

**SANJIVANI RURAL EDUCATION SOCIETY'S**  
**SANJIVANI COLLEGE OF ENGINEERING KOPARGAON 423603**  
**(An Autonomous Institute Affiliated to SPPU Pune)**



**DEPARTMENT OF COMPUTER ENGINEERING**

**Profile:** For any revolution to make an impact, Computer Engineering holds the key. The Department of Computer Engineering was established in the year 1989-90 and has qualified and experienced staff. The PG Programme in ME [Computer Engineering] is started from academic year 2011-2012. Department is accredited by NBA in Year 2003, 2008, 2015 and 2020 as well Accredited by Institute of Engineers, India in Year 2015. Department is having all the leading edge software's and hardware's in its state-of-the-art laboratories, because we believe that it will be here from where global professionals will be created!!

Total 300 Computers along with a well-equipped project lab have been set up exclusively for final year students for their project work. Department is providing SAP global certification having separate SAP Training lab with necessary software. System Department is looking after the centralized computing facilities having Computer Centre consisting of 120 nodes with dedicated 100 mbps leased line connectivity and separate 25 mbps leased line connectivity exclusively for Wi-Fi campus. Under Train n Hire programme, Department Faculty is providing training on Web Technology and PHP to shortlisted students by Xento Systems, Pune every year. To complement and make the curriculum more interesting, competitive and practical, lot of co-curricular activities are organized and conducted. The Department has formed an Association of Computer Engineering Students (ACES) and established the student chapters of professional bodies like IEEE and CSI. From time to time, these professional bodies, organize various events such as State Level Software Contest, State and National level paper presentation contest, Project Competitions & Workshops on Embedded Systems, leading technologies like AI and Machine Learning, Data Mining and Cloud Technology, Software Testing, Cyber Security, Java Technology, IOT and Data Analytics etc. We are conducting short term courses and seminars on Advanced C, C++, VB and Oracle, VC++, JAVA Technology, Python, PC Troubleshooting and maintenance, design patterns and extreme programming. The department has its own library consisting of around 527 books and manuals based on latest technology.

## **Vision**

- To develop world class engineering professionals with good moral characters and make them capable to exhibit leadership through their engineering ability, creative potential and effective soft skills which will improve the quality of life in society.

## **Mission**

- To impart quality technical education to the students through innovative and interactive teaching and learning process to acquire sound technical knowledge, professional competence and to have aptitude for research and development.
- Develop students as excellent communicators and highly effective team members and leaders with full appreciation of the importance of professional, ethical and social responsibilities.

## Program Outcomes (POs)

### Engineering Graduates will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **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.
3. **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.
4. **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.
5. **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.
6. **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.
7. **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.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **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.
11. **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.
12. **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 (PSOs)**

1. **Professional Skills:** The ability to apply knowledge of problem solving, algorithmic analysis, software Engineering, Data Structures, Networking, Database with modern recent trends to provide the effective solutions for Computer Engineering Problems.
2. **Problem-Solving Skills:** The ability to inculcate best practices of software and hardware design for delivering quality products useful for the society.
3. **Successful Career:** The ability to employ modern computer languages, environments, and platforms in creating innovative career paths.

### **Program Educational Objectives (PEOs)**

- 1 To prepares the committed and motivated graduates by developing technical competency, research attitude and life-long learning with support of strong academic environment.
2. Train graduates with strong fundamentals and domain knowledge, update with modern technology to analyse, design & create novel products to provide effective solutions for social benefits.
3. Exhibit employability skills, leadership and right attitude to succeed in their professional career.

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**DEPARTMENT OF COMPUTER ENGINEERING**  
**COURSE STRUCTURE - 2020 PATTERN**  
**SECOND YEAR B. TECH.**  
**w.e.f. 2021-22**

## COURSE STRUCTURE- 2020 PATTERN

### SECOND YEAR B. TECH: COMPUTER ENGINEERING

#### SEMESTER-I

Cat.	Code	Course Title	Teaching Scheme			Credits	Evaluation Scheme-Marks						
			L (hrs)	T (hrs)	P (hrs)		Theory			OR	PR	TW	Total
							ISE	ESE	CA				
PCC	CO201	<u>Discrete Mathematics</u>	3	1	-	4	30	50	20	-	-	-	<b>100</b>
PCC	CO202	<u>Data Structures I</u>	4	-	-	4	30	50	20	-	-	-	<b>100</b>
PCC	CO203	<u>Digital Electronics and Data Communication</u>	3	-	-	3	30	50	20	-	-	-	<b>100</b>
PCC	CO204	<u>Computer Organization and Architecture</u>	3	-	-	3	30	50	20	-	-	-	<b>100</b>
HSMC	HS205	<u>Universal Human Values and Ethics</u>	3	-	-	3	30	50	20	-	-	-	<b>100</b>
LC	CO206	<u>Data Structures Laboratory-I</u>	-	-	2	1	-	-	-	-	50	50	<b>100</b>
LC	CO207	<u>Digital Electronics Laboratory</u>	-	-	2	1	-	-	-	-	50	-	<b>50</b>
LC	CO208	<u>Computer Organization Laboratory</u>	-	-	2	1	-	-	-	50	-	-	<b>50</b>
MC	MC209	<u>Mandatory Course – III</u>	2	-	-	NC	-	-	-	-	-	-	<b>-</b>
<b>Total</b>			<b>18</b>	<b>1</b>	<b>6</b>	<b>20</b>	<b>150</b>	<b>250</b>	<b>100</b>	<b>50</b>	<b>100</b>	<b>50</b>	<b>700</b>

**MC209**

**Mandatory Course - III**

**Constitution of India – Basic features and fundamental principles**

#### LIST OF ABBREVIATIONS

Abbreviation	Full Form	Abbreviation	Full Form
ESC	Engineering Science courses	HSMC	Humanities and Social Sciences including Management courses
PCC	Professional Core courses	CA	Continuous Assessment
PEC	Professional Elective courses	OR	End Semester Oral Examination
OEC	Open Elective courses	PR	End Semester Practical Examination
ISE	In-Semester Evaluation	TW	Continuous Term work Evaluation
ESE	End-Semester Evaluation	BSC	Basic Science Course
PROJ	Project	MC	Mandatory Course
LC	Laboratory course	L	Lecture
T	Tutorial	P	Practical
Cat	Category		

## SEMESTER-II

Cat.	Code	Course Title	Teaching Scheme			Credits	Evaluation Scheme-Marks						
			L (hrs)	T (hrs)	P (hrs)		Theory			OR	PR	TW	Total
							ISE	ESE	CA				
BSC	BS202	<a href="#">Engineering Mathematics-III</a>	3	1	-	4	30	50	20	-	-	-	<b>100</b>
PCC	CO210	<a href="#">Object Oriented Programming</a>	3	-	-	3	30	50	20	-	-	-	<b>100</b>
PCC	CO211	<a href="#">Operating System and Administration</a>	4	-	-	4	30	50	20	-	-	-	<b>100</b>
PCC	CO212	<a href="#">Data Structures-II</a>	4	-	-	4	30	50	20	-	-	-	<b>100</b>
PROJ	CO213	<a href="#">Seminar</a>	1	-	2	2	-	-	-	-	-	50	<b>50</b>
LC	CO214	<a href="#">Data Structure Laboratory -II</a>	-	-	2	1	-	-	-	-	50	-	<b>50</b>
LC	CO215	<a href="#">Operating System and Administration Laboratory</a>	-	-	2	1	-	-	-	-	-	50	<b>50</b>
LC	CO216	<a href="#">Object Oriented Programming Laboratory</a>	-	-	2	1	-	-	-	-	50	-	<b>50</b>
PROJ	CO217	<a href="#">Mini Project / Choice Based Subject</a>	-	-	4	2	-	-	-	50	-	50	<b>100</b>
MC	MC218	<a href="#">Mandatory Course – IV</a>	2	-	-	NC	-	-	-	-	-	-	-
<b>Total</b>			<b>17</b>	<b>1</b>	<b>12</b>	<b>22</b>	<b>120</b>	<b>200</b>	<b>80</b>	<b>50</b>	<b>100</b>	<b>150</b>	<b>700</b>

**MC220**

**Mandatory Course - IV**

**Innovation - Project based – Sc., Tech, Social, Design & Innovation**

### LIST OF ABBREVIATIONS

Abbreviation	Full Form	Abbreviation	Full Form
ESC	Engineering Science courses	HSMC	Humanities and Social Sciences including Management courses
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PEC	Professional Elective courses	OR	End Semester Oral Examination
OEC	Open Elective courses	PR	End Semester Practical Examination
ISE	In-Semester Evaluation	TW	Continuous Term work Evaluation
ESE	End-Semester Evaluation	BSC	Basic Science Course
PROJ	Project	MC	Mandatory Course
LC	Laboratory course	L	Lecture
T	Tutorial	P	Practical
Cat	Category		

**Total Credits: 42**

**Total Marks: 1500**

# **SEMESTER I**



## CO201: Discrete Mathematics

Teaching Scheme	Examination Scheme	
Lectures: 3 Hrs. / Week	In-Sem Exam:	30 Marks
Tutorial: 1 Hrs./ Week	End-Sem Exam:	50 Marks
Credits: 4	Teacher Assessment:	20 Marks
	<b>Total</b>	<b>100 Marks</b>

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**Prerequisite: Basic Mathematics**

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### Course Objectives:

1. To understand the set theory & propositional logic.
2. To know about relation and function.
4. To learn the concept of graph & terminology associated with graph theory.
4. To study the concept of tree & algorithms for construction of tree.
5. To acquire the knowledge algebraic system & coding theory.
6. To learn & understand the significance of number theory.

**Course Outcomes (COs):** On completion of the course, student will be able to-

Course Outcome (s)	Bloom's Taxonomy	
	Level	Descriptor
1. <b>Analyze</b> the problem to select appropriate set theory operation.	4	Analyze
2. <b>Apply</b> relation and function to find out the mapping between the objects.	3	Apply
3. <b>Relate</b> the graph theory concepts to solve real word problems.	4	Analyze
4. <b>Apply</b> the appropriate algorithm for construction of tree.	3	Create
5. <b>Summarize</b> different type's algebraic system and its usage.	1	Remember
6. <b>Understand</b> significance of number theory.	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		3								2	3	2	
CO2	2	1		2								2	3	2	
CO3	3	2		3								2	3	2	
CO4	3	2		2								2	3	2	
CO5	3	2		3								2	3	2	
CO6	3	2		3								2	3	2	

**COURSE CONTENTS**

<b>Unit I</b>	<b>SET THEORY AND LOGIC</b>	<b>No. of Hours</b>	<b>COs</b>
	Significance of Discrete Mathematics in Computer Engineering, Sets– Need of Sets, Representation of Sets, Set Operations, Venn diagram, cardinality of set, principle of inclusion and exclusion, Types of Sets –Countable and Uncountable Sets, Finite and Infinite Sets, Countably Infinite and Uncountably Infinite Sets. Introduction to bounded and unbounded sets and multiset, power set, Subset, Universal Set, Empty Set, Power Set. Propositional Logic-logic, Propositional Equivalences, Application of Propositional logic-translating English Sentences, Proof by Mathematical Induction.	8	1
<b>Unit II</b>	<b>RELATION AND FUNCTIONS</b>	<b>No. of Hours</b>	<b>COs</b>
	Relations and Their Properties, n-ary Relations and Their Applications, Representing Relations, Closures of Relations, Equivalence Relations, Partial Orderings, partitions, Hasse Diagram, Lattices, Chains and Anti-Chains, Transitive Closure and Warshall’s Algorithm, n-Ary Relations and their Applications. Functions- Surjective, Injective and Bijective functions, Inverse Functions and Compositions of Functions, The Pigeonhole Principle.	8	2
<b>Unit III</b>	<b>GRAPH THEORY</b>	<b>No. of Hours</b>	<b>COs</b>
	Graphs and Graph Models, Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and	6	3

