2:
Apply the knowledge of Computer Hardware & Networking, Cyber Security, Artificial Intelligence and Internet of Things to effectively integrate IT based solutions.
PSO3:
Apply the knowledge of best practices and standards of Software Engineering for Project Management.

DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE STRUCTURE AND SYLLABUS - 2020 PATTERN

SECOND YEAR B. TECH.

LIST OF ABBREVIATIONS			
Abbreviation	**Full Form**	**Abbreviation**	**Full Form**
ES	Engineering Science	HSMC	Humanity Science
PC	Professional Core	CA	Continuous Assessment
PE	Professional Elective	OR	End Semester Oral Examination
OE	Open Elective	PR	End Semester Practical Examination
ISE	In-Semester Evaluation	TW	Continuous Term work Evaluation
ESE	End-Semester Evaluation	BSC	Basic Science Course
PRJ	Project	MC	Mandatory Course

SEMESTER - III

Course		Course Title	Teaching Scheme Hours/ Week			Credits	Evaluation Scheme - Marks						
							Theory			OR	PR	TW	Total
Cat.	Code		L	T	P		ISE	ESE	CA				
PC	IT201	Discrete Mathematics	3	1	-	4	30	50	20	-	-	-	100
PC	IT202	Digital Electronics & Computer Organization	4	-	-	4	30	50	20	-	-	-	100
PC	IT203	Fundamentals of Data Structures	3	-	-	3	30	50	20	-	-	-	100
PC	IT204	Object Oriented Programming	3	-	-	3	30	50	20	-	-	-	100
HS MC	HS205	Universal Human Values And Ethics	3	-	-	3	30	50	20	-	-	-	100
PC	IT206	Digital Electronics Laboratory	-	-	2	1	-	-	-	-	-	50	50
PC	IT207	Fundamental of Data Structure Laboratory	-	-	2	1	-	-	-	-	50	-	50
PC	IT208	Object Oriented Programming Laboratory	-	-	2	1	-	-	-	50	-	-	50
MC	MC209	Mandatory Course-III	2	-	-	NON Credit	-	-	-	-	-	-	-
		Total	18	1	6	20	150	250	100	50	50	50	650

MC209	Mandatory Course-III	Constitution of India – Basic features and fundamental principles

SEMESTER - IV

Course		Course Title	Teaching Scheme Hours/ Week			Credits	Evaluation Scheme – Marks						
							Theory			OR	PR	TW	Total
Cat.	Code		L	T	P		ISE	ESE	CA				
PC	IT210	Microprocessor & Microcontroller	4	-	-	4	30	50	20	-	-	-	100
PC	IT211	Database Management System	3	-	-	3	30	50	20	-	-	-	100
BS	BS202	Engineering Mathematics - III	4	-	-	4	30	50	20	-	-	-	100
PC	IT213	Data Structures & Files	4	-	-	4	30	50	20	-	-	-	100
PC	IT214	Database Management System Laboratory	-	-	2	1	-	-	-	-	-	50	50
PC	IT215	Microprocessor & Microcontroller Laboratory	-	-	2	1	-	-	-	50	-	-	50
PC	IT216	Data Structures & Files Laboratory	-	-	2	1	-	-	-	-	50	-	50
PRJ	IT217	Seminar	2	-	-	2	-	-	-	50	-	-	50
PRJ	IT218	Mini Project	-	-	4	2	-	-	-	-	-	50	50
MC	MC219	Mandatory Course-IV	2	-	-	NON Credit	-	-	-	-	-	-	-
		Total	19	-	10	22	120	200	80	100	50	100	650

MC219	Mandatory Course-IV	Innovation - Project based – Sc., Tech, Social, Design & Innovation

Total Credits: 42

Total Marks: 1300

S.Y. B. Tech Information Technology Semester III

IT201: Discrete Mathematics		
Teaching Scheme	**Examination Scheme**	
Lectures: 3 Hrs./Week	**Continuous Assessment:**	**20 Marks**
Tutorial: 1 Hr/Week	**In-Sem Exam:**	**30 Marks**
	End-Sem Exam:	**50 Marks**
Credits: 4	**Total:**	**100 Marks**
Prerequisite Course: Basic Mathematics		

Course Objectives

1. To provide the knowledge of Set, proof techniques and determine logical possibilities.
2. To understand relation, functions among various entities in real world.
3. To introduce the basic of Group and Ring.
4. To learn to formulate problems mathematically using graph theory.
5. To understand the fundamental mathematics requirement used in cryptographic algorithms.
6. To comprehend the concept of decodability and prefix-free property.

Course Outcomes (COs):

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

	Course Outcome (s)	Bloom's Taxonomy	
		Level	**Descriptor**
CO1	**Apply**the basic terminology of set, proof techniques and determine logical possibilities in a given situation.	3	Apply
CO2	**Understand** relations & functions and to determine their properties.	2	Understand
CO3	**Solve** problems based on Group and Rings.	3	Apply
CO4	**Demonstrate** the Information Theory.	3	Apply
CO5	**Understand** the fundamental mathematical requirement of cryptographic algorithms.	2	Understand
CO6	**Understand** the basics of Statistics and Probability	2	Understand

Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	1	1	1	1	1	2	1	1	1	2	-	-
CO2	3	3	1	1	1	1	1	1	2	1	1	2	-	-	-
CO3	3	3	2	2	1	1	1	1	2	1	1	2	-	-	-
CO4	3	3	2	2	1	2	1	1	2	1	1	2	-	-	-
CO5	3	3	2	2	2	1	1	2	2	1	2	2	-	2	-
CO6	3	3	2	1	1	2	1	1	2	1	2	2	-	-	2

Course Contents			
Unit-I	**COMBINATORICS**	**No. of Hours**	**COs**
	Sets, Combinations of sets, Venn Diagrams, Finite and Infinite sets, Uncountable infinite sets, Principle of inclusion and exclusion, multisets. Propositions, Conditional Propositions, Logical Connectivity, Propositional calculus, Universal and Existential Quantifiers, Normal forms, methods of proofs, Mathematical Induction.	06	CO1
Unit-II	**RELATIONS AND FUNCTIONS**	**No. of Hours**	**COs**
	Relations : Binary Relations, Closure of relations, Warshall's algorithm, Equivalence Relations and partitions, Partial ordering relations and lattices, Chains and Anti chains. Recurrence Relation, Linear Recurrence Relations With constant Coefficients, Generating functions. **Regression Analysis**: Linear, Logistic and Polynomial Regression **Function** Functions, Composition of functions, Invertible functions, Pigeonhole Principle, Discrete Numeric functions and Generating functions, Job scheduling Problem.	06	CO2
Unit-III	**GROUPS, SEQUENCES AND SUMMATIONS**	**No. of Hours**	**COs**
	Group Theory: Elementary properties, subgroups, cosets, normal groups, quotient groups, cyclic groups, homomorphism and isomorphism, Isomorphism theorem, permutation groups, Sylow's theorem and application, Application to Number theory: Lagrange's theorem, Euler's theorem, Fermat's theorem. **Sequences and summations:** Arithmetic progression, Geometric progression, Recursively defined sequences, Fibonacci sequence, Summations, Arithmetic series, Double summations, Geometric series and Infinite geometric series.	06	CO3
Unit-IV	**INFORMATION THEORY**	**No. of Hours**	**COs**
	Information sources and entropy, Relative entropy, Joint and conditional entropy, mutual information, Lossless Source Coding with Variable Codeword Lengths, Best prefix-free codes, Huffman codes, Lossy Source Coding with Fixed Codeword Lengths, Channel Coding and Cyclic Codes.	06	CO4
Unit-V	**INTEGER FOUNDATIONS**	**No. of Hours**	**COs**
	Rings and fields: Rings, Ideals, maximal ideals, quotient rings, Integral domains, principal ideal domain(PID), Euclidean domain(ED), ring of integers as example of PID and ED, Euclidean algorithm for GCD, extended Euclidean algorithm, finding modular inverse of an integer, Chinese Remainder Theorem(CRT), Euler's φ-function, quadratic residues.	06	CO5
Unit-VI	**INTRODUCTION TO STATISTICS AND PROBABILITY**	**No. of Hours**	**COs**
	Statistics, notion of probability, distributions, mean, variance, covariance, covariance matrix, understanding univariate and multivariate normal distributions, introduction to hypothesis testing, confidence interval for	06	CO6

	estimates, Simple linear regression and verifying assumptions used in linear regression, Multivariate linear regression, model assessment, assessing importance of different variables, subset selection.		

Text Books:

1. S. K. Chakraborty, B.K. Sarkar, "Discrete Mathematics and its Applications", Oxford University Press 2011, ISBN9780198065432.
2. C. L. Liu and D. P. Mohapatra, "Elements of Discrete Mathematics", McGraw Hill 4th Edition.

Reference Books:

1. N. Biggs, "Discrete Mathematics", Oxford University Press, 2nd Edition.
2. Singh, "Discrete Mathematical Structures", Wiley ISBN- 9788126527908.
3. Eric Gossett, "Discrete Mathematics with Proof", Wiley 2nd Edition ISBN-9788126527588.
4. Edgar G. Goodaire and Michael M. Parmenter, "Discrete Mathematics with Graph Theory", Pearson Education 3rd Edition, ISBN-13978013167995.
5. Richard Johnsonbaugh, "Discrete Mathematics", Pearson Education, 7th Edition ISBN: 9332535183.

IT202: Digital Electronics & Computer Organization

Teaching Scheme	Examination Scheme	
Lectures: 4 Hrs./Week	**Continuous Assessment:**	**20 Marks**
	In-Sem Exam:	**30 Marks**
	End-Sem Exam:	**50 Marks**
Credits: 4	**Total:**	**100 Marks**

Prerequisite Course: Basic Electronics Engineering, Fundamental of Programming Languages

Course Objectives

1. To design and implement combinational logic circuits.
2. To design and implement sequential logic circuits.
3. To develop VHDL programs.
4. To understand processor organization.
5. To understand memory and I/O Organization.
6. To understand parallel organization..