	Hamilton Paths, Single source shortest path- Dijkstra's Algorithm, Planar Graphs, Regular graph, Bipartite graph, Euler's graph Graph Colouring. Case Study- Web Graph, Google map		
<b>Unit IV</b>	<b>TREES</b>	<b>No. of Hours</b>	<b>COs</b>
	Introduction, properties of trees, Binary search tree, decision tree, prefix codes and Huffman coding, cut sets, Spanning Trees and Minimum Spanning Tree, Kruskal's and Prim's algorithms, The Max flow- Min Cut Theorem (Transport network). Case Study- Game Tree, Mini-Max Tree.	6	4
<b>Unit V</b>	<b>ALGEBRAIC STRUCTURES AND CODING THEORY</b>	<b>No. of Hours</b>	<b>COs</b>
	The structure of algebra, Algebraic Systems, Semi Groups, Monoids, Groups, Homomorphism and Normal Subgroups, and congruence relations, Rings, Integral Domains and Fields, coding theory, Polynomial Rings and polynomial Codes, error correction & detection code. Case Study- Brief introduction to Galois Theory –Field Theory and Group Theory.	6	5
<b>Unit VI</b>	<b>NUMBER THEORY</b>	<b>No. of Hours</b>	<b>COs</b>
	Introduction, Basic Properties of Integers, Division Greatest common divisor, Euclidean Algorithm, Least common Multiple, Congruence Relation, Properties of congruence relation, Congruence Arithmetics, Residue or Congruence classes, Properties of Residue Classes, Arithmetic of Residue Classes, Congruence Equation, Linear Congruence Equation, Simultaneous linear Congruence, Application of Congruence: Hash function, cryptography.	6	6

**Books:**

**Text Books(T):**

T1. Kenneth H. Rosen, "Discrete Mathematics and its Applications", Tata McGraw-Hill, ISBN978-0-07-288008-3, 7 th Edition.

T2. C. L. Liu, "Elements of Discrete Mathematics," TMH, ISBN 10:0-07-066913-9.

**Reference Books(R):**

R1. Bernard Kolman, Robert C. Busby and Sharon Ross, "Discrete Mathematical Structures", Prentice-Hall of India /Pearson, ISBN: 0132078457, 9780132078450.

R2. N. Biggs, "Discrete Mathematics", 3rd Edition, Oxford University Press, ISBN 0 –19850717 –

8.

R3. Dr. K. D. Joshi, "Foundations of Discrete Mathematics", New Age International Limited, Publishers, January 1996, ISBN: 8122408265, 9788122408263.

R4. Seymour Lipschutz and Marc Lars Lipson "Discrete Mathematics", 3<sup>rd</sup> Special, Indian Edition, ISBN-13: 978-0-07-060174-1

R5. DeoNarsingh, "Graph theory with applications to Engineering & Computer Science", Prentice Hall of India Pvt. Ltd., 2000.

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## CO202: Data Structures-I

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

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**Prerequisite Course: Computer Fundamentals and Programming**

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### Course Objectives:

1. To know about problem solving tools and strategies.
2. To be acquainted with linear data structure, its constraints and advantages.
3. To understand the representation and memory requirements of various linear data structures.
4. To operate on data stored in linear data structures.
5. To be familiar with the applications of data structures.
6. To learn various data searching and sorting techniques.

**Course Outcome (COs):** On completion of the course, students will be able to-

Course Outcomes	Bloom's Taxonomy	
	Level	Descriptor
1. <b>Interpret</b> different tools and strategies for solving the problems.	2	Understand
2. <b>Summarize</b> different types of data structures, and its usage.	1	Remember
3. <b>Use</b> appropriate data structure for solving problems and programming.	3	Apply
4. <b>Operate</b> on data stored in different linear data structures.	3	Apply
5. <b>Analyze</b> the problem to select appropriate algorithm and data structure.	4	Analyze
6. <b>Apply</b> appropriate searching and sorting techniques for the specified problem.	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	PSO 1	PSO2	PSO3
<b>CO1</b>	3	3	2	2	-	-	-	-	-	-	-	2	3	2	-
<b>CO2</b>	3	3	-	-	-	-	-	-	-	-	-	-	3	2	-
<b>CO3</b>	3	3	1	2	-	-	1	-	1	-	-	2	3	2	-
<b>CO4</b>	2	3	2	2	-	-	1	-	2	1	-	-	3	2	-
<b>CO5</b>	1	3	2	-	-	-	2	-	2	-	-	2	3	2	-
<b>CO6</b>	2	3	2	-	-	-	-	-	1	-	-	2	3	2	-

**COURSE CONTENTS**

<b>Unit I</b>	<b>INTRODUCTION TO DATA STRUCTURE</b>	<b>No. of Hours</b>	<b>COs</b>
	Problem Solving, Introduction to Algorithms, Characteristics of Algorithms, Algorithm Design Tool: Pseudo code, Algorithm Analysis: Time and Space complexity, Asymptotic notations-Big- O, Theta and Omega, Algorithmic strategies. Data Structures-Introduction to Data Structures, Classification of Data Structures, Abstract Data Type	8	1,2
<b>Unit II</b>	<b>ARRAY</b>	<b>No. of Hours</b>	<b>COs</b>
	Array as an ADT, Storage Representation of an Array- one dimensional array, memory representation and calculation, operations on one dimensional array, Multidimensional Arrays, Two dimensional, Row major and Column major 2D array. Concept of Ordered List, Sparse Matrix, Sparse matrix representation, Sparse matrix addition, Transpose of sparse matrix String– Representation of Strings and operations on Strings using array Case Study: SET as an ADT	8	2,3,4
<b>Unit III</b>	<b>LINKED LIST</b>	<b>No. of Hours</b>	<b>COs</b>
	Introduction, Comparison of sequential and linked organizations, Representation of Linked List, Realization of linked list using arrays, Dynamic Memory Management, Linked list using dynamic memory management, Implementation of Linked List, Types of linked list: Circular Linked List, Doubly Linked List and operations. Application–Polynomial Representation and Addition.	8	2,3,4,5
<b>Unit IV</b>	<b>STACK</b>	<b>No. of Hours</b>	<b>COs</b>
	Concept, operations on stack, Stack as an ADT, Sequential Implementation of Stack, Multiple Stacks, Expression conversion and Evaluation, Need for prefix and postfix expressions, Linked Stack and Operations, Reversing a String, Recursion-concept Applications of Stack– Well form-ness of Parenthesis	8	2,3,4,5
<b>Unit V</b>	<b>QUEUE</b>	<b>No. of Hours</b>	<b>COs</b>

	Concept, Queue as an ADT, Sequential implementation of Linear Queue, Circular Queue, Priority Queue, Double Ended Queue, Multiple Queues, linked Queue. Applications of Queue– Job scheduling, Queue simulation, Categorizing data.	8	2,3,4,5
<b>Unit VI</b>	<b>SEARCHING AND SORTING</b>	<b>No. of Hours</b>	<b>COs</b>
	<b>Searching:</b> Search Techniques, Sequential search, Binary search, Fibonacci search. <b>Sorting:</b> Types of sorting-Internal and external sorting, General sort concepts-sort order, stability, efficiency, number of passes, Sorting methods- Bubble sort, Insertion sort, Selection sort, Quick sort, Shell sort, Merge sort, Bucket sort.	8	6
<b>Books:</b>			
<b>Text Books(T):</b>			
T1. Sartaj Sahni, Data Structures, Algorithms and Applications in C++, 2 <sup>nd</sup> edition, Universities Press, ISBN-13: 978-81-7371-522-8 T2. Horowitz, Sahani, Mehta, Fundamentals of Data Structures in C++, 2 <sup>nd</sup> edition, Universities Press			
<b>Reference Books( R ):</b>			
R1. Langsam, Augenstein, Tenenbaum, Data Structures using C and C++, 2 <sup>nd</sup> Edition, PHI publication, ISBN-978-81-203-1177-0 R2. A. Aho, J. Hopcroft, J. Ulman, Data Structures and Algorithms, 9 <sup>th</sup> impression, Pearson Education, ISBN-9780-07-066-726-6. R3. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, 3 <sup>rd</sup> edition, Pearson publications, ISBN-978-81-317-1474-4			

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## CO203: Digital Electronics and Data Communications

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

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**Prerequisite Course: Basics of Electronic Engineering**

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### Course Objectives:

1. To understand procedure of Logic Minimization.
2. To study combinational circuits.
3. To study sequential circuit.
4. To learn different signal modulation techniques.
5. To understand basics of data communication.

**Course Outcomes (COs):** On completion of the course, students will be able to-

Course Outcomes	Blooms Taxonomy	
	Level	Descriptor
1. <b>Apply</b> acquired knowledge to Logic Minimization Problem.	3	Apply
2. <b>Develop</b> circuit diagram for given specification of Combinational circuits.	3	Apply
3. <b>Develop</b> circuit diagram for given specification of Sequential circuits.	3	Apply
4. <b>Compare</b> types of signals (Analog and Digital) and <b>Illustrate</b> different types of signal modulation techniques.	2	Understand
5. <b>Explain</b> basics of data communication and <b>Compare</b> various transmission medium.	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	-	-	3	3	-	-	-	-	-	3	3	-
CO2	3	1	3	-	-	3	3	-	-	-	-	2	3	3	-
CO3	3	1	3	-	-	3	3	-	-	-	-	2	3	3	-
CO4	2	1	2	-	-	-	-	-	-	-	-	-	2	2	-
CO5	2	1	2	-	-	-	-	-	-	-	-	-	2	2	-

**COURSE CONTENTS**

Unit I	LOGIC MINIMIZATION	No. of Hours	COs
	<p><b>Logic gates:</b> NOT , AND , OR , NAND , NOR, EX-OR, EX-NOR</p> <p><b>Boolean Function Representation:</b> Sum of Product (SOP) and Product of Sum (POS) form of Boolean expression, Standard SOP and POS form.</p> <p><b>Minimization Technique:</b> K-map representation of Logical function, Simplification of Logical function using K-map. Minimization of SOP forms using K- Map, Minimization of POS forms using K-Map, Don't Care Condition, and Implementation of circuits using Universal gates.</p> <p><b>Codes:</b> Binary code, BCD code, Excess-3 code, Gray code, Alphanumeric code, Error Detecting and Correcting code</p>	7	1
Unit II	COMBINATIONAL LOGIC DESIGN	No. of Hours	COs
	<p>Introduction, <b>Adder:</b> Half and Full Adder, <b>Subtractor:</b> Half subtractor, Full Subtractor, Parallel Adder, Look ahead carry adder, BCD Adder, 4-bit Subtractor, Code Converters. <b>Multiplexer:</b> Design examples using Multiplexer IC 74151, Multiplexer Tree.</p> <p><b>Demultiplexer:</b> Design examples using Demultiplexer, Demultiplexer Tree.</p> <p><b>Comparator:</b> One and Two bit Comparator, IC 7485.</p> <p>Encoder, Priority Encoder, Decoder, <b>Case Study (Any one):</b> IC</p>	7	1, 2

	74181 (ALU), BCD to 7-Segment display controller, Calender Subsystem		
<b>Unit III</b>	<b>SEQUENTIAL CIRCUIT DESIGN-1</b>	<b>No. of Hours</b>	<b>COs</b>
	<p><b>Flip Flop:</b> 1 bit memory cell, clocked S-R FF, J-K FF, race around condition, M/S J-K FF, D and T FF, Excitation table, flip-flop conversion.</p> <p><b>Counter:</b> Asynchronous and Synchronous Counters, Design of Asynchronous counter, Modulus Asynchronous Counters, IC 7490, Design of Synchronous Counter, Modulus Synchronous Counter, <b>Case Study:</b> Security Monitoring System</p>	7	1, 3
<b>Unit IV</b>	<b>SEQUENTIAL CIRCUIT DESIGN-2</b>	<b>No. of Hours</b>	<b>COs</b>
	<p><b>Shift Register:</b> Shift Registers: SISO, SIPO, PIPO, PISO, Bidirectional Shift Register, Universal Shift Register, Ring and twisted ring/Johnson Counter.</p> <p><b>Moore / Mealy Machine:</b> Representation techniques, state diagrams, state tables, state reduction, state assignment, Implementation using flip-flops. Design of Sequence Generator and Detector.</p>	7	1, 3
<b>Unit V</b>	<b>SIGNALS</b>	<b>No. of Hours</b>	<b>COs</b>
	Signals, Classification of signals, Digital transmission- Analog to digital conversion(ADC)-PCM, Delta modulation, Digital to Digital conversion-line coding, Block Coding, Scrambling, Analog to Analog Conversion-AM, FM, PM	6	4
<b>Unit VI</b>	<b>DATA COMMUNICATION</b>	<b>No. of Hours</b>	<b>COs</b>
	<p>Introduction to Data Communication, Baseband, Broadband, Carrier Communication, Baud rate, Bit rate, SNR, Channel Bandwidth.</p> <p><b>Transmission Media:</b> Guided media- Twisted pair, Coaxial, Fiber Optic Cable Unguided Media-Electromagnetic Spectrum FHSS, DSS</p>	6	5
<b>Books:</b>			
<b>Text Books(T):</b>			
T1. Jain R.P., “Modern Digital Electronics”, 4 <sup>th</sup> ed. Tata McGraw-Hill Education, ISBN–13: 978-0-07-066911-6.			
T2.Forouzan B. A., “Data Communications and Networking”,5 <sup>th</sup> ed. Mc Graw Hill, ISBN 13-978-0-07-063414-5.			

**Reference Books( R):**

R1.Tocci R.J., Widmer N.S., Moss G.L., “Digital systems: principles and applications”, 8<sup>th</sup> ed. Prentice Hall,ISBN-978-0-13-700510-9

R2. Leach D.P., Malvino A.P., Saha G., “Digital Principles and Applications”, 8<sup>th</sup> ed. Tata McGraw-Hill. ISBN 978-0-07-060175-8.

R3.J. Crowe, Barrie Hayes-Gill, “Introduction to Digital Electronics”, Butterworth-Heinemann, 1998, 978-0-34-064570-3

R4.Wayne Tomasi, “Introduction to Data communication and Networking”, 8th ed. Pearson Education. ISBN 9788131709306

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## CO204: Computer Organization and Architecture

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

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**Prerequisite Course: Digital Logic Design, Computer Fundamentals and Programming.**

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### Course Objectives:

1. To understand basic structure and operation of a digital computer.
2. To learn implementation of fixed-point operations and representation of floating-point numbers.
3. To understand processor organization and pipeline architecture.
4. To learn the hierarchical memory system including cache memories and virtual memory.
5. To study RISC architecture.
6. To study CISC architecture and superscalar architecture.

**Course Outcomes (COs):** On completion of the course, students will be able to-

Course Outcome(s)	Bloom's Taxonomy	
	Level	Descriptor
1. <b>Illustrate</b> basic structure of the computer system.	2	Understand
2. <b>Apply / Identify</b> arithmetic algorithms for solving ALU operations.	3	Apply
3. <b>Analyze</b> processor organization and pipeline architecture.	4	Analyze
4. <b>Classify</b> memory architecture and apply mapping techniques for cache memory.	3	Apply
5. <b>Explain</b> RISC architecture.	2	Understand
6. <b>Explain</b> and <b>Compare</b> CISC with RICS architecture and describe superscalar architecture.	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	-	1	-	-	-	-	-	-	-	-	-	1	1	-
CO2	3	1	2	-	-	-	-	-	-	-	-	1	3	1	-
CO3	1	-	1	-	-	-	1	-	-	-	-	1	1	1	-
CO4	1	-	1	-	-	-	1	-	-	-	-	1	1	1	-
CO5	1	-	1	-	-	-	-	-	-	-	-	1	1	2	-
CO6	1	-	1	-	-	-	-	-	-	-	-	1	1	2	-

**COURSE CONTENTS**

Unit I	INTRODUCTION	No. of Hours	COs
	Overview of Computer Architecture and Organization Basic Organization of Computers, Structure, Functions and Instruction cycle. <b>A Top-level View of Computer Function and Interconnection:</b> Computer Components, Computer Function, Interconnection Structure, Von Neumann model, Harvard Architecture.	6	1
Unit II	ARITHMETIC OPERATIONS	No. of Hours	COs
	<b>Data Representation and Arithmetic Algorithms:</b> Integer Data computation- Addition, Subtraction, Multiplication: unsigned multiplication, Booth's algorithm, Division of integers: Restoring and non-restoring, division. <b>Floating point representation:</b> IEEE 754 floating point number representation.	7	2
Unit III	PROCESSOR ORGANIZATION	No. of Hours	COs
	Processor Organization, Register Organization, <b>Case Study-</b> Microprocessor 8086: Functional Block Diagram, Programming Model, Addressing Modes, Instruction Formats. Instruction Pipelining- Pipelining Strategy, Pipeline Performance: CPI, Speed Up, Efficiency, Throughput, Analysis. Data Dependencies, Data Hazards, Branch Hazards. Introduction to FPGA Accelerator.	7	3
Unit IV	MEMORY ORGANIZATION	No. of Hours	COs
	Classifications of Primary and Secondary Memories. Characteristics of Memory, Memory Hierarchy: Cost and Performance Measurement, Locality of Reference <b>Cache Memory:</b> Cache memory Concepts, Design Problems Based on Mapping Techniques, Cache	7	4

	Replacement Algorithm, Cache Coherency, Write Policies. Introduction to Associative memory and SCM (Storage Class Memory).		
<b>Unit V</b>	<b>RISC PROCESSOR ARCHITECTURE</b>	<b>No. of Hours</b>	<b>COs</b>
	Characteristics of RICS Processor, Use of Large Register File, Register Window, Compiler - Based Register Optimization, RISC Pipelining, Case Study: ARM Processor.	7	5
<b>Unit VI</b>	<b>CISC PROCESSOR ARCHITECTURE</b>	<b>No. of Hours</b>	<b>COs</b>
	Why CISC, Characteristics of CISC processor, RISC architecture vs CISC architecture, Superscalar Architecture, Features of Superscalar Architecture, Case study: Pentium Processor.	7	6
<b>Books:</b>			
<b>Text Books(T):</b>			
T1. W. Stallings, "Computer Organization and Architecture: Designing for performance", 10th Edition , Pearson Education/ Prentice Hall of India, 2003, ISBN 978-93-325-1870-4. T2. Zaky S, Hamacher, "Computer Organization", 5th Edition ,McGraw-Hill Publications, 2001, ISBN- 978-1-25-900537-5			
<b>Reference Books( R):</b>			
R1. John P Hays, "Computer Architecture and Organization", 3rd Edition, McGraw-Hill Publication, 1998, ISBN:978-1-25-902856-4. R2. A. Tanenbaum, "Structured Computer Organization", 4th Edition, Prentice Hall of India, 1991 ISBN: 81 – 203 – 1553 – 7. R3. Steve Furber, "ARM System On Chip architecture", 2 <sup>nd</sup> Edition, Pearson, ISBN-10: 8131708403. R4. Patterson and Hennessy, "Computer Organization and Design", 4 <sup>th</sup> Edition, Morgan Kaufmann Publishers, ISBN 978-0-12-374750-1. R5. C. William Gear, "Computer Organization And Programming: With An Emphasis", 4 <sup>th</sup> Edition , McGraw-Hill Publication, ISBN-13: 978-0070230491.			

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## HS205: Universal Human Values and Professional Ethics

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

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**Prerequisite Course:**

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**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 starting 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):** On completion of the course, students will be able to-

Course Outcomes	Bloom's Taxonomy	
	Level	Descriptor
1. <b>Recognize</b> the concept of self-exploration as the process of value education.	2	Remember
2. <b>Interpret</b> the human being as the coexistence of self and body.	2	Understand
3. <b>Apply</b> the holistic approach for fulfilling human aspirations for the humans to live in harmony at various levels.	3	Apply
4. <b>Organize</b> the universal human order in correlation with professional ethics.	4	Analyze
5. <b>Implement</b> ethical practices in the engineering profession.	3	Apply
6. <b>Outline</b> the importance of various ethical practices in the wake of global realities.	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
CO1	-	-	-	-	-	2	-	3	-	1	-	2
CO2	-	-	-	-	-	2	-	3	-	1	-	2
CO3	-	-	-	-	-	3	2	3	-	1	-	2
CO4	-	-	-	-	-	3	-	3	-	1	-	2
CO5	-	-	-	-	-	3	-	3	-	1	-	2
CO6	-	-	-	-	-	3	2	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 fulfilment.	6	1
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	6	2
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	6	3
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	6	4



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	6	5
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	6	6
<b>Books:</b>			
<b>Text Books(T):</b>			
T1. R. R. Gaur, R. Sangal, G. P. Bagaria, "A Foundation Course in Human Values and Professional Ethics", Excel Books Pvt. Ltd.			
T2. R. S. Naagarazan, "A Textbook on Professional Ethics and Human Values", New Age International (P) Ltd. Publishers			
<b>Reference Books(R):</b>			
R1. B. P. Banerjee, "Foundations of Ethics and Management", Excel Books Pvt. Ltd.			
R2. P. L. Dhar, R. R. Gaur, "Science and Humanism", Commonwealth Publishers			
R3. M. K. Gandhi, "The Story of my Experiments with Truth", Discovery Publisher			
R4. <a href="http://uhv.org.in/">http://uhv.org.in/</a>			

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## CO206: Data Structures Laboratory-I

Teaching Scheme	Examination Scheme	
Practical : 2 Hrs. / Week	Term Work:	50 Marks
Credits: 1	Practical Exam:	50 Marks
	Total:	100 Marks

### Course Objectives:

1. To know the representation of data in various data structures.
2. To realise the memory representation of different data structures.
3. To get familiar with ADTs of Data structures.
4. To analyse the time and space complexity of given problem solution.
5. To study various searching and sorting techniques.

**Course Outcome (COs):** On completion of the course, students will be able to-

Course Outcomes	Blooms Taxonomy	
	Level	Descriptor
1. <b>Represent</b> data in various Data structure formats.	1	Remember
2. <b>Select</b> appropriate data structure to solve a given problem.	2	Understand
3. <b>Execute</b> operations like insertion, deletion, searching and traversing on linear Data Structure.	3	Apply
4. <b>Analyze</b> solutions using time and space complexity.	4	Analyze
5. <b>Implement</b> various searching and sorting techniques.	3	Apply

### Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes

(PSOs):

	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	2	3	-	-	-	-	-	-	-	-	-	-	3	2	-
<b>CO2</b>	3	3	1	2	-	-	2	-	1	-	-	2	3	2	-
<b>CO3</b>	2	3	2	2	-	-	2	-	2	-	-	-	3	2	-
<b>CO4</b>	1	3	2	-	-	-	2	-	1	-	-	2	3	2	-
<b>CO5</b>	2	3	2	-	-	-	-	-	1	-	-	2	3	2	-

## **Suggested List of Assignments**

Set of suggested assignment list is provided in groups- A, B, C and D. Each student must perform at least 8 assignments as at least 2 from Group A, 2 from Group B, 2 from Group C and Group D Assignments are mandatory. For each assignment program code with sample output is to be submitted as a soft copy. Handwritten write up ( Title, Objectives, Problem Statement, Outcomes, Relevant Theory- Concept in brief, Algorithm, Flowchart, Test cases, Conclusion) of each assignment is to be submitted by students.