Course Outcomes (COs):

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

	Course Outcome (s)	Bloom's Taxonomy	
		Level	**Descriptor**
CO1	**Design** and implementcombinational logic circuits.	3	Apply
CO2	**Design** and implement sequential logic circuits.	3	Apply
CO3	**Develop** VHDL programs.	3	Apply
CO4	**Understand** processor organization.	2	Understand
CO5	**Understand** memory and I/O Organization.	2	Understand
CO6	**Understand** parallel organization.	2	Understand

Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	3	1	2	3	1	-	3	2	-	2	-	3	-
CO2	1	2	3	1	2	3	1	-	3	2	-	2	-	3	-
CO3	1	2	3	1	3	-	-	-	3	2	-	2	-	3	-
CO4	3	1	1	-	-	-	-	-	1	1	1	1	-	3	-
CO5	3	3	1	-	-	-	-	1	1	1	1	1	-	3	-
CO6	3	-	1	-	-	-	-	1	1	1	-	1	-	3	-

Course Contents			
Unit-I	**COMBINATIONAL LOGIC CIRCUITS**	**No. of Hours**	**COs**
	Number Systems, Boolean Algebra & Logic Minimization, Design of code converters, Design of adders, Multiplexers, Demultiplexer/ Decoders, Encoder.	06	CO1
Unit-II	**SEQUENTIAL LOGIC CIRCUITS**	**No. of Hours**	**COs**
	Introduction to sequential circuits, Flip- Flops, Design of Counters, Modulo counters. Registers, Design of sequence Generator, Pseudo Random Binary Sequence Generator Introduction to SPLD, CPLD, FPGA	06	CO2
Unit-III	**INTRODUCTION TO VHDL PROGRAMMING**	**No. of Hours**	**COs**
	Design flow: Basic Concept of Simulation and Synthesis Introduction to VHDL, Data Objects, Data Types, Attributes, Models of Design, Concurrent Statements Vs Sequential Statements, Design of Digital Circuits	06	CO3
Unit-IV	**PROCESSOR ORGANIZATION**	**No. of Hours**	**COs**
	Computer Evolution, Computer Performance, RISC Vs CISC, Building Data Paths , Pipelined Datapath and Control **Data Hazards:** Forwarding versus Stalling, Control Hazards	06	CO4
Unit-V	**MEMORY AND I/O ORGANIZATION**	**No. of Hours**	**COs**
	Introduction, The Basics of Caches, Measuring and Improving Cache Performance, Virtual Memory, A Common Framework for Memory Hierarchies, Virtual Machines, Parallelism and **Memory Hierarchies:** Cache Coherence, Connecting Processors, Memory, and I/O Devices. Interfacing I/O Devices to the Processor, Memory, and Operating System	06	CO5
Unit-VI	**PARALLEL ORGANIZATIONS**	**No. of Hours**	**COs**
	Introduction, The Difficulty of Creating Parallel Processing Programs, Shared Memory Multiprocessors, Clusters and Other Message-Passing Multiprocessors, Hardware Multithreading, SISD, MIMD, SIMD, SPMD, and Vector, Introduction to Graphics Processing Units, Introduction to Multiprocessor Network Topologies, Multiprocessor Benchmarks	06	CO6

Text Books:

1. M Morris Mano, "Digital Design", Prentice Hall, 3rd Edition, ISBN: 0130621218.
2. Mano, M. Morris, "Digital Design: with an Introduction to the Verilog HDL, VHDL, System Verilog", 6th Edition, Pearson.
3. D. Patterson, J. Hennessy, "Computer Organization and Design: The Hardware Software Interface", 4th Edition, 2013, ISBN 978-0-12-374750-1.
4. W. Stallings, "Computer Organization and Architecture: Designing for Performance", Prentice Hall of India, 8th Edition, 2010, ISBN 13: 978-0-13-607373-4.

Reference Books:

1. Flyod, “Digital Principles”, Pearson EducationISBN:978-81- 7758-643-6.
2. John Yarbrough, “Digital Logic applications and Design”, Thomson Publication ISBN: 978-0314066756.
3. Malvino, D. Leach, “Digital Principles and Applications”, 5th edition, Tata McGraw Hill
4. R.P. Jain, “Modern Digital Electronics “, 3rd Edition, Tata McGraw-Hill, ISBN: 0–07–049492–4.
5. Stephen Brown, ZvonkoVranesic, “Fundamentals of Digital Logic with VHDL Design”, McGraw- Hill, ISBN: 978–0–07–352953–0.
6. J. Bhaskar, “VHDL Primer”, Pearson Education,3rd Edition, ISBN: 0071226249
7. C. Hamacher, V. Zvonko, S. Zaky, “Computer Organization”, McGraw Hill,5th edition, 2002, ISBN: 007-120411-3.
8. M. Usha, T. S. Srikanth, “Computer System Architecture and Organization”, Wiley, 2014, ISBN: 978-81-265-2284-2.
9. A. S. Tanenbaum, “Structured Computer Organization”, Prentice Hall of India, 4th Edition, 1991, ISBN: 81–203–1553–7.
10. J. Hays, “Computer Architecture and Organization”, McGraw-Hill, 2nd Edition, 1988 ISBN 0–07–100479–3.

IT203: Fundamentals of Data Structures		
Teaching Scheme	**Examination Scheme**	
Lectures: 3 Hrs./Week	**Continuous Assessment:**	**20 Marks**
	In-Sem Exam:	**30 Marks**
	End-Sem Exam:	**50 Marks**
Credits: 3	**Total:**	**100 Marks**
Prerequisite Course: Computer Fundamentals & Programming CFP-105		

Course Objectives

1. To learn linear data structure and its application.
2. To learn dynamic memory allocation concepts.
3. To learn fundamentals of data structure and its applications.
4. To learn algorithm design technique with time and space complexity.
5. To learn concept of linked organization for problem solving and programming.
6. To learn the Stack and Queue data structure

Course Outcomes (COs):

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

	Course Outcome (s)	Bloom's Taxonomy	
		Level	Descriptor
CO1	**Apply** appropriate constructs of C language, coding standards for application development.	3	Apply
CO2	**Select** appropriate data structures and algorithmic foundations for problem solving and programming.	3	Apply
CO3	**Apply** appropriate searching and/or sorting techniques in the application development.	3	Apply
CO4	**Use** dynamic memory allocation concepts in various application developments,	3	Apply
CO5	**Analyze** the Stack as Linear and Nonlinear data structure on various applications.	4	Analyze
CO6	Use the Queue as data structure in various ways.	3	Apply

Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	-	-	2	-	-	1	1	1	2	3	-	-
CO2	1	1	3	-	3	-	-	-	1	1	1	2	3	-	-
CO3	1	3	1	1	-	3	-	-	1	1	1	2	3	-	-
CO4	2	3	1	1	1	2	-	-	1	-	1	2	3	-	-
CO5	2	3	1	3	1	2	1	-	--	-	1	2	3	-	-
CO6	2	3	1	3	-	3	-	-	1	-	1	2	3	-	1

Course Contents			
Unit-I	**POINTERS**	**No. of Hours**	**COs**
	Multidimensional arrays, Array of structures, storage representation & address calculation of Multidimensional Array, Introduction to Pointers, Dynamic Memory Allocation: malloc(), calloc(), realloc(), free(), pointer to pointer, pointer to single and multidimensional arrays, array of pointers, pointers to string & C string functions using pointers, Structure using pointers, Pointers to functions.	06	CO1
Unit-II	**FUNDAMENTALS OF DATA STRUCTURE**	**No. of Hours**	**COs**
	Fundamentals: Data structure, Abstract Data Types, realization of ADT in 'C'. Types of data structure: Primitive non-primitive, linear Non-linear, static dynamic, persistent ephemeral data structures. Performance Analysis of Algorithm: Space Complexity, Time Complexity.	05	CO2
Unit-III	**SEARCHING & SORTING**	**No. of Hours**	**COs**
	Searching Algorithms: Linear Search, Binary search their comparison. Internal and external sorting, Sorting Algorithms: Bubble Sort, Selection Sort, Quick Sort, Insertion Sort, and Merge Sort. Time complexity of all sorting algorithms and their comparison.	07	CO3
Unit-IV	**LINKED ORGANIZATION**	**No. of Hours**	**COs**
	Linked organization, Types of Linked List: Singly Linked List, Doubly Linked List, Circular Linked List. Linked list as an ADT. Polynomial representation using linked lists.	06	CO4
Unit-V	**STACK**	**No. of Hours**	**COs**
	Concept of Sequential organization. Introduction to Stack, Implementation of Stack using sequential organization. Implementation of Stack using Linked organization, Concept of implicit and explicit stack. Applications: Infix to postfix conversion, infix to prefix conversion, Evaluation of prefix and postfix expression, decimal to binary conversion, well-formedness of parenthesis.	06	CO5
Unit-VI	**QUEUE**	**No. of Hours**	**COs**
	Concept of queues as ADT, Implementation of queue using sequential & linked organization. Concept of circular queue and its implementation, Concept of double ended queue and its implementation, Concept of priority queue. Applications of queues.	06	CO6

Text Books:

1. Ellis Horowitz, SartajSahni, Susan Anderson-Freed “Fundamentals of Data Structures in C”, Universities Press, 2008.
2. Richard F. Gilberg&Behrouz A. Forouzan, “Data Structures: A Pseudocode Approach with C, Second Edition”, Cengage Learning.

Reference Books:

1. Robert Sedgewick and Kevin Wayne, “Algorithms” 4th Edition; Pearson Education,

ISBN-13: 978-0321573513.
2. E. Horowitz, S. Sahni, D. Mehta, “Fundamentals of Data Structures in C”, Galgotia Book
3. Y. Langsam, M. Augenstin, A. Tannenbaum, “Data Structures using C and C++”, Prentice Hall of India.
4. Aaron Tanenbaum, “Data Structures using C”, Pearson Education.
5. Goodrich, “Data Structures and Algorithms in C++”, Wiley.
6. YashavantKanetkar, “Understanding Pointers in C”, BPB Publication.
7. YashavantKanetkar, “Let Us C”, BPB Publication.

IT 204: Object Oriented Programming

Teaching Scheme	Examination Scheme	
Lectures: 3 Hrs./Week	**Continuous Assessment:**	**20 Marks**
	In-Sem Exam:	**30 Marks**
	End-Sem Exam:	**50 Marks**
Credits: 3	**Total:**	**100 Marks**
Prerequisite Course: Computer Fundamentals & Programming CFP-105.		

Course Objectives

1. To understand the basics of Object Oriented Programming using C++.
2. To understand the principles and techniques of Object Oriented Programming.
3. To write a program using classes and objects.
4. To develop C++ classes using Overloading and Inheritance.
5. To use memory allocation and exception handling features.
6. To apply standard template library for problem solving

Course Outcomes (COs):

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

Course Outcome (s)		Bloom's Taxonomy	
		Level	Descriptor
CO1	**Understand** the basics of Object Oriented Programming using C++.	2	Understand
CO2	**Understand** the principles and techniques of Object Oriented Programming.	2	Understand
CO3	**Write** a program using classes and objects.	3	Apply
CO4	**Develop** C++ classes using Overloading and Inheritance.	3	Apply
CO5	**Use** memory allocation and exception handling features.	3	Apply
CO6	**Apply** standard template library for problem solving	3	Apply

Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	--	2	1	--	2	1	3	1	2	3	3	--	--
CO2	3	2	2	2	1	--	2	1	3	1	1	3	3	--	3
CO3	--	3	--	1	2	1	1	2	2	1	1	2	--	--	3
CO4	--	3	2	1	2	--	1	2	1	1	--	2	--	--	3
CO5	--	3	--	2	1	--	1	1	1	--	1	1	2	--	--
CO6	--	3	--	2	1	--	1	1	--	1	--	1	2	--	--

Course Contents			
Unit-I	**INTRODUCTION TO C++**	**No. Of Hours**	**COs**
	C++ Syntax and Semantics, The program development process, Numeric Types, expressions and Output in C++, Macros, Enumerations, Strings, Signatures of functions, passing variables to functions - Reference vs. pointers, Reference vs. value, Keyword const, Default arguments.	06	CO1
Unit-II	**OBJECT-ORIENTED PROGRAMMING BASICS**	**No. of Hours**	**COs**
	Basic class design principles - collaborations and responsibilities; separating interface and implementation; decoupling. Object-oriented principles and techniques - using a polymorphic class hierarchy; abstract base classes for common interface. Major object-oriented idioms and design patterns - providing extensibility and code stability simultaneously.	06	CO2
Unit-III	**CLASSES AND OBJECTS**	**No. Of Hours**	**COs**
	Structures, Pointers to structures, Classes- private and public members, Constructors – Types of constructors, Destructors, The this pointer, Friend functions, Friend classes Conditions, Logical Expressions and Selection Control Structures, Loops, functions, structured types, data abstraction and classes, Arrays, Default parameters, references, bidirectional function parameters.	06	CO3
Unit-IV	**OVERLOADING AND INHERITANCE**	**No. Of Hours**	**COs**
	Pointers to overloaded functions, Overloading constructors, Operator overloading, overloading binary operators, Overloading unary operators, overloading using friend operators, Inheritance, types of inheritance, Constructors, destructors and inheritance, Pointers to derived classes, Virtual functions, Friend functions and inheritance, Polymorphism.	6	CO4
Unit-V	**MEMORY ALLOCATION**	**No. Of Hours**	**COs**
	Dynamic allocation and memory management, destructors, Exception handling, Introduction to the STL, Implementation of basic data structures such as linked lists, stacks, and queues using C++.	6	CO5
Unit-VI	**TEMPLATE**	**No. Of Hours**	**COs**
	Templates, C++ Standard library, Programming for efficiency and Testability, performance measurement, and debugging, standard library string and vector, Stream.	6	CO6

Text Books:

1. E. Balagurusamy, Object Oriented Programming with C++, McGraw Hill Edition 5th Edition.

Reference Books:

1. Bjarne Stroustrup, “The C++ Programming Language”, 4th Edition ISBN-13: 978-0321563842.
2. Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides, “Design Pattern-Elements of Reusable Object Oriented Programming”, Pearson.
3. Alice E. Fischer and David W. Eggert, “Applied C and C++ Programming”, University of New Haven, and Michael J. Fischer, Yale University, August 2018.

4. Dale. N and Weems. C., "Programming and Solving with C++", 4th Edition Jones and Bartlett Publishers, 2004.
5. Daniel Du_y, "Introduction to C++ for Financial Engineers: An Object-oriented Approach", 2006.
6. Steve Oualline, "Practical C++ Programming", 1995.
7. Andrew Haigh, "Object Oriented Analysis & Design", Tata McGraw Hill Edition.
8. Herbert Schildt, "Teach Yourself C++", 1992.
9. Jesse Liberty, "Teach Yourself C++ in 24 hours", 1999.
10. Schildt. H., "C++ from the Ground up", 2nd Edition, Osborne McGraw-Hill, 1998.
11. Shtern. V, "Core C++ A Software Engineering Approach", Prentice Hall Publisher, 2000.
12. Mary Delemater, Joel Murach, "Murach's C++ Programming", Pub 2018 ISBN: 9781-943872-27-5.
13. Bjarne Stroustrup, "A Tour of C++ (C++ In-Depth)", 1st Edition, ISBN-13: 978-0321958310.
14. Stanley Lippman, "C++ Primer", 5th Edition ISBN-13: 978-0321714114.

HS205: UNIVERSAL HUMAN VALUES AND PROFESSIONAL ETHICS

Teaching Scheme	Examination Scheme	
Lectures: 3 Hrs./Week	Continuous Assessment:	20 Marks
	In-Sem Exam:	30 Marks
	End-Sem Exam:	50 Marks
Credits: 3	Total:	100 Marks

Course Objectives

1. To make the students aware about the concept and need of value education.
2. To help the students appreciate the essential complementarity between values and skills to ensure sustained happiness and prosperity.
3. To facilitate the development of a holistic perspective among the students towards life and profession.
4. To facilitate the understanding of harmony at various levels staring from self and going towards family, society and nature.
5. To make the students aware about the correlation between engineering ethics and social experimentation in various situations.
6. To highlight the importance of professional ethics in the wake of global realities.

Course Outcomes (COs):

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

	Course Outcome (s)	Bloom's Taxonomy	
		Level	Descriptor
CO1	**Understand** the concept of self exploration as the process of value education.	2	Understand
CO2	**Understand** the human being as the coexistence of self and body.	2	Understand
CO3	**Apply** the holistic approach for fulfilling human aspirations for the humans to live in harmony at various levels.	3	Apply
CO4	**Analyze** the universal human order in correlation with professional ethics.	4	Analyze
CO5	**Apply** ethical practices in engineering profession.	3	Apply
CO6	**Evaluate** the importance of various ethical practices in the wake of global realities.	5	Evaluate

Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	2	-	3	-	1	-	2	-	-	-
CO2	-	-	-	-	-	2	-	3	-	1	-	2	-	-	-
CO3	-	-	-	-	-	3	-	3	-	1	-	2	-	-	-
CO4	-	-	-	-	-	3	-	3	-	1	-	2	-	-	-
CO5	-	-	-	-	-	3	-	3	-	1	-	2	-	-	-
CO6	-	-	-	-	-	3	-	3	-	1	-	2	-	-	-

Course Contents			
Unit-I	**INTRODUCTION TO VALUE EDUCATION**	**No. of Hours**	**COs**
	Values, Morals and Ethics; Concept and need of value education; Self-exploration as the process for value education; Guidelines for value education; Basic human aspirations and their fulfillment.	06	CO1
Unit-II	**HARMONY IN HUMAN BEING**	**No. of Hours**	**COs**
	Human being as the coexistence of self and the body; Discrimination between the needs of the self and the body; The body as an instrument; Harmony in the self; Harmony of the self with the body.	06	CO2
Unit-III	**HARMONY IN THE FAMILY, SOCIETY AND NATURE**	**No. of Hours**	**COs**
	Harmony in the family- The basic unit of human interaction; Values in the human to human relationship; Harmony in the society; Vision for the universal human order; Harmony in the nature; Realizing existence as coexistence at all levels.	06	CO3
Unit-IV	**PROFESSIONAL ETHICS**	**No. of Hours**	**COs**
	Natural acceptance of human values; Definitiveness of ethical human conduct; Humanistic education and universal human order; Competence in professional ethics; Transition towards value-based life and profession.	06	CO4
Unit-V	**ENGINEERING ETHICS AND SOCIAL EXPERIMENTATION**	**No. of Hours**	**COs**
	Need of engineering ethics; Senses of engineering ethics; Variety of moral issues; Moral autonomy; Utilitarianism; Engineering as experimentation. Engineers as responsible experimenters; Codes of ethics.	06	CO5
Unit-VI	**GLOBAL ISSUES**	**No. of Hours**	**COs**
	Globalization and multi-national corporations; Cross-cultural issues; Business ethics; Environmental ethics; Computer ethics; Bio-ethics; Ethics in research; Intellectual property rights and plagiarism.	06	CO6

Text Books:

1. R. R. Gaur, R. Sangal, G. P. Bagaria, "A Foundation Course in Human Values and Professional Ethics", Excel Books Pvt. Ltd.
2. R. S. Naagarazan, "A Textbook on Professional Ethics and Human Values", New Age International (P) Ltd. Publishers.

Reference Books:

1. B. P. Banerjee, "Foundations of Ethics and Management", Excel Books Pvt. Ltd.
2. P. L. Dhar, R. R. Gaur, "Science and Humanism", Commonwealth Publishers.
3. M. K. Gandhi, "The Story of my Experiments with Truth", Discovery Publisher.
4. http://uhv.org.in/.

Considering the specific nature of this course, the methodology is explorational and thus universally adaptable. In order to connect the content of this course with practice, minimum 6 group activities should be conducted with active involvement of the students. The teacher's assessment should be strictly based on the participation of the students in these activities.

IT206 : Digital Electronics Laboratory

Teaching Scheme	Examination Scheme	
Lectures: 2 Hrs./Week	**Term Work:**	**50 Marks**
	Oral :	**NA**
	Practical:	**NA**
Credits: 1	**Total:**	**50 Marks**

Prerequisite Course: Basic Electronics Engineering

Course Objectives

1. To design Combinational logic circuits using SSI & MSI chips.
2. To design Asynchronous and Synchronous Counters, MOD Counters.
3. To implement and simulate using different modelling styles digital circuits in VHDL.
4. To use digital circuit simulator to simulate digital circuits.

Course Outcomes (COs):

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

Course Outcome (s)		Bloom's Taxonomy	
		Level	**Descriptor**
CO1	**Design** Combinational logic circuits using SSI & MSI chips.	3	Apply
CO2	**Design** Asynchronous and Synchronous Counters, MOD Counters.	3	Apply
CO3	**Implement** and **Simulate** using different modelling styles digital circuits in VHDL.	3	Apply
CO4	**Use** Digital circuit simulator to simulate digital circuits.	3	Apply

Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	1	-	-	2	-	-	2	1	-	1	-	3	-
CO2	-	-	3	2	2	3	2	-	3	1	2	1	-	3	-
CO3	-	3	1	-	-	2	-	-	3	1	-	1	-	3	-
CO4	-	-	3	2	2	3	-	-	3	1	2	1	-	3	-

Guidelines: This Digital Laboratory course has Digital Electronics & Logic Design as a core subject. The problem statements should be framed based on Group A, B, C, D mentioned in the syllabus. The teacher will frame the problem statements with due consideration that students have two hours to complete that. The practical examination will comprise of implementation and related theory. All assignments From Group A & Group B are to be performed on Digital Trainer Kit and from Group C are to be performed on Xilinx software.