### **Group A: (At least 2)**

1. Supermarket keeps a record for different products purchased by customers on a day. Select appropriate data structure and write a program to perform various operations on given product information.
2. Write a program for storing matrix. Write functions to:
  - i) Add, subtract and multiply two matrices
  - ii) Compute transpose of matrix
  - iii) Check whether given matrix is upper triangular or not
  - iv) Compute summation of diagonal elements
3. Write a program for sparse matrix realization and operations on it- Transpose, Fast Transpose.
4. Write a program for string operations- copy, concatenate, check substring, equal, reverse and length without using library functions.
5. Second year Computer Engineering class, set A of students like Vanilla Ice-cream and set B of students like butterscotch ice-cream. Write a program to store two sets using array. Compute and display- i. Set of students who like either vanilla or butterscotch or both, ii. Set of students who like both vanilla and butterscotch, iii. Set of students who like only vanilla not butterscotch, iv. Set of students who like only butterscotch not vanilla, v. Number of students who like neither vanilla nor butterscotch

### **Group B: ( At least 2 )**

6. Write a program to perform following operations on Singly Linked List for Employee data with fields: Emp\_id, Name, Designation, Mobile\_No and Salary
  - a) Create SLL for N employees.
  - b) Perform insertion at front, middle and end of SLL
  - c) Perform deletion at front, middle and end of SLL
  - d) Display status of SLL and count no of employees present in SLL
7. Design a circular linked list to represent polynomials with integer coefficient. Each term of the Polynomial will be represented as a node. A node will have three fields as Coefficient, Exponent and

Link to another node. Construct two CLL to represent two different polynomials. Write a program to perform addition of these two polynomials.

8. Write a program for storing binary number using doubly linked lists. Write functions to:

a) Compute 1's and 2's complement

b) Add two binary numbers

**Group C (At least 2)**

9. Write a program to implement STACK as an ADT using array. Use same ADT to compute string reverse and to check given expression is well parenthesized.

10. Write a program to convert expression from infix to postfix and evaluate postfix expression using stack.

11. Write a program to implement Queue as an ADT using array.

12. In job scheduling operating system maintains jobs in job queue. If the operating system uses priorities, then the jobs are processed based on their priorities, job with higher priority will be scheduled first. Write a program for simulating job queue.

13. Write a program to implement Circular Queue as an ADT using array.

**Group D: (Mandatory)**

14. Department Library maintains records of books. Write a program to implement Linear and Binary Search operations on it. Use appropriate data structure and analyse its complexity.

15. Write a program to store first year percentage of students in an array. Sort array of floating point Numbers in ascending order using bubble sort and quick sort display three topmost scores.

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## CO207: Digital Electronics Laboratory

Teaching Scheme	Examination Scheme	
<b>Practical : 2 Hrs. / Week</b>	<b>Term Work:</b>	--
<b>Credits: 1</b>	<b>Practical Exam:</b>	<b>50 Marks</b>
	<b>Total:</b>	<b>50 Marks</b>

### Course Objectives:

1. To understand the representation of basic gates using universal gates.
2. To understand design and implementation steps of Combinational circuits.
3. To study Flip-flop conversion logic.
4. To understand the use of flip flops in sequential circuits.
5. To understand design and implementation steps of Sequential circuits.
6. To study transmission media used in data communication.

**Course Outcome (COs):** On completion of the course, students will be able to-

Course Outcomes	Blooms Taxonomy	
	Level	Descriptor
1. <b>Apply</b> acquired knowledge to represent any Boolean function using Universal gate.	3	Apply
2. <b>Develop</b> combinational circuit for a given problem statement.	6	Create
3. <b>Apply</b> flip-flop conversion logic to convert given flip-flop to desired flip-flop.	3	Apply
4. <b>Develop</b> sequential circuit for a given problem statement.	6	Create
5. <b>Compare</b> transmission media used in Data Communication	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
<b>CO1</b>	2	-	1	-	-	-	-	-	-	-	-	-	1	1	-
<b>CO2</b>	3	1	3	1	-	-	-	-	-	-	-	-	3	3	-
<b>CO3</b>	2	-	1	-	-	-	-	-	-	-	-	-	1	1	-
<b>CO4</b>	3	1	3	1	-	-	-	-	-	-	-	-	3	3	-
<b>CO5</b>	1	1	1	1	-	-	-	-	-	-	-	-	1	1	-

## Suggested List of Assignments

### Group A (Any 4)

1. Realize Basic gates (AND,OR,NOT) From Universal Gates( NAND & NOR)
2. Design and implement Full Adder and Full Subtractor using Logic gates
3. Design and implement Code Gary to Binary , BCD to Excess-3 code converter
4. Design and implement Boolean functions using Multiplexer IC 74151
5. Design and implement 1 bit and 2-bit Comparator.
6. Design and Implement Parity generator and Checker.
7. A Jet Aircraft employ a system for monitoring rpm, pressure, temperature values of engine using sensors that operate as follows:

RPM sensor output = 0 only when speed < 4800 rpm

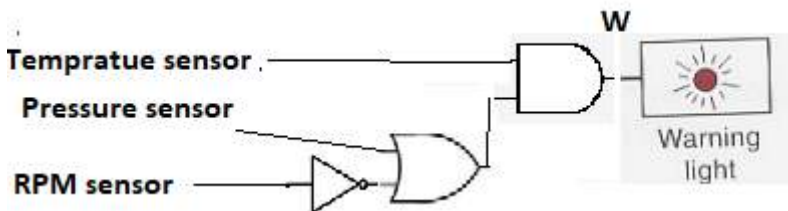
P sensor output = 0 only when pressure < 220 psi

T sensor output = 0 only when temperature < 200<sup>0</sup>F

Figure shows logic circuit that controls cockpit warning light for certain engine condition. Assume that high output W activate the warning light.

(a) Determine what engine conditions will give a warning to the pilot.

(b) Implement the circuit using NAND gate.



8. A manufacturing plant needs to have a horn sound to signal quitting time. The horn should be activated when either of the following condition is met.

- a. Its after 5 o'clock and all machines are shut down.
- b. Its Friday, the production run for day is complete and all machine are shut down.

Design logic circuit that will control the horn.

9. Design multiplier circuit that takes two bit binary number  $x_1x_0$  and  $y_1y_0$  as a input and produces binary output  $z_3z_2z_1z_0$  that is equal to arithmetic product of the input numbers.

10. Four large tanks at chemical plant contain different liquids being heated. Liquid level sensors are used to detect whenever level in tank A or tank B rises above predetermined level. Temperature sensors in tank C and tank D detect when temperature in either of these tanks drops prescribed temperature limit. Assume that liquid level sensor outputs A and B are low when level is satisfactory

and HIGH when level is too high. Also temperature sensor output C and D are low when temperature is satisfactory and HIGH when temperature is too low. Design logic circuit that will detect whenever level in tank A or tank B is too high at the same time that the temperature in either tank C or tank D is too low.

**Group B (Any 4)**

11. Realization of Flip-Flop Conversion
12. Design and implement Asynchronous counter using suitable Flip flops
13. Design and implement Synchronous counter using suitable Flip flops
14. Design and implement Modulus asynchronous counter using IC 7490
15. Design and Implement Sequence Generator using suitable Flip flops

**Group C (Mandatory)**

16. Study various Transmission media of Data communication.

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## CO208: Computer Organization Laboratory

Teaching Scheme	Examination Scheme	
Practical : 2 Hrs. / Week	Term Work:	----
Credits: 1	Oral Exam:	50 Marks
	Total:	50 Marks

### Course Objectives:

1. To understand basic structure and operation of hardware system.
2. To learn implementation of fixed-point arithmetic operations.
3. To understand design and analysis of K- Stage pipeline.
4. To learn Assembly language.
5. To understand memory management system.
6. To study architecture of Raspberry-Pi and Arduino board.

**Course Outcome** On completion of the course, students will be able to-

Course Outcomes	Bloom's Taxonomy	
	Level	Descriptor
1. <b>Illustrate</b> basic structure of the computer system.	2	Understand
2. <b>Perform</b> fixed point operation using arithmetic algorithms	3	Apply
3. <b>Analyze</b> K – Stage pipeline	4	Analyze
4. <b>Implement</b> basic assembly language programs.	3	Apply
5. <b>Apply</b> cache replacement algorithms and memory mapping techniques.	3	Apply
6. <b>Explain</b> architecture of Raspberry-Pi and Arduino board	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	-	1	-	-	-	-	-	-	-	-	-	1	1	-
CO2	2	1	1	-	-	-	-	-	-	-	-	-	2	1	-
CO3	3	1	2	-	-	-	-	-	-	-	-	-	3	1	-
CO4	3	1	2	-	-	-	-	-	-	-	-	-	1	1	-
CO5	2	1	2	-	-	-	-	-	-	-	-	-	1	-	-
CO6	1		1	-	1	-	-	-	-	-	-	-	1	1	-



## Guidelines for Laboratory Conduction

The instructor is expected to frame the assignments by understanding the prerequisites, technological aspects, utility and recent trends related to the topic. The assignment framing policy needs to address the average students and inclusive of an element to attract and promote the intelligent students. The instructor may set multiple sets of assignments and distribute among batches of students. It is appreciated if the assignments are based on real world problems/applications. Use of open source software is encouraged.

Operating System: Latest 64-bit Version and update of Microsoft Windows 10/ Microsoft Windows 7/ Windows 8 Operating, System onwards or 64-bit Open source Linux or its derivative.

Programming Tools: TASM, C or C++ editor, DOSBOX tools for dos support.

### Suggested List of Assignments:

[ Students have to complete total 10 assignments towards the successful completion of Term Work, where all the programming assignment are compulsory.]

#### 1. Identify Hardware Components of the Computer System and Explore different types of Motherboards.

- [ 1.1 Students have to identify Hardware Components of the computer system,
- 1.2 Student should explore different types of motherboard and various components which are attached to a motherboard.]

#### 2. Identify types of Buses in Computer System and Explore POST, Boot process and configure BIOS settings.

- [ 2.1 Students should know the types of Buses and working of the initialization phase of the Computer systems.
- 2.2. Students should know how POST is executed and configuring the BIOS setup to improve the utility of the system.]

#### 3. Implementation of Booth's Algorithm.

[ Use any programming language (preferable C or C++) to implement Booth's Algorithm which will work for Multiplication of Signed and Unsigned numbers. Here, understanding the concept of Booth's Algorithm is essential.]

#### 4. Study of Restoring and Non-Restoring Division Algorithms.

[ Learn and understand the algorithms to apply it to the given problems.]

#### 5. Design and Analysis of K – Stage Pipeline.

[ Study of pipeline architecture and design for analysis of given K - stage pipeline for n instructions and analyse performance parameters.]

#### 6. Study of Instruction Format.

[ Study of 8086 format, design of an instruction format for typical instruction set, giving num. of instructions, number of opcodes and possible addressing modes.]

#### 7. Write a program in Assembly Language to display string and 16-bit numbers.

[ The string and number can be defined in the Data Segment. Use of a 16-bit register is expected.]

**8. Write a program in Assembly Language to perform Signed Multiplication and Division of two 8-bit numbers.**

[ *The numbers can be defined in the Data Segment. Make your program user friendly to accept the choice from user for: a) Multiplication, b) Division, c) EXIT.*

*Use of a 16-bit register is expected. The program should be able to accept two 8-bit num. and display in Hexadecimal.]*

**9. Write a program in Assembly Language to perform Addition of N numbers in a given Array.**

[ *The array can be defined in the data segment. Use of a 16-bit register is expected and display addition in Hexadecimal.]*

**10. Study of Cache Replacement Algorithms.**

[*Study and compare the following cache replacement algorithms – FIFO, LRU, LFU*]

**11. Study and design of Memory Mapping Techniques.**

[ *Study the memory mapping techniques - direct mapping, associative mapping and set – associative mapping and apply it to a given problem.]*

**12. Study of Raspberry-Pi and Arduino board.**

[ *Study and understand the use of these Raspberry-Pi boards, Arduino boards and exploration of Organization and Architecture in IOT.]*

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## MC 209 : Constitution of India (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	The student will get acquainted with the historical background, salient features, preamble and union territories of Indian constitution		
CO2	The student will get aware about the fundamental rights.		
CO3	The student will get aware about directive principle of state policy and fundamental duties.		
CO4	The student will understand the system of government through parliamentary and federal system,		
CO5	The student will understand structure, formation and legislative framework of central government.		
CO6	The student will understand structure, formation and legislative framework of state government.		

### Course Contents

Unit-I	INTRODUCTION TO CONSTITUTION OF INDIA	No. of Hours	COs
	Historical background, Salient features, Preamble of constitution, Union and its territory		
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		
Unit-III	DIRECTIVE PRINCIPLE OF STATE POLICY AND FUNDAMENTAL DUTIES	No. of Hours	COs

	<p><b>Directive principle of state policy:</b> Features of directive principle, Classification of directive principle, Criticism of directive principle, Utility of directive principle, Conflict between Fundamental rights and directive principle</p> <p><b>Fundamental duties:</b> List of fundamental duties, Features of fundamental duties, Criticism of fundamental duties, Significance of fundamental duties, Swaran Singh Committee Recommendations</p>		
<b>Unit-IV</b>	<b>SYSTEM OF GOVERNMENT</b>	<b>No. of Hours</b>	<b>COs</b>
	<p><b>Parliamentary system:</b> Features of parliamentary government, Features of presidential government, merits and demerit of Parliamentary system</p> <p><b>Federal system:</b> Federal features of constitution, unitary features of constitution</p> <p><b>Centre and state relation:</b> Legislative relation, administrative relations and financial relation.</p> <p><b>Emergency provision:</b> National emergency, Financial emergency and criticism of emergency provision</p>		
<b>Unit-V</b>	<b>CENTRAL GOVERNMENT</b>	<b>No. of Hours</b>	<b>COs</b>
	<p><b>President:</b> Election of president, powers and functions of president, and Veto power of president</p> <p><b>Vice-president:</b> Election of vice-president, powers and functions of vice-president</p> <p><b>Prime minister:</b> Appointment of PM, powers and functions of PM, relationship with president</p> <p><b>Central council of ministers:</b> Appointment of ministers, responsibility of ministers, features of cabinet committees, functions of cabinet committees</p> <p><b>Parliament:</b> 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.</p> <p><b>Supreme court (SC):</b> Organization of supreme court, independence of supreme court, jurisdiction and powers of supreme court</p>		
<b>Unit-VI</b>	<b>STATE GOVERNMENT</b>	<b>No. of Hours</b>	<b>COs</b>
	<p><b>Governor:</b> Appointment of governor, powers and functions of governor, constitutional position</p> <p><b>Chief minister:</b> Appointment of CM, powers and functions of CM, relationship with governor</p> <p><b>State council of ministers:</b> Appointment of ministers, responsibility of ministers, cabinet.</p> <p><b>High court (HC):</b> Organization of HC, independence of HC, jurisdiction and powers of HC</p> <p><b>Sub-ordinate court:</b> Structure and jurisdiction, Lok Adalats,</p>		

	Family court, Gram Nyayalayas		
<b>Text Books:</b>			
<ol style="list-style-type: none"><li>1. M Laxmikanth, Indian Polity for Civil Service Examination, Mc GrawHill Education, 5<sup>th</sup> Edition.</li><li>2. Durga Das Basu, LexisNexis, Introduction to the Constitution of India, 22<sup>nd</sup> Edition</li></ol>			

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# **SEMESTER II**

## BS202: Engineering Mathematics-III

Teaching Scheme	Examination Scheme	
Lectures: 3 Hrs. / Week	In-Sem Exam:	30 Marks
Tutorial: 1 Hrs./Week	End-Sem Exam:	50 Marks
Credits: 4	Continuous Assessment:	20 Marks
	<b>Total:</b>	<b>100 Marks</b>

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**Prerequisite Course:**

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**Course Objectives:**

1. To describe and recall the basics of Vector Calculus and differential equations.
2. To understand the concept for solving problems based on vector and differential calculus in the universe.
3. To apply core concepts for the solution of engineering problems based on Vector calculus and differential equations.
4. To analyze the problems of which kind and their solution methods available in Vector and differential calculus and use a particular method for finding a solution in the engineering field.

**Course Outcome (COs):** On completion of the course, students will be able to-

Course Outcomes	Bloom's Taxonomy	
	Level	Descriptor
1. <b>Know</b> and recall the basics of Vector Calculus and differential equations	1	Remember
2. <b>Understand</b> the concept used for solving problems based on vector and differential calculus in the universe	2	Understand
3. <b>Apply</b> core concepts for the solution of engineering problems based on Vector calculus and differential equations	3	Apply
4. <b>Analyze</b> the problems of which kind and their solution methods available in Vector and differential calculus and use a particular method for finding a solution in the engineering field	4	Analyse

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

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

CO2	3	2	-	-	1	-	-	2	2	1	-	1	-	-
CO3	3	2	-	-	1	-	-	2	2	1	-	1	-	-
CO4	3	2	-	-	1	-	-	2	2	1	-	1	-	-
CO5	3	2	-	-	1	-	-	2	2	1	-	1	-	-
CO6	3	2	-	-	1	-	-	2	2	1	-	1	-	-

### 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	1,3
Unit-II	VECTOR INTEGRATION	No.of Hours	COs
	Line integral, Green's theorem, Work done, Conservative field, surface integral, Stokes theorem, volume integral, Gauss Divergence theorem.	08	3,4
Unit-III	HIGHER ORDER DIFFERENTIAL EQUATION	No.of Hours	COs
	Homogeneous and non-homogeneous linear differential equation of $n^{\text{th}}$ 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, Applications branch wise (Simple Electrical circuit, Mass spring system and Bending Movement).	08	1,2,3
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	3,4
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	2,3,4
<b>Unit-VI</b>	<b>APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATION</b>	<b>No.of Hours</b>	<b>COs</b>
	One dimensional heat equation, Wave equation, Two dimensional heat equation (Laplace equation), Telephone equation, Radio equations	08	1,3,4
<b>Books:</b>			
<b>Text Books(T):</b>			
T1. B. S. Grewal, Higher Engineering Mathematics, 42/e, Khanna Publishers, 2012, ISBN-13: 978-8174091154.			
T2. N. P. Bali and Manish Goyal, A Text Book of Engineering, Mathematics, 8/e, Lakshmi Publications, 2012. ISBN: 9788131808320.			
T3. H. K. Das, Engineering Mathematics, S Chand, 2006, ISBN-8121905209			
<b>Reference Books (R):</b>			
R1. K.A. Stroud & D. S. Booth, Advanced Engineering Mathematics, Industrial Press, 5/e, 2011, ISBN-9780831134495			
R2. P. C. Matthews, Vector Calculus, Springer, 2/e, 2012, ISBN-9783540761808			
R3. Robert C. Wrede, Introduction to vector and tensor analysis, Dover, 2013, ISBN-048661879X			
R4. W. E. Boyce, R. C. DiPrima, Elementary differential equation and boundary value problems.			
R5. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, Narosa Publishing House, 2014. ISBN-13: 978-1842653418.			
R6. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley, 9/e, 2013, ISBN-13: 978-0471488859.			

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CO210: Object Oriented Programming		
Teaching Scheme	Examination Scheme	
Lectures: 3 Hrs. / Week	In-Sem Exam:	30 Marks
Credits: 3	End-Sem Exam:	50 Marks
	Teacher Assessment:	20 Marks
	Total:	100 Marks

Prerequisite: Fundamental concept of C Language

#### Course Objectives:

1. To explore the basic principles of Object Oriented Programming (OOP).
2. To study the concepts of operator overloading and Inheritance.
3. To learn the concept of polymorphism and virtual function.
4. To learn the concept of Template and Exception Handling.
5. To learn the concept of file handling in C++.
6. To learn and understand concepts Standard Template Library (STL)

**Course Outcomes (COs):** On completion of the course, students will be able to-

Course Outcome (s)	Bloom's Taxonomy	
	Level	Descriptor
1. <b>Describe</b> the strengths of object oriented programming	1	Remember
2. <b>Understand</b> the concept of Operator overloading and inheritance.	2	Understand
3. <b>Demonstrate</b> the use of Polymorphism and virtual function.	3	Apply
4. <b>Apply</b> the concept of Template and Exception Handling mechanism for program development.	3	Apply
5. <b>Analyze</b> the OOP system using File handling in C++.	4	Analyze
6. <b>Develop</b> programming application using Standard Template Library.	6	Design

### 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	1	-	-	-	-	-	-	2	-	2	-	2
CO2	2	-	2	1	-	-	-	-	-	-	2	-	2	-	2
CO3	2	-	2	1	-	-	-	-	-	-	2	-	2	-	2
CO4	2	-	2	1	-	-	-	-	-	-	2	-	3	-	2
CO5	2	-	2	1	-	-	-	-	-	-	2	-	2	-	2
CO6	2	-	2	1	-	-	-	-	-	-	2	-	2	-	2

### COURSE CONTENTS

Unit I	FUNDAMENTALS OF OOP	No. of Hours	COs
	<p>Introduction to procedural, modular, object-oriented and generic programming techniques, Need of Object-Oriented Programming (OOP), Object Oriented Programming Paradigm, Basic Concepts of Object-Oriented Programming, C++ as object oriented programming language.</p> <p>C++ Programming- C++ programming Basics, Data Types, Structures, Enumerations, control structures, Arrays and Strings, Class, Object, class and data abstraction, class scope and accessing class members, controlling access to members.</p> <p>Functions- Function, function prototype, accessing function and utility function, Constructors and destructors, Objects and Memory requirements, Static Class members, data abstraction and information hiding, inline function.</p>	8	1, 2
Unit II	OVERLOADING AND INHERITANCE	No. of Hours	COs
	<p><b>Operator Overloading-</b> Concept of overloading, operator overloading, Overloading Unary Operators, Overloading Binary Operators, Data Conversion, Type casting (implicit and explicit), Pitfalls of Operator Overloading and Conversion, Keywords explicit and mutable. Function overloading</p> <p><b>Inheritance-</b> Base Class and derived Class, protected members, relationship between base Class and derived Class, Constructor and destructor in Derived Class, Class Hierarchies, Inheritance, Public and Private Inheritance, Types of Inheritance, Ambiguity in Multiple Inheritance, Virtual Base Class, Classes Within Classes.</p>	8	2, 3