Term work: Staff in-charge will suitably frame the above assignments and flexibility may be incorporated. Students will submit term work in the form of journal. Each assignment has to be well documented with problem definition, code documented with comments. Staff in-charge will assess the assignments continuously and grade or mark each assignment on completion date. All the assignments should be conducted on Digital Trainer Kit, Latest version of Open Source Operating Systems and tools.

Suggested List of Assignments

Group A	**COMBINATIONAL LOGIC DESIGN**	**No. of Hours**	**COs**
1	Assignment on Code Conversion using Gates.	2	CO1
2	Assignment on Adder.	2	CO1
3	Assignment on Multiplexer & Decoder.	2	CO1
Group B	**SEQUENTIAL LOGIC DESIGN**	**No. of Hours**	**COs**
4	Assignment on Up and Down Asynchronous/Synchronous Counters.	2	CO2
5	Assignment on Module ‘n’ Counter.	2	CO2
Group C	**VHDL PROGRAMMING (**Implement any two from this group)	**No. of Hours**	**COs**
7	Simulation using Behavioral Modeling.	2	CO3
8	Simulation using Data Flow & Structural Modeling.	2	CO3
9	Simulation of Counter/Shift Registers. (Use any modeling Style)	2	CO3
Group D	**DIGITAL SIMULATION TOOLS**	**No. of Hours**	**COs**
10	Design, construct digital logic circuits and analyze their behavior through simulation of any one assignment from either Group A or Group B with simulation software like Digital Works 3.0	2	CO4

Text Books:

1. R.P. Jain, “Modern Digital Electronics”, 3rd Edition, Tata McGraw-Hill, ISBN: 0–07–049492–4.
2. J. Bhaskar, “VHDL Primer”, Pearson Education, 3rd Edition, ISBN: 0071226249.

Reference Books:

1. Stephen Brown, ZvonkoVranesic, "Fundamentals of Digital Logic with VHDL Design", McGraw-Hill, ISBN: 978-0-07-352953-0.
2. John Yarbrough, "Digital Logic applications and Design", Thomson Publication, ISBN: 978-0314066756.

IT207 : Fundamental of Data Structure Laboratory

Teaching Scheme	Examination Scheme	
Lectures: 2 Hrs./Week	**Term Work:**	**NA**
	Oral :	**NA**
	Practical:	**50 Marks**
Credits: 1	**Total:**	**50 Marks**

Prerequisite Course: Computer Fundamentals and Programming

Course Objectives

1. To apply knowledge of pointers in different application development.
2. To apply appropriate sorting and searching techniques in the application development.
3. To implement Linear data structures and Use it for different applications.

Course Outcomes (COs):

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

Course Outcome (s)		Bloom's Taxonomy	
		Level	**Descriptor**
CO1	**Apply** knowledge of pointers in different application development.	3	Apply
CO2	**Apply** appropriate sorting and searching techniques in the application development.	3	Apply
CO3	**Implement** Linear data structures and **Use** it for different applications.	3	Apply

Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	1	2	1	-	-	1	-	1	1	3	-	-
CO2	3	3	2	1	2	1	-	-	1	-	1	1	3	-	-
CO3	2	3	2	1	1	1	-	-	1	-	2	2	3	1	-

Guidelines: This Fundamentals of Data Structures Laboratory course has Fundamentals of Data Structures as a core subject. The problem statements should be framed based on assignments mentioned in the syllabus. The teacher will frame the problem statements with due consideration that students have three hours to complete that. The practical examination will comprise of implementation and related theory. All assignments are to be performed in C Language or C++.
Use of open source platform and tools is encouraged

Term work: Staff in-charge will suitably frame the above assignments and flexibility may be incorporated. Students will submit term work in the form of journal. Each assignment has to be well documented with problem definition, code documented with comments. Staff in-charge will assess the assignments continuously and grade or mark each assignment on completion date. All the assignments should be conducted in C or C++ Language

Suggested List of Assignments

Sr. No.	Assignment	No. of Hours	COs
1.	Assignment based on matrix operations using pointer.	2 Hrs.	CO1
2.	Assignment based on string operations using pointer.	2 Hrs.	CO1
3.	Assignment based on array of structures using with and without pointers.	2 Hrs.	CO1
4.	Assignment based on Linear or Binary Search.	2 Hrs.	CO2
5.	Assignment based on Bubble Sort or Selection Sort.	2 Hrs.	CO2
6.	Assignment based on Quick Sort or Insertion Sort.	2 Hrs.	CO2
7.	Assignment based on Implementation of Stack and Queue and Circular Queue using array.	4 Hrs.	CO3
8.	Assignment based on implementation Singly Linked list, DLL and Circular LL.	4 Hrs.	CO3
9.	Assignment based on applications of Stack & Queue.	4 Hrs.	CO3
10.	Assignment based on Implementation of Stack and Queue using Linked List.	4 Hrs.	CO3

Text Books:

1. Ellis Horowitz, SartajSahni, Susan Anderson-Freed, “Fundamentals of Data Structures in C”, Universities Press, 2008.
2. Richard F. Gilberg&Behrouz A. Forouzan, “Data Structures: A Pseudocode Approach with C, Second Edition”, Cengage Learning.

Reference Books:

1. Y. Langsam, M. Augenstin, A. Tannenbaum, “Data Structures using C and C++”, Prentice Hall of India.
2. Aaron Tanenbaum, “Data Structures using C”, Pearson Education.
3. Goodrich, “Data Structures and Algorithms in C++”, Wiley.
4. YashavantKanetkar, “Understanding Pointers in C”, BPB Publication.
5. YashavantKanetkar, “Let Us C”, BPB Publication.

IT208 : Object Oriented Programming Laboratory

Teaching Scheme	Examination Scheme	
Lectures: 2 Hrs./Week	**Term Work:**	**NA**
	Oral :	**50 Marks**
	Practical:	**NA**
Credits: 1	**Total:**	**50 Marks**

Prerequisite Course: Computer Fundamentals and Programming

Course Objectives

1. To develop programs by applying concepts of constructors, friend function, inline functions and data abstraction.
2. To apply OOP principles polymorphism and inheritance to solve problems.
3. To use C++ features templates, exceptions and dynamic memory allocation for solution of various problems.

Course Outcomes (COs):

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

	Course Outcome (s)	Bloom's Taxonomy	
		Level	**Descriptor**
CO1	**Develop** programs by applying concepts of constructors, friend function, inline functions and data abstraction.	3	Apply
CO2	**Apply** OOP principles polymorphism and inheritance to solve problems.	3	Apply
CO3	**Use** C++ features templates, exceptions and dynamic memory allocation for solution of various problems.	3	Apply

Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	3	1	3	1	1	2	3	2	2	3	3	-	-
CO2	3	3	2	1	1	-	1	1	3	2	2	3	3	-	-
CO3	3	2	2	2	2	-	1	1	3	2	2	3	3	-	-

Guidelines: This Object Oriented Programming Laboratory course has Object Oriented Programming as a core subject. The problem statements should be framed based on mentioned assignments in the syllabus for conduction of practical examination. The teacher will frame the problem statements with due consideration that students have three hours to complete that. The practical examination will comprise implementation and related theory. All assignments are to be performed in C++ Language.

Term Work: Staff in-charge will suitably frame the above assignments and flexibility may be incorporated. Students will submit term work in the form of a journal. Each assignment has to be well documented with problem definition, code documented with comments. Staff in-charge will assess the assignments continuously and grade or mark each assignment on completion date. All the assignments should be conducted in C++ Language.

Suggested List of Assignments

Sr. No.	Assignments	No. of Hours	COs
1	Write a menu driven program with class, object and different types of constructors.	2 Hrs.	CO1
2	Write a program to demonstrate use of Friend function, inline function.	2 Hrs.	CO1
3	Write a program to demonstrate compile time polymorphism (Operator Overloading/ Function Overloading).	2 Hrs.	CO2
4	Write a program to demonstrate runtime polymorphism (Virtual Function Concept).	2 Hrs.	CO2
5	Write a program to demonstrate Encapsulation and Inheritance Concept.	2 Hrs.	CO2
6	Write a program to demonstrate Memory allocation in C++.	2 Hrs.	CO3
7	Write a program to demonstrate use of Template in C++.	2 Hrs.	CO3
8	Write a program to demonstrate Exception Handling concept.	2 Hrs.	CO3

Text Books:

1. E. Balagurusamy, "Object Oriented Programming with C++", McGraw Hill Edition 5th Edition.
2. Maureen Spankle, "Problem Solving and Programming Concepts", Pearson, 2011, ISBN-13: 978-0132492645.

Reference Books:

1. Robert Lafore, "Object Oriented Programming in Turbo C++", Sams Publishing Edition 4th Edition.
2. Ira Pohl, "Object Oriented Programming using C++", Pearson Education Edition 2nd Edition Reprint 2004.

MC 209 : Indian Constitution (Mandatory Course – III)		
Teaching Scheme	**Examination Scheme**	
Lectures: 2 Hrs./Week	**Term Work:**	**NA**
	Oral :	**NA**
	Practical:	**NA**
Credits: Non Credit	**Total:**	**NA**

Course Objectives

1. To study the historical background, salient features, preamble and union territories of Indian constitution.
2. To study the provision of fundamental right in the Indian constitution.
3. To study the directive principle of state policy and fundamental duties.
4. To study the system of government through parliamentary and federal system.
5. To understand the formation, structure and legislative framework of central government.
6. To understand the formation, structure and legislative framework of state government.