Unit III	POLYMORPHISM AND VIRTUAL FUNCTION	No. of Hours	COs
	<p><b>Polymorphism-</b> Concept, abstract classes, polymorphism. , Overriding Member Functions</p> <p><b>Virtual Function-</b>Pointers- indirection Operators, Memory Management: new and delete, Pointers to Objects, accessing Arrays using pointers, Function pointers, Pointers to Pointers, Smart pointers, Shared pointers. This Pointer, Virtual function, Rules of Virtual functions, dynamic binding, pure virtual function, Virtual destructor. Overloading and Overriding concept.</p>	7	2, 3
Unit IV	TEMPLATES AND EXCEPTION HANDLING	No. of Hours	COs
	<p><b>Templates-</b> function templates, Overloading Function templates, class templates, class template and Nontype parameters, template and inheritance, Applying Generic Function, Generic Classes, The type name and export keywords, The Power of Templates.</p> <p><b>Exception Handling-</b> Fundamentals, other error handling techniques, simple exception handling- Divide by Zero, throwing an exception, exception specifications, processing unexpected exceptions, constructor, destructor and exception handling,</p>	7	4, 5
Unit V	FILES AND STREAMS	No. of Hours	COs
	Data hierarchy, Stream and files, Stream Classes, Stream Errors, Disk File I/O with Streams, File Pointers, and Error Handling in File I/O, File I/O with Member Functions, Overloading the Extraction and Insertion Operators, memory as a Stream Object, Command-Line Arguments.	7	2, 5
Unit VI	STANDARD TEMPLATE LIBRARY (STL)	No. of Hours	COs
	Introduction to STL, Containers, algorithms and iterators, Containers- Sequence container and associative containers, container adapters, Algorithms- basic searching and sorting algorithms, min-max algorithm, set operations, heap sort, Iterators- input, output, forward, bidirectional and random access.	7	2, 6
<b>Books:</b>			
<b>Text Books(T):</b>			
T1. Bjarne Stroustrup, "The C++ Programming language", Third edition, Pearson Education. ISBN 9780201889543.			
T2. Deitel, "C++ How to Program", 4th Edition, Pearson Education, ISBN:81-297-0276-2			

T3. E Balgurusamy, “Object Oriented Programming with C++”, 4<sup>th</sup> Edition, Tata McGraw-Hill,ISBN-13:978-0-07-066907-9

**Reference Books( R):**

R1. Robert Lafore, —Object-Oriented Programming in C++, fourth edition, Sams Publishing, ISBN:0672323087 (ISBN 13: 9780672323089)

R2. Herbert Schildt, —C++ The complete referencel, Eighth Edition, McGraw Hill Professional, 2011,ISBN:978-00-72226805

R3. Cox Brad, Andrew J. Novobilski, —Object –Oriented Programming: An Evolutionary Approachll, Second Edition, Addison–Wesley, ISBN:13:978-020-1548341

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## CO211: Operating System and Administration

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

### Prerequisite:

### Course Objectives:

1. To learn and understand basics of Operating Systems including Boot process.
2. To learn and understand Shells Scripts and File System.
3. To introduce to administrative features of Operating Systems
4. To learn and understand the process control and its execution.
5. To learn and understand the interactive installation and network installation of Linux OS
6. To learn and understand the user and its access control

**Course Outcomes (COs):** On completion of the course, students will be able to–

Course Outcomes	Blooms taxonomy	
	Level	Descriptor
1. <b>Create</b> disk partitioning and Install the Linux operating system like Fedora, Ubuntu.	6	Create
2. <b>Acquire</b> the Basic knowledge of Unix/Linux operating system and its administrative features.	2	Understand
3. <b>Write</b> Basic shell script commands and Admin commands	6	Create
4. <b>Acquire</b> the Knowledge of files and storage systems	2	Understand
5. <b>Control</b> the processes and its execution.	4	Analyze
6. <b>Add</b> and <b>Manage</b> the users in Linux OS	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	3	2	3	2	2	-	-	-	-	-	1	2	3	3	-
CO2	3	2	3	2	2	-	-	-	-	-	1	2	3	3	-
CO3	3	2	3	2	2	-	-	-	-	-	1	2	3	3	-
CO4	3	2	3	2	2	-	-	-	-	-	1	2	3	3	-
CO5	3	2	3	2	2	-	-	-	-	-	1	2	3	3	-
CO6	3	2	3	2	2	-	-	-	-	-	1	2	3	3	-

**COURSE CONTENTS**

Unit I	INTRODUCTION TO OPERATING SYSTEM	No. of Hours	COs
	General Overview: History of Unix, System Structure User perspective, Operating system Services Assumptions about Hardware, Basic Concepts of Operating Systems, Kernel, shell and file system structure, Basic Concepts of Linux, Basic Commands of Linux, Advanced Linux Commands, Installation of Linux, Interactive Installation,	8	2
Unit II	INTRODUCTION TO THE KERNEL AND BUFFER CACHE	No. of Hours	COs
	Architecture of Unix operating system, Introduction to the system concepts, Kernel data structure, System Administration. Buffer Cache, Buffer Headers, Structure of Buffer Pool, Reading and Writing disk block. <b>Case Study- Booting and Shut Down, Scripting and                      Shell</b> Bootstrapping, Booting PCs, GRUB, Booting with single user mode, Rebooting and Shutting down., Shell Basics, bash scripting Python Scripting, Scripting Best Practices, Working with Startup Scripts	8	2
Unit III	THE STRUCTURE OF PROCESS, PROCESS CONTROL AND PROCESS SCHEDULING	No. of Hours	COs
	Process state and transitions, Layout of the system memory, Context of the process, saving the context of the process, Manipulation the process address space, Sleep, Process creation, Signal, Process termination, Awaiting	8	4

	the process termination, Invoking other program, Process Scheduling <b>Case Study - Access Control, Rootly Powers and Controlling Processes</b> Traditional UNIX access control, Modern Access Control, Real-world Access Control, Pseudo-users other than root. Components of a process, the lifecycle of a process, Signals, Kill, Process states, nice and renice, ps, Dynamic monitoring with top, prstat and topas, the /proc file system, strace, truss and tusc, runaway processes..		
<b>Unit IV</b>	<b>INTRODUCTION TO THE FILE SYSTEM</b>	<b>No. of Hours</b>	<b>COs</b>
	Internal representation of the files, i-node, structure of regular files, directories, conversion of pathnames to i-node, Superblock, i-node assignments to new files, Allocation of disk blocks Pathnames, File system, Mounting and unmounting, The organization of the File Tree, File Types, File Attributes, Access Control lists. <b>Case Study – Open Source Automation Red Hat Ansible</b> , Introduction, Overview and setup, How Ansible works, Playbooks, Variables, Advanced execution.	8	3
<b>Unit V</b>	<b>MEMORY MANAGEMENT POLICIES, I/O SUBSYSTEM AND IPC</b>	<b>No. of Hours</b>	<b>COs</b>
	Swapping, Demand Paging, Driver interface, disk drivers, Process Tracing , Network communication, Sockets <b>Case study –Container, Dockers Containers,</b>	8	5
<b>Unit VI</b>	<b>ADDING NEW USERS AND STORAGE</b>	<b>No. of Hours</b>	<b>COs</b>
	The /etc/passwd file, The /etc/shadow and /etc/security/passwd files /etc/group,file, Adding users, Adding users with useradd,, Storage: Adding a hard Disk, Storage Hardware, Storage hardware InterfacesSoftware aspects of storage, Formatting, Disk PartitioningRAID, LVMLinuxFile System: The ext family, file system terminology, mkfs, fsck, file system mounting, setup for automatic.mounting, USB drivemounting, Enabling swapping <b>Case Study –Advanced Operating System like iPhone OS (IOS), Tizen, Iris OS, Swift, Virtual OS</b>	8	6
<b>Books:</b>			
<b>Text Books(T):</b>			
T1. Maurice J. Bach , The Design of the Unix Operating System, Pearson Education, ISBN: 81-7758-770-6			



T2. Evi Nemeth, Garth Snyder, Tren Hein, Ben Whaley, Unix and Linux system Administration Handbook, Fourth Edition, ISBN: 978-81-317-6177-9, 2011  
T3. Abraham Silberschatz , Peter B.Galvin, Greg Gagne, Operating System Concepts, 8th Edition, ISBN-13: 978-0470128725 ISBN-10: 0470128720 John Willy & Sons Publications.

**Reference Books( R):**

R1. William Stallings, Operating Systems: Internals and Design Principles, Pearson Publication.  
R2. D M Dhamdhare, Operating Systems: A Concept-Based Approach, ISBN-13: 978-1259005589 ISBN-10: 1259005585, McGraw-Hill Publication-.  
R3. Charles Crowley, Operating System: Design-oriented Approach, ISBN-13: 978-0256151510 ISBN-10: 0256151512, McGraw-Hill Publication.

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## CO212: Data Structures-II

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

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**Prerequisite:** Data Structures- I

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**Course Objectives:**

1. To learn and understand various operations on Trees.
2. To represent and handle data using graph data structure.
3. To learn and represent data in hash table using various hashing techniques.
4. To learn and design static and dynamic symbol table.
5. To understand various types of search trees and its usages.
6. To learn and understand various structured data representation.

**Course Outcomes (COs):** On completion of the course, students will be able to-

Course Outcomes	Blooms Taxonomy	
	Level	Descriptor
1. <b>Interpret</b> various operations on trees for given problem statement.	2	Understand
2. <b>Construct</b> solution for given specific problem using Graph data structure.	3	Apply
3. <b>Illustrate</b> various hashing techniques to represent data in hash table	2	Understand
4. <b>Understand</b> and <b>Design</b> symbol tables using static and dynamic strategy.	3	Apply
5. <b>Construct</b> different types of search trees.	3	Apply
6. <b>Understand</b> and <b>Represent</b> data in various structured format.	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
<b>CO1</b>	3	3	3	-	-	-	-	-	-	-	-	3	3	3	-
<b>CO2</b>	3	3	3	2	2	-	-	-	-	-	-	3	3	3	-
<b>CO3</b>	3	3	3	-	-	-	-	-	-	-	-	3	3	3	-
<b>CO4</b>	3	3	3	2	2	-	-	-	-	-	-	3	3	3	-
<b>CO5</b>	3	3	3	3	2	-	-	-	-	-	-	3	3	3	-
<b>CO6</b>	2	3	1	-	-	-	-	-	-	-	-	3	3	3	-

**COURSE CONTENTS**

<b>Unit I</b>	<b>TREE</b>	<b>No. of Hours</b>	<b>COs</b>
	Analysis of Algorithms: Recurrences, Master Method Tree: Introduction, Tree Terminologies, Binary Tree, Representation, Types of Binary Tree, Binary Tree Traversals, Binary Search Tree, operations on BST, Threaded binary tree, Applications – Expression Tree, Huffman Encoding.	9	1
<b>Unit II</b>	<b>GRAPH</b>	<b>No. of Hours</b>	<b>COs</b>
	Basic Concepts, Storage representation, Adjacency matrix, adjacency list, adjacency multi list, inverse adjacency list. Traversals-depth first and breadth first, Introduction to Greedy Strategy, Minimum spanning Tree, Greedy algorithms for computing minimum spanning tree- Prim's and Kruskal Algorithm, Dijkstra's Single source shortest path, Topological ordering. Applications- Data structure used in World Wide Web, Facebook, Google map.	9	2
<b>Unit III</b>	<b>HASHING</b>	<b>No. of Hours</b>	<b>COs</b>
	Hash Table- Concepts-hash table, hash function, bucket, collision, probe, synonym, overflow, open hashing, closed hashing, perfect hash function, load density, full table, load factor, rehashing, issues in hashing, hash functions- properties of good hash function, division, multiplication, extraction, mid-square, folding and universal, Collision resolution strategies- Open Hashing and open addressing and chaining, extendible hashing.	8	3
<b>Unit IV</b>	<b>SYMBOL TABLE</b>	<b>No. of Hours</b>	<b>COs</b>
	Symbol Table- Representation of Symbol Tables- Static tree table and Dynamic tree table, Introduction to Dynamic Programming, Weight balanced tree, Optimal	8	4