Course Outcomes (COs):

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

	Course Outcome (s)	**Bloom's Taxonomy**	
		Level	**Descriptor**
CO1	**Describe** background, salient features of constitution of India.	1	Remember
CO2	**Explain** the system of government, it's structure and legislative framework.	2	Understand
CO3	**Apply** the fundamental rights and duties in their life.	3	Apply

Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-

Course Contents			
Unit-I	**INTRODUCTION TO CONSTITUTION OF INDIA**	**No. of Hours**	**COs**
	Historical background, Salient features, Preamble of constitution, Union and its territory.	7	CO1
Unit-II	**FUNDAMENTAL RIGHTS**	**No. of Hours**	**COs**
	Features of fundamental rights, Basic rights: 1. Right to equality; 2. Right to freedom; 3. Right against exploitation; 4. Right to freedom of religion; 5. Cultural and educational rights; 6.Right to property; 7. Right to constitutional remedies.	5	CO3
Unit-III	**DIRECTIVE PRINCIPLE OF STATE POLICY AND FUNDAMENTAL DUTIES**	**No. of Hours**	**COs**
	Directive principle of state policy: Features of directive principle, Classification of directive principle, Criticism of directive principle, Utility of directive principle, Conflict between Fundamental rights and directive principle. **Fundamental duties:** List of fundamental duties, Features of fundamental duties, Criticism of fundamental duties, Significance of fundamental duties, Swaran Singh Committee Recommendations.	5	CO3
Unit-IV	**SYSTEM OF GOVERNMENT**	**No. of Hours**	**COs**
	Parliamentary system: Features of parliamentary government, Features of presidential government, merits and demerit of Parliamentary system. **Federal system:** Federal features of constitution, unitary features of constitution. **Centre and state relation:** Legislative relation, administrative relations and financial relation. **Emergency provision:** National emergency, Financial emergency and criticism of emergency provision.	5	CO2
Unit-V	**CENTRAL GOVERNMENT**	**No. of Hours**	**COs**
	President: Election of president, powers and functions of president, and Veto power of president. **Vice-president:** Election of vice-president, powers and functions of vice-president. **Prime minister:** Appointment of PM, powers and functions of PM, relationship with president. **Central council of ministers:** Appointment of ministers, responsibility of ministers, features of cabinet committees, functions of cabinet committees. **Parliament:** Organization of parliament, composition of the two houses , duration two houses, membership of parliament, session of parliament, joint sitting of two houses, budget in parliament. **Supreme court (SC):** Organization of supreme court, independence of supreme court, jurisdiction and powers of supreme court.	5	CO2

Unit-VI	STATE GOVERNMENT	No. of Hours	COs
	Governor: Appointment of governor, powers and functions of governor, constitutional position. **Chief minister:** Appointment of CM, powers and functions of CM, relationship with governor. **State council of ministers:** Appointment of ministers, responsibility of ministers, cabinet. **High court (HC):** Organization of HC, independence of HC, jurisdiction and powers of HC. **Sub-ordinate court:** Structure and jurisdiction, LokAdalats, Family court, Gram Nyayalayas.	5	CO2

Text Books:

1. M Laxmikanth, "Indian Polity for Civil Service Examination", McGrawHill Education, 5th Edition.
2. Durga Das Basu, LexisNexis, "Introduction to the Constitution of India", 22nd Edition.

S.Y. B. Tech Information Technology Semester II

IT210: Microprocessor & Microcontroller

Teaching Scheme	Examination Scheme	
Lectures: 4 Hrs./Week	**Continuous Assessment:**	**20 Marks**
	In-Sem Exam:	**30 Marks**
	End-Sem Exam:	**50 Marks**
Credits: 4	**Total:**	**100 Marks**

Prerequisite Course: Computer Organization & Digital Electronics

Course Objectives

1. To use ALP concepts to write the programs.
2. To understand architectural details of 8086 and 80386 microprocessors.
3. To understand segmentation mechanism w.r.t. 80386 microprocessor.
4. To understand paging and protection in 80386 microcontroller.
5. To understand features of 8051 microcontroller.
6. To make use of 8051 microcontroller for interfacing I/O devices.

Course Outcomes (COs):

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

Course Outcome (s)		Bloom's Taxonomy	
		Level	**Descriptor**
CO1	**Use** ALP concepts to write the programs.	3	Apply
CO2	**Explain** architectural details of 8086 and 80386 microprocessors.	2	Understand
CO3	**Demonstrate** segmentation w.r.t. 80386 microprocessor.	3	Apply
CO4	**Demonstrate** the Paging and Protection concepts.	3	Apply
CO5	**Explain** features of 8051 microcontroller.	2	Understand
CO6	**Use** 8051 for Interfacing I/O devices.	3	Apply

Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	2	1	1	3	-	-	-	-	-	-	-	3	1
CO2	3	1	2	1	1	3	-	-	-	-	-	-	-	3	1
CO3	2	1	3	1	1	2	-	-	-	-	-	-	-	3	1
CO4	2	1	3	1	1	2	1	-	2	-	-	-	-	3	2
CO5	2	3	2	2	1	2	1	-	1	-	-	-	-	3	1
CO6	2	1	3	1	1	2	2	-	2	-	-	-	-	3	2

Course Contents			
Unit-I	**INTRODUCTION TO ASSEMBLY LANGUAGE PROGRAMMING**	**No. of Hours**	**COs**
	Introduction to assembly language programming. **ALP Tools:** Assembler, Linker, Loader, Debugger, Emulator. Assembler directives, Far and near procedure, Macros, DOS Interrupts.	08	CO1
Unit-II	**INTRODUCTION TO 8086 & 80386 PROCESSOR**	**No. of Hours**	**COs**
	Introduction to 8086 Processor: Features, Architecture, Pin configuration, Instruction set, Addressing modes. **80386 Processor:** 80386 Family, Features, Architecture, Pin Description, Register Set, Addressing modes, Instruction set.	08	CO2
Unit-III	**SEGMENTATION**	**No. of Hours**	**COs**
	Segmentation: Introduction, Real mode segmentation. **80386 Protected Mode Segmentation:** Segment Selector & Descriptors, Descriptor Types, System Tables (IDT, LDT, GDT), Logical to linear/physical address translation.	08	CO3
Unit-IV	**PROTECTION MECHANISM & PAGING**	**No. of Hours**	**COs**
	Protection in segmentation: Protection Levels, Privileged instructions, Inter-privilege level transfer using Call gates and conforming code segment. **Paging:** support registers, Data structures, Descriptors, Linear to physical address translation, Page level protection. **Multitasking:** TSS, Task Switching.	08	CO4
Unit-V	**INTRODUCTION TO 8051 MICROCONTROLLER**	**No. of Hours**	**COs**
	Microprocessor Vs Microcontroller. **8051 microcontroller:** 8051 family, Features, Architecture, Pin Description, Register bank and Special Function Registers (SFRs), Addressing modes, Instruction set, External data memory and program memory organization. **I/O ports programming:** Structures, Related SFRs and Configuration.	08	CO5
Unit-VI	**8051 INTERFACING & APPLICATIONS**	**No. of Hours**	**COs**
	Timers/counters programming: Structure, Related SFRs, Operating modes, Delay calculations and Configuration. **Serial port programming**: Related SFRs, Operating modes, Baud rate calculation and Configuration. **Interfacing of displays:** LED, LCD, keys, ADC & DAC, stepper motor, Sensors (temperature, pressure). Design of minimum system using 8051 micro-controller for an applications.	08	CO6

Text Books:

1. Peter Abel, NiyazNizamuddin, "IBM PC Assembly Language and Programming", Pearson Education.
2. James Turley, "Advanced 80386 Programming Techniques", McGraw Hill Education.
3. A. Ray, K.Bhurchandi, “Advanced Microprocessors and peripherals: Arch, Programming & Interfacing”, Tata McGraw Hill, 2004, ISBN 0-07-463841-6.
4. M. A. Mazidi, J. G. Mazidi, "The 8051 Microcontroller and Embedded Systems", Pearson Education.

Reference Books:

1. Intel Datasheets of 8086, 80386 Microprocessors & 8051 Microcontroller.
2. Walter A. Tribel, Avtar Singh, "The 8088 and 8086 Microprocessors", 4th Edition, Prentice Hall of India.
3. Ray Duncan, "Advanced MS DOS Programming", 2nd Edition, BPB Publications.
4. Kenneth Ayala, "The 8051 Micro Controller", 3rd Edition, Delmar Cengage Learning.
5. I. Scott MacKenzie, Raphael C.-W. Phan, "8051 Microcontroller", 4th Edition, Pearson Education
6. Joshi, “Processor Architecture and Interfacing”, Wiley, ISBN-9788126545605.
7. Douglas Hall, “Microprocessors and Interfacing”, 2nd Edition, 1992, McGraw-Hill, ISBN-0-07-100462-9.

IT 211: Database Management Systems		
Teaching Scheme	**Examination Scheme**	
Lectures: 3 Hrs./Week	**Continuous Assessment:**	**20 Marks**
	In-Sem Exam:	**30 Marks**
	End-Sem Exam:	**50 Marks**
Credits: 3	**Total:**	**100 Marks**
Prerequisite Course: Data Structures		

Course Objectives

1. To understand the fundamental concepts of database management.
2. To study systematic database design approaches.
3. To devise queries using Relational Algebra, SQL.
4. To study basic issues of transaction processing, concurrency control.
5. To evaluate query and query optimization technique and learn recovery techniques.
6. To learn and understand specialty databases.

Course Outcomes (COs):

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

Course Outcome (s)		Bloom's Taxonomy	
		Level	**Descriptor**
CO1	**Explore** fundamental concepts of database management	2	Understand
CO2	**Apply** relational algebra and SQL to database.	3	Apply
CO3	**Design** systematic database schema	3	Apply
CO4	**Understand** transaction management and concurrency control protocols.	2	Understand
CO5	**Optimize** the queries and compare recovery scheme	3	Apply
CO6	**Understand** large scale databases	2	Understand

Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	-	-	-	-	-	3	-	-	1	3	-
CO2	-	2	3	2	-	-	-	-	-	-	-	-	-	-	2
CO3	2	-	-	-	3	-	-	-	-	-	-	-	-	-	2
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
CO5	2	1	-		-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-		-	-	-	-	-	-	-	3	-	-	-

Course Contents			
Unit-I	**INTRODUCTION TO DBMS**	**No. of Hours**	**COs**
	Introduction: Introduction to database systems application, purpose of database system. Introduction to Data models, Three-schema architecture of a database, Components of a DBMS. **E-R model**: modeling, entity, attributes, relationships, constraints, components of E-R model. **Relational model:** basic concepts, attributes and domains, concept of integrity and referential constraints, schema diagram.	06	CO1
Unit-II	**RELATIONAL ALGEBRA, SQL and QUERY PROCESSING**	**No. of Hours**	**COs**
	Relational Algebra: Basic Operations, Selection, projection, joining, outer join, union, difference, intersection, Cartesian product, division operations (examples of queries in relational algebraic using symbols). **Introduction to SQL:** Characteristics and advantages, SQL Data Types and Literals, DDL, DML, DCL, SQL Operators, Tables: Creating, Modifying, Deleting, Views: Creating, Dropping, Updating using Views, Indexes, Nulls, SQL DML Queries: SELECT Query and clauses, Set Operations, Predicates and Joins, Set membership, Tuple Variables, Set comparison, Ordering of Tuples, Aggregate Functions, Nested Queries, Database Modification using SQL Insert, Update and Delete Queries. procedure and functions, triggers and cursors, Embedded SQL.	06	CO2
Unit-III	**DATABASE DESIGN USING NORMALIZATION**	**No. of Hours**	**COs**
	Functional Dependency, Purpose of Normalization, Data Redundancy and Update Anomalies, Single Valued Normalization: 1NF, 2NF, 3NF, BCNF. Decomposition: lossless join decomposition and dependency preservation, Decomposition Algorithms. Multi valued Normalization (4NF), Join Dependencies and the Fifth Normal Form.	06	CO3
Unit-IV	**TRANSACTION MANAGEMENT AND CONCURRENCY CONTROL**	**No. of Hours**	**COs**
	Transactions: Basic concept of a Transaction, Transaction Management, Properties of Transactions, Concept of Schedule, Serial Schedule, **Serializability:** Conflict and View, Cascaded Aborts, Recoverable and No recoverable Schedules. **Concurrency Control:** Time-stamps and locking protocols, validation-based protocols, multiple granularity protocols, deadlock handling.	06	CO4
Unit-V	**RECOVERY SYSTEM AND QUERY OPTIMIZATION**	**No. of Hours**	**COs**
	Recovery System: Shadow-Paging and Log-Based Recovery, Checkpoints. **Query Processing:** Overview, Measures of query cost, Evaluation of expression, Materialization and Pipelining algorithm. **Query Optimization:** Transformation of Relational Expressions, Cost-based optimization, Heuristics in Optimization	6	CO5
Unit-VI	**EMERGING DATABASE TECHNOLOGIES**	**No. of Hours**	**COs**
	JSON: Overview, Data Types, Objects, Schema, JSON with	6	CO6

	Java/PHP/Ruby/Python. **Introduction to No SQL Databases**: SQLite Database, XML Databases, **MongoDB:** MongoDB CRUD Operations, MongoDB Operators, Aggregation, Indexes, MongoDB Cloud, MongoDB Connectivity		

Text Books:

1. Abraham Silberschatz, Henry F. Korth and S. Sudarshan, "Database System Concepts", 6th Edition, McGraw Hill, 2010.
2. Raghu Ramkrishnan and Johannes Gehrke, "Database Management Systems", 2nd Edition, McGraw Hill International Editions, ISBN 978-0072465631.
3. Kristina Chodorow and MongoDB, "The Definitive Guide", 2nd Edition, O'Reilly Publications, ISBN: 978-93-5110-269-4.

Reference Books:

1. RamezElmasri and Shamkant B. Navathe, "Fundamental Database Systems", 3rd Edition, Pearson Education, 2003, ISBN 978-0321204486.
2. "Big Data Black Book", DT Editorial services, 2015 Edition.
3. Hellerstein, Joseph, and Michael Stonebraker, "Readings in Database Systems (The Red Book)", 4th Edition, MIT Press, 2005, ISBN: 9780262693141.

BS 202 : ENGINEERING MATHEMATICS - III

Teaching Scheme	Examination Scheme	
Lectures: 4 Hrs./Week	**Continuous Assessment:**	**20 Marks**
	In-Sem Exam:	**30 Marks**
	End-Sem Exam:	**50 Marks**
Credits: 4	**Total:**	**100 Marks**

Prerequisite Course: Basic of Mathematics

Course Objectives

1. **To Know** and **recall** core knowledge of Scalar and vector function.
2. **To Understand** the concept of Vector integral.
3. **To Apply** core concept Higher Order Differential Equation applied problems in engineering.
4. **To Analyse** the Problem of Series Solution Of Differential Equations.
5. **To Understand** the core concept of Partial Differential Equation.
6. To **Use PDEs** in Various Applications .

Course Outcomes (COs):

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

	Course Outcome (s)	Bloom's Taxonomy	
		Level	**Descriptor**
CO1	**Know** and **recall** core knowledge of Scalar and vector function	1	Remember
CO2	**Understand** the concept of Vector integral	2	Understand
CO3	**Apply** core concept Higher Order Differential Equation applied problems in engineering.	3	Apply
CO4	**Analyse** the problem of Series Solution Of Differential Equation.	3	Apply
CO5	**Understand** the core concept of Partial Differential Equation	2	Understand
CO6	**Use** of PDEs in various Application	3	Apply

Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO6	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-

Course Contents			
Unit-I	**VECTOR DIFFERENTIATION**	**No. of Hours**	**COs**
	Scalar and vector point function, Derivative of a vector point function, Gradient of scalar function ∅, Directional derivative, Divergence and Curl of vector point function, Solenoidal and irrotational vector field and scalar potential, vector identities.	08	CO1
Unit-II	**VECTOR INTEGRATION**	**No. of Hours**	**COs**
	Line integral, Greens theorem, Work done, Conservative field, surface integral, Stokes theorem, volume integral, Gauss Divergence theorem.	08	CO2
Unit-III	**HIGHER ORDER DIFFERENTIAL EQUATION**	**No. of Hours**	**COs**
	Homogeneous and non homogeneous linear differential equation of n^{th} order and its solution, Method of variation of parameter, operator method for particular integral, solution of certain types of linear differential equation:-Cauchy's and Legendre's differential equation.	08	CO3
Unit-IV	**SERIES SOLUTION OF DIFFERENTIAL EQUATION**	**No. of Hours**	**COs**
	Linear differential equations with variable coefficients, solution about ordinary point, about singular point (Frobenius method) series solution of Bessel's equation, series solution of Legendre's equation.	08	CO4
Unit-V	**PARTIAL DIFFERENTIAL EQUATION**	**No. of Hours**	**COs**
	Formation of partial differential equation, Partial differential equation of order one (linear and nonlinear), Charpit method, PDE of higher order with constant coefficient.	08	CO5
Unit-VI	**APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATION**	**No. of Hours**	**COs**
	One dimensional heat equation, Wave equation, Two dimensional heat equation (Laplace equation), Telephone equation, Radio equations.	08	CO6

Text Books:

1. B. S. Grewal, "Higher Engineering Mathematics", 42/e, Khanna Publishers, 2012, **ISBN-13: 978-8174091154.**
2. N. P. Bali and Manish Goyal, "A Text Book of Engineering, Mathematics", 8/e, Lakshmi Publications, 2012. **ISBN: 9788131808320.**
3. H. K. Das, "Engineering Mathematics", S Chand, 2006, **ISBN-8121905209.**

Reference Books:

1. K.A. Stroud & D. S. Booth, "Advanced Engineering Mathematics", Industrial Press, 5/e, 2011, **ISBN-9780831134495.**
2. P. C. Matthews, "Vector Calculus", Springer, 2/e, 2012, **ISBN-9783540761808.**
3. Robert C. Wrede, "Introduction to vector and tensor analysis", Dover, 2013.
4. W. E. Boyce, R. C. Diprima, "Elementary differential equation and boundary value problems", John Wiley & Sons, 2012, ISBN-978-0-470-45831-0833.
5. R. K. Jain and S. R. K. Iyengar, "Advanced Engineering Mathematics", Narosa Publishing House, 2014. **ISBN-13: 978-1842653418.**
6. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley, 9/e, 2013.

IT213: Data Structures and Files		
Teaching Scheme	**Examination Scheme**	
Lectures: 4 Hrs./Week	**Continuous Assessment:**	**20 Marks**
	In-Sem Exam:	**30 Marks**
	End-Sem Exam:	**50 Marks**
Credits: 4	**Total:**	**100 Marks**
Prerequisite Course: Fundamentals of Data Structures		

Course Objectives

1. To apply appropriate data structures to implement Trees.
2. To apply appropriate data structures to implement Graphs.
3. To apply heap data structure for problem solving.
4. To apply the different hashing functions.
5. To understand the different types of Search tree
6. To understand and Implement different File organizations.

Course Outcomes (COs):

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

Course Outcome (s)		Bloom's Taxonomy	
		Level	**Descriptor**
CO1	**Apply** appropriate data structures to implement Trees.	3	Apply
CO2	**Apply** appropriate data structures to implement Graphs.	3	Apply
CO3	**Apply** heap data structure for problem solving.	3	Apply
CO4	**Apply** the different hashing functions.	3	Apply
CO5	**Understand** the different types of Search tree.	2	Understand
CO6	**Understand** and **Implement** different File organizations.	3	Apply

Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	2	1	1	2	2	1	3	2	2	2	3	-	2
CO2	3	1	3	1	1	2	2	1	3	2	2	2	3	-	2
CO3	2	3	3	1	1	1	-	1	2	2	2	2	3	-	2
CO4	2	1	3	1	1	1	-	1	2	2	2	2	3	-	2
CO5	1	3	2	1	1	1	-	-	2	2	1	-	3	-	2
CO6	1	1	2	1	1	2	1	-	2	2	1	3	3	-	2

Course Contents			
Unit-I	**TREES**	**No. of Hours**	**COs**
	Trees and binary trees-concept and terminology. Expression tree. Conversion of general tree to binary tree. Binary tree as an Abstract Data Type(ADT). Recursive and non-recursive algorithms for binary tree traversals, construction of tree from its traversals, Binary search trees, Binary search tree as ADT, Applications of trees.	08	CO1
Unit-II	**GRAPHS**	**No. of Hours**	**COs**
	Graph as an ADT, Representation of graphs using adjacency matrix and adjacency list, Depth First Search and Breadth First Search traversal. Prim's and Kruskal's algorithms for minimum spanning tree, shortest path using Warshall's and Dijkstra's algorithm, topological sorting.	08	CO2
Unit-III	**TABLES**	**No. of Hours**	**COs**
	Symbol Table: Notion of Symbol Table, OBST, Huffman's algorithm, Heap data structure, Min and Max Heap, Heap sort implementation, applications of heap: priority queue.	08	CO3
Unit-IV	**HASH TABLES**	**No. of Hours**	**COs**
	Hash tables and scattered tables: Basic concepts, hash function, characteristics of good hash function, different key-to-address transformations techniques, synonyms or collisions, collision resolution techniques- linear probing, quadratic probing, rehashing, chaining without replacement and chaining with replacement.	08	CO4
Unit-V	**SEARCH TREE**	**No. of Hours**	**COs**
	Concept of threaded binary tree, AVL Trees, Concept of red and black trees, Multiway Trees: B trees, B+ trees, Splay trees.	08	CO5
Unit-VI	**FILE ORGANIZATION**	**No. of Hours**	**COs**
	External storage devices, File, File types and file organization: Sequential, Index sequential and Direct access, Primitive operations and implementations for each type. Comparison of file organizations.	08	CO6

Text Books:

1. Thomas H. Cormen, Charles E. Leiserson and Ronald L. Rivest, "Introduction to Algorithms", 2nd Edition, The MIT Press, 2001, ISBN 0-262-03293-7.
2. R. Gilberg, B. Forouzan, "Data Structure: A Pseudo code approach with C++", Cengage Learning.
3. SartajSahni, "Data Structures, Algorithms and Applications in C++", 2nd Edition, Universities Press.