	Binary Search Tree (OBST), Height Balanced Tree- AVL tree.		
<b>Unit V</b>	<b>SEARCH TREES</b>	<b>No. of Hours</b>	<b>COs</b>
	Multiway-Search Trees: B-Tree, B+Tree, String Trees: Trie Tree, Suffix tree, Self-adjusted Tree: Splay Tree, Red-Black Tree, K-dimensional tree, AA tree. Heap-Basic concepts, realization of heap and operations, Heap as a priority queue, heap sort, Binomial Heaps.	8	5
<b>Unit VI</b>	<b>FILE ORGANIZATION</b>	<b>No. of Hours</b>	<b>COs</b>
	Sequential file organization- concept and primitive operations, Direct Access File- Concepts and Primitive operations, Indexed sequential file organization-concept, types of indices, structure of index sequential file, Linked Organization- multi list files, coral rings, inverted files and cellular partitions. External Sort- Consequential processing and merging two lists, multiway merging- a k way merge algorithm.	6	6
<b>Books:</b>			
<b>Text Book(T):</b>			
T1. Horowitz and Sahani, Fundamentals of Data Structures, Galgotia Publisher, T2. SartajSahani,Data Structures, Algorithms and Applications in C++, 2 <sup>nd</sup> edition, Universities Press,ISBN-81-7371-522			
<b>Reference Books( R):</b>			
R1. A. Aho, J. Hopcroft, J. Ullman, Data Structures and Algorithms,2 <sup>nd</sup> edition, Pearson Education, ISBN-97881-775-8826-2. R2. G A V Pai, Data Structures and Algorithms, The McGraw-Hill Companies, ISBN 9780070667266. R3.Peter Brass, Advanced Data Structures, Cambridge University Press, ISBN: 978-1-107-43982-5			

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## CO213: Seminar

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

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**Prerequisite:**

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**Course Objectives:**

1. To develop ability of thinking and motivation for seminar.
2. To expose students to new technologies, researches, products, algorithms.
3. To explore basic principles of communication.
4. To explore empathetic listening, speaking techniques.
5. To study report writing techniques.
6. To develop Seminar presentation and Technical Communication Skills.

**Course Outcomes (COs):** On completion of the course, students will be able to-

Course Outcomes	Bloom's Taxonomy	
	Level	Descriptor
1. <b>Get</b> familiar with basic technical writing concepts and terms, such as audience analysis, jargon, format, visuals, and presentation.	2	Understand
2. <b>Perform</b> literature survey	3	Apply
3. <b>Understand</b> system and its components	2	Understand
4. <b>Write</b> the technical report	6	Create
5. <b>Prepare</b> presentation	6	Create
6. <b>Improve</b> communication skills	4	Analyse

**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	1	2	-	-	-	-	-	2	-	2	-	-	2
CO2	-	3	-	-	-	-	-	-	-	3	-	-	-	-	1
CO3	1	-	-	-	-	-	-	-	-	-	-	-	2	-	1
CO4	-	1	-	-	-	-	-	-	-	3	-	1	1	-	2
CO5	-	-	-	-	2	-	-	-	-	3	-	2	-	-	2
CO6	-	-	-	-	-	-	-	-	-	3	-	2	-	-	1

**Guidelines:**

1. Each student will select a topic in the area of Computer Engineering and Technology Preferably keeping track with recent technological trends and development beyond scope of syllabus avoiding repetition in consecutive years.
2. The topic must be selected in consultation with the institute guide.
3. Each student will make a seminar presentation using audio/visual aids for duration of 20-25 minutes and submit the seminar report.
4. Active participation at classmate seminars is essential.

**Recommended Format of the Seminar Report:**

- Title Page with Title of the topic, Name of the candidate with Exam Seat Number / Roll Number, Name of the Guide, Name of the Department, Institution and Year & University
- Seminar Approval Sheet/Certificate
- Abstract and Keywords
- Acknowledgements
- Table of Contents, List of Figures, List of Tables and Nomenclature
- Chapters Covering topic of discussion- Introduction with section including organization of the report, Literature Survey/Details of design/technology/Analytical and/or experimental work, if any/ ,Discussions and Conclusions, Bibliography /References

## List of Assignments

1. Identify application as social problem using algorithmic methodologies.
2. To determine scope and objectives of the defined problem.
3. To perform literature review of proposed system.
4. To represent system design and architecture.
5. To study implementation details of methodology selected.
6. To perform result analysis using data tables and comparison with other methods.
7. Seminar documentation and final 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. BarunMitra, Effective Technical Communication a Guide for Scientist and Engineers, Oxford 9780195682915
3. Raman M. ,Shama, Technical Communication, Oxford,9780199457496

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## CO214: Data Structure Lab II

Teaching Scheme	Examination Scheme	
<b>Practical : 2 Hrs. / Week</b>	<b>Term Work:</b>	-----
<b>Credits: 1</b>	<b>Practical Exam:</b>	<b>50 Marks</b>
	<b>Total:</b>	<b>50 Marks</b>

### Course Objectives:

1. To construct and perform various operations on Tree.
2. To represent data as per the problem statement using Graph data structure.
3. To represent, retrieve and search specific data using hash table.
4. To implement symbol tables using dynamic Programming with minimum search cost.
5. To learn representation of structured data.

**Course Outcomes:** On completion of the course, students will be able to–

Course Outcomes	Blooms taxonomy	
	Level	Descriptor
1. <b>Construct and Implement</b> various operations on Tree data structure	3	Apply
2. <b>Represent and Implement</b> Solution for given problem statement using Graph.	6	Create
3. <b>Construct</b> hash table and implement various hash functions for retrieving and searching data.	3	Apply
4. <b>Build</b> symbol table with minimum search cost using Dynamic programming.	6	Create
5. <b>Represent and Implement</b> operations on structured data.	3	Apply



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

	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	-	-	-	-	-	-	-	-	3	3	3	-
CO2	3	3	3	-	-	-	-	-	-	-	-	3	3	3	-
CO3	3	3	3	-	-	-	-	-	-	-	-	3	3	3	-
CO4	3	3	3	2	2	-	-	-	-	-	-	3	3	3	-
CO5	3	3	3	3	2	-	-	-	-	-	-	3	3	3	-
CO6	2	3	1	-	-	-	-	-	-	-	-	3	3	3	-

**Instructor Guideline:**

Set of suggested assignment list is provided in groups- A, B, C and D. Each student must perform at least 8 assignments as at least 2 from Group A, 2 from Group B, 3 from Group C and 1 from Group D. For each assignment program code with sample output is to be submitted as a soft copy. Handwritten write up ( Title, Objectives, Problem Statement, Outcomes, Relevant Theory- Concept in brief, Algorithm, Flowchart, Test cases, Conclusion) of each assignment is to be submitted by students.

**Suggested List of Assignments:****Group A:(At least 2)**

1. Construct Tree for representing Vehicles Type Hierarchy and print the nodes. Find the time and space requirements of your method.
2. Create Binary Search Tree for given data and write function to:
  - a) Perform any non-recursive traversals on tree.
  - b) To count no of leaf nodes present in a tree.
  - c) To compute Height of a tree.
  - d) To compute Mirror image of a tree.
3. Convert given binary tree into threaded binary tree. Analyze time and space complexity of the algorithm.
4. For any given inorder expression construct an expression tree and traverse it using post order traversal (non- recursive).
5. Write a program to create a binary tree if inorder and preorder or inorder and postorder any two traversals are given.

**Group B: (At least 2)**

6. There are flight paths between cities. If there is a flight between city A and city B then there is an edge between the cities. The cost of the edge can be the time that flight takes to reach city B from A or the amount of fuel used for the journey. The node can be represented by airport name or name of the city. Use adjacency list representation of the graph and adjacency matrix representation of the graph. Justify the storage representation used.
7. Company wants to lease phone lines to connect its offices of distinct cities, with each other. Phone Company charges different amounts of money to connect distinct pairs of cities. Use appropriate data structures to connect all offices of a company with a minimum cost.
8. Tour operator organizes guided bus trips across the Maharashtra. Tourists may have different preferences. Tour operator offers a choice from many different routes. Every day the bus moves from starting city S to another city F as chosen by client. Find the Shortest path from source to the specified destination. Use appropriate data structure and algorithm.
9. Consider the scheduling problem where n tasks to be scheduled on single processor. Let  $t_1, \dots, t_n$  be task to execute on single processor. The tasks can be executed as per the dependency between them but one task at a time. Implement an algorithm for this problem and schedule each task as per dependency.

**Group C (At least 3)**

10. Write a program to create Student Information database of N students. Make use of a hash table implementation to quickly look up Student Information.
11. Implement all the functions of a word dictionary (ADT) using hashing.  
Data: Set of (key, value) pairs, Keys are mapped to values, Keys must be comparable, and Keys must be unique  
Standard Operations: Insert (key, value), Find (key), Delete (key)
12. Given sequence  $k = k_1 < k_2 < \dots < k_n$  of n sorted keys, with a search probability  $p_i$  for each key  $k_i$ . Build the Binary search tree that has the least search cost given the access probability for each key.
13. A Dictionary stores keywords & its meanings. Provide facility for adding new keywords, deleting keywords, updating values of any entry. Provide facility to display whole data sorted in ascending/ Descending order. Also find how many maximum comparisons may require for finding any keyword. Use Height balance tree and find the complexity for finding a keyword

**Group D (At least one)**

14. Department maintains student information. The file contains roll number, name, division and address. Allow user to add, delete information of student. Display information of particular employee. If record of student does not exist an appropriate message is displayed. If it is, then the

system displays the student details. Use sequential file to maintain the data.

15. Implement the Heap sort algorithm demonstrating heap data structure.

16. Assume we have two input and two output tapes to perform the sorting. The internal memory can hold and sort  $m$  records at a time. Write a program in java for external sorting. Find out time complexity.

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## CO215: Operating System and Administration Lab

Teaching Scheme	Examination Scheme	
<b>Practical : 2 Hrs. / Week</b>	<b>Term Work:</b>	<b>50 Marks</b>
<b>Credits: 1</b>	<b>Practical Exam:</b>	<b>----</b>
	<b>Total:</b>	<b>50 Marks</b>

### Course Objectives

1. To learn and understand the basic and advance Linux commands.
2. To learn and understand the Shell Scripts, Perl Scripts and Python Scripts.
3. To be able to add and delete the user and giving access rights to users in Linux platform.
4. To be able to write and execute the C/C++, Java program under Linux Platforms.
5. To be able to perform disk formatting and partitioning.
6. To be able to install Linux operating system such Ubuntu, and Fedora.

**Course Outcomes (COs):** On completion of the course, students will be able to–

Course Outcomes	Blooms taxonomy	
	Level	Descriptor
1. <b>Create</b> the program using Linux commands	6	Create
2. <b>Understand</b> the Shell Scripts, Perl Scripts, Python Scripts	2	Understand
3. <b>Create</b> a program in C/C++ /Java under Linux Platform	6	Create
4. <b>Understand</b> the execution of the program under Linux platform	2	Understand
5. <b>Process</b> control and its execution using different System Calls	4	Analyze
6. <b>Create</b> disk formatting and disk portioning for Linux Installation	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	3	2	3	2	2	-	-	-	-	-	1	2	3	3	-
CO2	3	2	3	2	2	-	-	-	-	-	1	2	3	3	-
CO3	3	2	3	2	2	-	-	-	-	-	1	2	3	3	-
CO4	3	2	3	2	2	-	-	-	-	-	1	2	3	3	-
CO5	3	2	3	2	2	-	-	-	-	-	1	2	3	3	-
CO6	3	-	3	2	2	-	-	-	-	-	1	2	3	3	-

**Suggested List of Assignments****Group A (Implement any four assignments)**

1. Implementation of Create/ rename/ delete a file using Unix/Linux commands. Adding users and access rights
2. Write a function to display the list of devices connected to your system including the physical names and its instance number. Write a function using mount and unmounts command to mount device and un-mount it.
3. Implement the commands for creation and deletion of directory. Write a program to change current working directory and display the node details for each file in the new directory.
4. Process related commands list the processes for the current shell, Display information about processes, Display the global priority of a process, and change the priority of a process with default arguments.
5. Use Operating system Commands to obtain the following results
  1. To print the name of operating system
  2. To print the login name
  3. To print the host name

**Group B (Implement any four assignments)**

6. Write a shell program to convert all lowercase letter in a file to uppercase letter.
7. Write program to find number of CPU cores and CPU Manufacturer
8. Study assignment on Installation of Linux, Interactive Installation.
9. Write a shell script that determines the period for which a specified user is working on the system.
10. Write a shell script that accepts a file name, starting and ending line numbers as arguments and

displays all the lines between the given line numbers.