Reference Books:

1. Robert Sedgewick and Kevin Wayne, "Algorithms", 4th Edition; Pearson Education, ISBN-13: 978-0321573513.
2. E. Horowitz, S. Sahni, S. Anderson-freed, "Fundamentals of Data Structures in C", 2nd Edition, University Press, ISBN 978-81-7371-605-8.
3. E. Horowitz, S. Sahni, D. Mehta, "Fundamentals of Data Structures in C++", Galgotia

Book.
4. Alan Tharp, “File Organization and Processing”, Willey India edition.
5. Y. Langsam, M. Augenstin, A. Tannenbaum, “Data Structures using C and C++”, Prentice Hall of India.
6. Goodrich, “Data Structures and Algorithms in C++”, Wiley.

IT214 : Database Management Systems Laboratory

Teaching Scheme	Examination Scheme	
Lectures: 2 Hrs./Week	**Term Work:**	**50 Marks**
	Oral :	**NA**
	Practical:	**NA**
Credits: 1	**Total:**	**50 Marks**

Prerequisite Course: Database Management Systems

Course Objectives

1. To implement ER models using DDL, DML and DCL commands.
2. To develop applications using stored procedures, triggers and cursors.
3. To populate and query a database using MongoDB commands.

Course Outcomes (COs):

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

	Course Outcome (s)	Bloom's Taxonomy	
		Level	**Descriptor**
CO1	**Implement** ER models using DDL, DML and DCL commands.	3	Apply
CO2	**Develop** applications using stored procedures, triggers and cursors.	3	Apply
CO3	**Populate** and query a database using MongoDB commands.	3	Apply

Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	1	-	-	-	-	-	-	2	-	-	1	3	-
CO2	1	2	-	-	-	-	-	-	-	-	-	-	-	-	3
CO3	1	-	2	-	3	-	-	-	-	-	-	-	-	-	1
CO4	1	-	3	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	3	-	-	-	-	-	-	1	-	-
CO6	-	-	-	-	3	-	-	-	-	3	2	-	-	-	-

Guidelines: This Database System Laboratory course has Database Systems as a core subject. The problem statements should be framed based on assignments mentioned in the syllabus. The teacher will frame the problem statements with due consideration that students have two hours to complete that. The oral examination will comprise of implementation and related theory. All assignments are to be performed in open source software tools. Use of open source platform and tools is encouraged.

Term work: Staff in-charge will suitably frame the above assignments and flexibility may be incorporated. Students will submit term work in the form of journal. Each assignment has to be well documented with problem definition, code documented with comments. Staff in-charge will assess the assignments continuously and grade or mark each assignment on completion date. All the assignments should be conducted on open source software tools

Suggested List of Assignments

Sr. No.	Assignment	No. of Hours	COs
1	Design any database with at least 3 entities and relationships between them. Apply DCL and DDL commands.	2	CO1
2	Design and implement a database and apply at least 10 different DML queries. Make use of wild characters and LIKE operator, Make use of Boolean and arithmetic operators.	2	CO1
3	Design and implement a database and apply the aggregate functions like count, sum, avg etc. Use group by and having clauses.	2	CO1
4	Implement nested sub queries. Perform a test for set membership (in, not in), set comparison (<some, >=some, <all etc.).	2	CO2
5	Write and execute triggers on suitable database.	2	CO2
6	Write and execute PL/SQL stored procedure/function using cursors to perform a suitable task on the database.	2	CO2
7	Create a database with suitable example using MongoDB and implement CRUD operations. ● Inserting and saving document ● Removing document ● Updating document (document replacement, using modifiers, upserts, updating multiple documents, returning updated documents)	2	CO3
8	Execute at least 10 queries on any suitable MongoDB database that demonstrates following querying techniques: ● Find and findOne (specific values) ● Query criteria (Query conditionals, OR queries, $not, Conditional semantics) ● Type-specific queries (Null, Regular expression, Querying arrays)	2	CO3
9	Execute at least 10 queries on any suitable MongoDB database that demonstrates following: ● $ where queries ● Cursors (Limits, skips, sorts, advanced query options)	2	CO3
10	Implement Map reduce example with suitable example.	2	CO3

Reference Books:

1. Ivan Bayross, “SQL, PL/SQL: The Programming Language of Oracle”, BPB Publication.
2. Weinberg, Paul N., et al. “SQL, the Complete Reference”, McGraw-Hill, 2010.
3. Kristina Chodorow, “MongoDB The definitive guide”, O’Reilly Publications, ISBN: 978-93-5110-269-4, 2nd Edition.
4. Dr. P. S. Deshpande, “SQL and PL/SQL for Oracle 10g Black Book”, Dream Tech.
5. George Reese and Randy Jay Yarger, “Managing And Using MySQL”, O Reilly.

IT215 : Microprocessor & Micro-controller Laboratory

Teaching Scheme	Examination Scheme	
Lectures: 2 Hrs./Week	**Term Work:**	**NA**
	Oral :	**50 Marks**
	Practical:	**NA**
Credits: 1	**Total:**	**50 Marks**

Prerequisite Course: Microprocessor & Micro-controller.

Course Objectives

1. To develop ALP using macros and procedures.
2. To use DOS interrupts for file operations.
3. To develop 8051 based programs.
4. To develop 8051 interface with I/O

Course Outcomes (COs):

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

	Course Outcome (s)	Bloom's Taxonomy	
		Level	**Descriptor**
CO1	**Develop** ALP using macros and procedures.	3	Apply
CO2	**Use** DOS interrupts for file operations.	3	Apply
CO3	**Develop** 8051 based programs.	3	Apply
CO4	**Develop** 8051 interface with I/O devices	3	Apply

Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	2	1	1	1	2	-	1	-	-	-	-	3	2
CO2	3	1	2	1	1	1	2	-	3	2	1	-	-	3	2
CO3	2	1	3	1	1	1	-	-	2	1	-	-	-	3	2
CO4	2	1	3	1	1	1	-	-	2	1	-	-	-	3	2

Guidelines: This Microprocessor & Micro-controller Laboratory course has Microprocessor & Micro-controller as a core subject. The problem statements should be framed based on assignments mentioned in the syllabus. The teacher will frame the problem statements with due consideration that students have three hours to complete that. The practical examination will comprise of implementation and related theory. All assignments are to be performed in MASM/TASM, TURBO DEBUGGER, 8051 Simulator and 8051 Trainer kit with interfacing devices. Use of open source platform and tools is encouraged

Term work: Staff in-charge will suitably frame the above assignments and flexibility may be incorporated. Students will submit term work in the form of journal. Each assignment has to be well documented with problem definition, code documented with comments. Staff in-charge will assess the assignments continuously and grade or mark each assignment on completion date. All the assignments should be conducted in 8086 and 8051 ALP.

Suggested List of Assignments

Group A	MICROPROCESSOR PROGRAMMING USING 8086	No. of Hours	COs
1.	Assignment on addition of N numbers stored in the memory using macros.	2 Hrs.	CO1
2.	Assignment on number conversion using macros.	2 Hrs.	CO1
3.	Assignment on string manipulations using near and far procedure.	2 Hrs.	CO2
4.	Assignment on File operation using DOS interrupts.	2 Hrs.	CO2
Group B	**MICRO-CONTROLLER PROGRAMMING**	**No. of Hours**	**COs**
5.	Assignment on memory block transfer.	2 Hrs.	CO3
6.	Assignment on Timer programming: ISR based.	2 Hrs.	CO3
7.	Assignment on ADC and Sensor (Eg. Temperature) Interfacing.	2 Hrs.	CO4
8.	Assignment on LCD interfacing.	2 Hrs.	CO4

Reference Books:

1. Peter Abel, NiyazNizamuddin, "IBM PC Assembly Language and Programming", Pearson Education.
2. Ray Duncan, "Advanced MS DOS Programming", 2nd Edition, BPB Publications.
3. Intel 8051 Micro-controller Manual.
4. M. A. Mazidi, J. G. Mazidi, "The 8051 Microcontroller and Embedded Systems", Pearson Education.

IT216 : Data Structures & Files Laboratory

Teaching Scheme	Examination Scheme	
Lectures: 2 Hrs./Week	**Term Work:**	**NA**
	Oral :	**NA**
	Practical:	**50 Marks**
Credits: 1	**Total:**	**50 Marks**

Prerequisite Course: Fundamentals of Data Structures, C++ Programming.

Course Objectives

1. To implement Trees and perform traversals.
2. To implement Graphs and Heap.
3. To apply hashing concepts and manipulate databases using different file organizations.

Course Outcomes (COs):

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

	Course Outcome (s)	Bloom's Taxonomy	
		Level	**Descriptor**
CO1	**Implement** Trees and perform traversals.	3	Apply
CO2	**Implement** Graphs and Heap.	3	Apply
CO3	**Apply** hashing concepts and manipulate databases using different file organizations.	3	Apply

Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	3	1	1	2	2	2	3	1	1	2	3	-	2
CO2	2	-	3	1	1	2	2	2	3	1	1	2	3	-	2
CO3	2	-	3	1	1	2	2	2	3	1	1	2	3	-	2

Guidelines: This Advanced Data Structures Laboratory course has Advanced Data Structures as a core subject. The problem statements should be framed based on mentioned assignments in the syllabus for conduction of practical examination. The teacher will frame the problem statements with due consideration that students have three hours to complete that. The practical examination will comprise implementation and related theory. All assignments are to be performed in C++ Language.

Term Work: Staff in-charge will suitably frame the above assignments and flexibility may be incorporated. Students will submit term work in the form of a journal. Each assignment has to be well documented with problem definition, code documented with comments. Staff in-charge will assess the assignments continuously and grade or mark each assignment on completion date. All the assignments should be conducted in C++ Language.

Suggested List of Assignments			
Sr. No.	**Assignments**	**No. of Hours**	**COs**
1	Assignment based on implementation of tree.	2 Hrs.	CO1
2	Assignment based on traversal of tree.	2 Hrs.	CO1
3	Assignment based on minimum spanning tree.	2 Hrs.	CO1
4	Assignment based on shortest path in graph.	2 Hrs.	CO2
5	Assignment based on implementation of priority queue as application of heap.	2 Hrs.	CO2
6	Assignment based on Implement hash table.	2 Hrs.	CO3
7	Assignment based on implementation of advanced tree.	2 Hrs.	CO3
8	Assignment based on file organizations.	2 Hrs.	CO3

Books:

Reference Books:

1. R. Gilberg, B. Forouzan, "Data Structure: A Pseudo code approach with C++", Cengage Learning.
2. E. Horowitz, S. Sahni, D. Mehta, "Fundamentals of Data Structures in C++", Galgotia Book.
3. SartajSahni, "Fundamentals of Data Structures", University Press.
4. Robert Sedgewick and Kevin Wayne, "Algorithms" 4th Edition; Pearson Education, ISBN-13: 978-0321573513.
5. Y. Langsam, M. Augenstin, A. Tannenbaum, "Data Structures using C and C++", Prentice Hall of India.
6. Goodrich, "Data Structures and Algorithms in C++", Wiley.
7. A. Tharp, "File Organization and Processing", Willey India Edition.
8. G. A.V, Pai, "Data Structures and Algorithms", McGraw Hill.

IT217 : Seminar			
Teaching Scheme		**Examination Scheme**	
Lectures: 2 Hrs./Week		**Term Work:**	**NA**
		Oral :	**50 Marks**
		Practical:	**NA**
Credits: 2		**Total:**	**50 Marks**

Prerequisite Course: Basic Communication, Reading Skill and writing skill.

Course Objectives

1. To acquaint with basic technical writing concepts and terms, such as audience analysis, jargon, format, visuals, and presentation.
2. To reframe the literature and present using multimedia and presentation skills.
3. To analyze and summarize the literature survey and prepare technical reports.

Course Outcomes (COs):

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

	Course Outcome (s)	Bloom's Taxonomy	
		Level	**Descriptor**
CO1	**Acquaint** with basic technical writing concepts and terms, such as audience analysis, jargon, format, visuals, and presentation.	2	Understand
CO2	**Reframe** the literature and present using multimedia and presentation skills.	3	Apply
CO3	**Analyze** and **summarize** the literature survey and prepare technical reports.	4	Analyze

Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	3	2	-	1	-	3	2	-	-	-	-	3
CO2	-	-	-	3	2	-	1	-	3	2	-	-	-	-	3
CO3	-	-	-	3	2	-	1	-	3	2	-	-	-	-	3

Course Content
Context
● Each student will select a multidisciplinary topic in the area of Engineering and Technology preferably keeping track with recent technological trends and development beyond scope of syllabus avoiding repetition in consecutive years. ● The topic must be selected in consultation with the institute guide. ● Each student will make a seminar presentation using audio/visual aids for a duration of 20-25 minutes and submit a seminar report prepared in Latex only. ● Seminar Log book should be compulsorily maintained. ● Seminar should make the student attain skills like: a) Gathering of literature in a specific area in a focused manner. b) Effectively summarizing the literature to find state-of-the-art in the proposed area. c) Identifying scope for future work. d) Reporting literature review and proposed work in a scientific way using good English.
Guidelines for Seminar Work Evaluation:
A panel of examiners along with a guide will assess the seminar work based on following parameters: a) Relevance of topic - 05 Marks b) Relevance + depth of literature reviewed- 10 Marks c) Seminar report (Technical Content) - 10 Marks d) Seminar report (Language) - 05 Marks e) Presentation Slides - 05 Marks f) Communication Skills - 05 Marks g) Question and Answers - 10 Marks **Note:** Student will prepare a seminar report as per the template given by the department. They should prepare and public a review paper based on their seminar work and publish/present it in a suitable journal/conference. ● Oral examination in the form of presentation will be based on the project and seminar work completed by the candidates. ● Seminar report must be presented during the presentation.
Reference Books:
1. Rebecca Stott, Cordelia Bryan, Tory Young, “Speaking Your Mind: Oral Presentation and Seminar Skills (Speak-Write Series)”, Longman, ISBN-13: 978-0582382435. 2. Johnson-Sheehan, Richard, “Technical Communication”, Longman, ISBN 0-321-11764-6. 3. VikasShirodka, “Fundamental skills for building Professionals”, SPD, ISBN: 978-93-5213-146-5.

IT218 : Mini Project

Teaching Scheme	Examination Scheme	
Lectures: 4 Hrs./Week	Term Work:	50 Marks
	Oral :	NA
	Practical:	NA
Credits: 2	Total:	50 Marks

Prerequisite Course: Fundamental of Programming Languages.

Course Objectives

1. To use modular programming approach and programming skills in diversified problem domains.
2. To use specialized features of the technological tools to provide effective solutions.
3. To analyze real world problem using domain knowledge and analytical skills.
4. To demonstrate the concepts, principles, strategies and methodologies of web applications.

Course Outcomes (COs):

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

	Course Outcome (s)	Bloom's Taxonomy	
		Level	Descriptor
CO1	**Use** modular programming approach and programming skills in diversified problem domains.	3	Apply
CO2	**Use** specialized features of the technological tools to provide effective solutions.	3	Apply
CO3	**Analyze** real world problem using domain knowledge and analytical skills.	4	Analyze
CO4	**Demonstrate** the concepts, principles, strategies and methodologies of web applications.	2	Understand

Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	2	1	3	3	1	-	3	3	2	3	2	-	3
CO2	3	1	2	1	3	2	1	-	3	3	2	3	2	-	3
CO3	2	3	2	2	3	1	1	-	3	3	2	3	2	-	3
CO4	3	2	1	1	3	1	1	-	3	3	2	3	2	-	3

Guidelines: This Mini Project Laboratory course has Programming Languages as a core subject. The problem statements should be framed based on mentioned assignments in the syllabus for conduction of practical examination. The teacher will frame the problem statements with due consideration that students will develop a web application mini project at the end of the course. All assignments are to be performed in in any one of the three tools viz: **PHP based technology**, **Java based technology** or **Python based technology** with a suitable back-end.

Term Work: Staff in-charge will suitably frame the above assignments and flexibility may be incorporated. Students will submit term work in the form of journal. Each assignment has to be well documented with problem definition, code documented with comments. Staff in-charge will assess the assignments continuously and grade or mark each assignment on completion date. All the assignments should be conducted in PHP/Java/Python and MySQL or suitable database.

Suggested List of Assignments

Sr. No.	Assignments	No. of Hours	COs
1	Assignment on Operators, Data types, Variables and Constants.	4 Hrs.	CO1
2	Assignment on Arrays, Control Structures, Looping Structures.	4 Hrs.	CO1
3	Assignment on Conditional Statements, User Defined Functions.	4 Hrs.	CO1
4	Assignment on String Function, Math library functions.	4 Hrs.	CO2
5	Assignment on Graphical User Interface and validation.	4 Hrs.	CO2
6	Assignment on State Management: Cookies, Session management.	4 Hrs.	CO2
7	Assignment on Embedded SQL: Creating Database & Tables, Dropping Database & Tables, Adding Fields, Selecting Tables.	4 Hrs.	CO2
8	Assignment on Mini-project Part-I: Problem definition and Analysis.	4 Hrs.	CO3
9	Assignment on Mini-project Part-II: Design and Implementation.	4 Hrs.	CO4
10	Assignment on Mini-project Part-III: Testing and Deployment.	4 Hrs.	CO4

Books:

Reference Books:

1. Steve Holzner, “The Complete Reference PHP”, TATA McGraw Hill.
2. Ivan Bayross, “Web Enabled Commercial Application Development Using HTML, JavaScript, DHTML and PHP”, 4th Edition, BPB Publications. ISBN: 9788183330084.
3. “Web Technologies Black Book: HTML, JavaScript, PHP, Java, JSP, XML and AJAX”, Kogent Learning Solutions Inc. ISBN: 9788126554560, 8126554568.
4. VikramWaswani, “The Complete Reference MySQL”, TATA McGraw Hill.
5. Luke Welling and Laura Thomson, “PHP and MySQL Web Development”, Addison Wesley, 5th Edition, 2017.
6. Herbert Schildt, “The Complete Reference: Java2”, 5th Edition, Tata McGraw-Hill, 2011, ISBN: 978-0-07-049543-2.
7. Jim Keogh, “The Complete Reference: J2EE”, Tata McGraw-Hill, 2012, ISBN: 978-0-07-052912-0.

MC 219 : Innovation - Project based – Sc., Tech, Social, Design & Innovation (Mandatory Course – IV)

Teaching Scheme	Examination Scheme	
Lectures: 2 Hrs./Week	**Term Work:**	**NA**
	Oral :	**NA**
	Practical:	**NA**
Credits: Non Credit	**Total:**	**NA**

Course Objectives

1. To develop strategic thinking to solve social problems.
2. Understand the role of innovation and technical change in enterprise and national level economic performance.
3. Understand the technological, human, economic, organizational, social and other dimensions of innovation.
4. Understand the effective management of technological innovation requires the integration of people, processes and technology.
5. Recognize opportunities for the commercialization of innovation.

Course Outcomes (COs):

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

	Course Outcome (s)	Bloom's Taxonomy	
		Level	**Descriptor**
CO1	**Understand** the role of innovation and technical change in enterprise and national level economic performance	2	Understand
CO2	**Develop** strategic thinking to solve social problems	3	Apply
CO3	**Recognize** opportunities for the commercialization of innovation	6	Create

Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	3	2	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	2	2	3	3	3	2	2	2	-	-	-

Course Contents
Many students, when they enter engineering, are full of enthusiasm to understand new areas, to build systems and to experiment and play with them. This enthusiasm is to be tapped and to direct it to exploration and sustained pursuit by the student, which may result in development of a working system, a prototype, or a device or material, etc. They are not required or even expected to produce research or an innovation. Students may be encouraged to take up projects which are aimed at providing solutions to societal problems, reduce drudgery and improving efficiency in rural work, green technologies, utilization of rural and urban waste, sanitation and public health, utilizing non-conventional energy sources, technologies for the benefit of the differently abled people and technologies ready to be implemented in the Institute. Two types of activities may be undertaken under this (a) Exposure to social problems (which are amenable to technological solutions) (b) Design & Innovation (to address above problems) After this students be encouraged to undertake technology projects of social relevance.