**Group C (Implement any four assignments)**

11. Write a C/C++ script to display all logged in users
12. C/C++ Program to Parent creating the child process by use of fork.
13. Java Program to identify the available memory in the system
14. Write Java script to display all logged in users. Count the number of logged-in users. Write a program to create a foreground and background process for the selected user and display its status.
15. Python Program to add two matrices.
16. Python Program to Illustrate Different Set Operations
17. Python Program to Generate a Random Number

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## CO216: Object Oriented Programming Laboratory

Teaching Scheme	Examination Scheme	
<b>Practical : 2 Hrs. / Week</b>	<b>Term Work:</b>	----
<b>Credits: 1</b>	<b>Practical Exam:</b>	<b>50 Marks</b>
	<b>Total:</b>	<b>50 Marks</b>

### Course Objective:

1. To study basic object oriented programming concept.
2. To learn the operator overloading, Inheritance, virtual function.
3. To understand the exception handling concept.
4. To learn and understand file handling operation.
5. To study STL programming.
6. To get familiar with python basic concept.

**Course Outcome (s):** On completion of the course, students will be able to-

Course Outcome(s)	Bloom's Taxonomy	
	Level	Descriptor
1. <b>Demonstrate</b> the basic object oriented programming concept	3	Apply
2. <b>Apply</b> the concept of operator overloading, Inheritance, virtual function.	3	Apply
3. <b>Illustrate</b> the concept exception handling.	4	Analyse
4. <b>Implement</b> the various file operations.	3	Apply
5. <b>Develop</b> the small application using OOP.	6	Design
6. <b>Describe</b> the basic python programming.	1	Remember



## 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	2	-	-	-	-	-	-	2	-	3	-	2
CO2	3	-	2	2	-	-	-	-	-	-	2	-	3	-	2
CO3	3	-	2	2	-	-	-	-	-	-	2	-	2	-	2
CO4	3	-	2	2	-	-	-	-	-	-	2	-	3	-	2
CO5	3	-	2	3	-	-	-	-	2	-	3	-	3	-	2
CO6	3	-	2	3	-	-	-	-	2	-	3	-	3	-	2

**Operating System Recommended:** 64-bit Open source Linux or its derivative

**Programming tools recommended:** - Open Source C++ Programming tool like G++/GCC.

Set of suggested assignment list is provided in 4 groups- A, B, C, D. Instructor is suggested to design assignments list by selecting/designing at least 10 suitable Assignments.

4 Assignments from group A, 4 Assignments from group B, 2 from group C, Group D compulsory.

### Suggested list of Assignments

#### Group-A

1. Create a class named weather report that holds a daily weather report with data member's day\_of\_month, hightemp, lowtemp, amount\_rain and amount\_snow. The constructor initializes the fields with default values: 99 for day\_of\_month, 999 for hightemp,-999 for low emp and 0 for amount\_rain and amount\_snow. Include a function that prompts the user and sets values for each field so that you can override the default values. Write a C++ program that creates a monthly report.

a) Menu driven program with options to Enter data and Display report

b) Report Format

Day	Amt_Rain	Amt_Snow	High_Temp	Low_Temp
Avg				

2. A book shop maintains the inventory of books that are being sold at the shop. The list includes details such as author, title, price, publisher and stock position. Whenever a customer wants a book, the sales person inputs the title and author and the system searches the list and displays whether it is available or not. If it is not, an appropriate message is displayed. If it is, then the system displays the

book details and requests for the number of copies required. If the requested copies are available, the total cost of the requested copies is displayed; otherwise the message “Required copies not in stock” is displayed.

Design a system using a class called books with suitable member functions and Constructors. Use new operator in constructors to allocate memory space required. Implement C++ program for the system.

3. Design a C++ Class ‘Complex ‘ with data members for real and imaginary part. Provide default and parameterized constructors. Write a program to perform arithmetic operations of two complex numbers using operator overloading (using either member functions or friend functions).

4. Write a Program to Implement a Class STUDENT having Following Members: Data members & Member functions, Accept Name of the student, marks of the student to Compute Total, Average to Display the Data

5. Implement C++ program to implement a base class consisting of the data members such as name of the student, roll number and subject. The derived class consists of the data members subject code ,internal assessment and university examination marks. The program should have the facilities. i) Build a master table ii) List a table iii) Insert a new entry iv) Delete old entry v) Edit an entry vi) Search for a record. Use virtual functions.

### **Group -B**

6. Develop an object oriented program in C++ /Python to create a database of the personnel information system containing the following information: Name, Date of Birth, Blood group, Height, Weight, Insurance Policy number, Contact address, telephone number, driving licence no. etc Construct the database with suitable member functions for initializing and destroying the data viz constructor, default constructor, copy constructor, destructor, static member functions , friend class, this pointer, inline code and dynamic memory allocation operators-new and delete.

7. Create a C++ /Python class named Television that has data members to hold the model number and the screen size in inches, and the price. Member functions include overloaded insertion and extraction operators. If more than four digits are entered for the model, if the screen size is smaller than 12 or greater than 70 inches, or if the price is negative or over \$5000 then throw an integer. Write a main() function that instantiates a television object, allows user to enter data and displays the data members .If an exception is caught, replace all the data member values with zero values.

8. Write a function template selection Sort. Write a program that inputs, sorts and outputs an integer array and a float array.

9. Write a menu driven program that will create a data file containing the list of telephone numbers in the following form

John 23456

Ahmed 9876

.....

.....

Use a class object to store each set of data, access the file created and implement the following tasks

I. Determine the telephone number of specified person II. Determine the name if telephone number is known III. Update the telephone number, whenever there is a change

10. Write C++ program using STL to add binary numbers (assume one bit as one number); use STL stack

### **Group C**

11. Write a Python program to calculate salary of an employee given his basic pay (take as input from user). Calculate gross salary of employee. Let HRA be 10 % of basic pay and TA be 5% of basic pay. Let employee pay professional tax as 2% of total salary. Calculate net salary payable after deductions

12. Write a Python program to check whether input number is Armstrong number or not. An Armstrong number is an integer with three digits such that the sum of the cubes of its digits is equal to the number itself.

13. To accept from user the number of Fibonacci numbers to be generated and print the Fibonacci series.

### **Group D**

14. To Develop a Mini project using OOP concept.

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## CO217: Mini Project/Choice Based Subject

Teaching Scheme	Examination Scheme	
Lectures: 4 Hrs. / Week	Term Work:	50 Marks
Credits: 2	Oral Exam:	50 Marks
	Total:	100 Marks

Prerequisite: Basics of Programming

Students need to select any one of the following training buckets, learn the course, perform list of assignments, develop mini-project in a group of 3-4 students and at the end need to submit project report as per the guidelines given in course syllabus:

Bucket 1: Python Programming

Bucket 2: Web Development using HTML & Java Script

Bucket 3: Core Java Programming

Bucket 4: Computer Graphics and Animation

### Guidelines for Assessment:

Continuous assessment of laboratory work is done based on overall performance in lab assignments and mini-project. Each lab assignment assessment will assign grade/marks based on parameters with appropriate weightage.

Term Work will be based on assignments carried out by a student and mini-project demonstration and related skills learned.

### General Guidelines for Mini-Project:

1. The mini project should be undertaken preferably by a group of 3-4 students who will jointly work together and implement the project.
2. Topic should be based on the technology that students have studied in choice based subject.
3. It is appreciated if the mini-project is based on real world problems and day to day life.
3. Use of open source software is to be appreciated.
4. The group has to select the project topic with the approval of the guide and submit the name of the project with synopsis of the proposed work.
5. At the end of the semester each group need to submit a report of minimum 15 pages.

The formats for synopsis and report are as given below:

### Synopsis

**Group Id:**

**Student Name: 1.**

**2.**

**3.**

**Title:**

**Abstract:**

**Objectives:**

**Technology Used:**

**Outcomes:**

### Report

**Group Id:**

**Student Name: 1.**

**2.**

**3.**

**Title:**

**Abstract:**

**Introduction:**

**Objectives:**

**Technology Used:**

**System Design:**

**Implementation Details:**

**Results:**

**Outcomes:**

**Conclusion:**

**References:**

## Bucket-1 Python Programming

### Course Objectives:

1. To learn basic principles of Python programming language
2. To understand the concepts of variables and loops
3. To understand the concept of Functions
4. To represent Lists, Tuples and Dictionaries
5. To acquainted with application development in Python

**Course Outcome (COs):** On completion of the course, students will be able to-

Course Outcomes	Blooms Taxonomy	
	Level	Descriptor
1. <b>Describe</b> basic principles of Python programming language	1	Remember
2. <b>Illustrate</b> use of variables and loops	2	Understand
3. <b>Apply</b> the Functions in Python Programming	3	Apply
4. <b>Examine</b> Lists, Tuples and Dictionaries	4	Analyse
5. <b>Create</b> an application using Python Programming	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	-	-	-	-	-	-	1	-	-	--
CO2	-	-	2	-	2	-	-	-	-	-	-	1	-	-	--
CO3	-	-	3	-	2	-	-	-	-	-	-	1	-	-	---
CO4	-	-	3	-	2	-	-	-	-	-	-	1	-	-	--
CO5	-	-	3	-	2	-	-	-	-	-	-	1	-	-	--

### COURSE CONTENTS

I	GETTING STARTED WITH PYTHON	No. of Hours	COs
	Installation and configuration, Concept of interpreter, Indent in python	2	1
II	VARIABLES LOOPS AND STATEMENTS	No. of Hours	COs

	Variables, While Loops, For Loops, If Statements, If Else Statements, If Elif Else Statements	4	2
<b>III</b>	<b>FUNCTIONS</b>	<b>No. of Hours</b>	<b>COs</b>
	Functions and variables, Functions ,Function Parameters ,Global and Local Variables.	4	3
<b>IV</b>	<b>INTERMEDIATE PYTHON</b>	<b>No. of Hours</b>	<b>COs</b>
	Input and Statistics, Import Syntax, Making Modules, Error Handling - Try and Except ,Lists vs. Tuples and List Manipulation, Dictionaries	5	4
<b>V</b>	<b>WORKING WITH FILES AND CLASSES</b>	<b>No. of Hours</b>	<b>COs</b>
	Writing to a File, Appending to a File ,Reading from a File, Classes	3	5
<b>Suggested List of Laboratory Assignments on Python Programming</b>			
<ol style="list-style-type: none"> <li>1. Python Program for factorial of a number</li> <li>2. Program to print ASCII Value of a character</li> <li>3. Python program to check if a string is palindrome or not</li> <li>4. Python program to check whether the string is Symmetrical or Palindrome</li> <li>5. Write a python function to find factorial of a number</li> <li>6. Write a program using try-except to avoid unexpected termination of program</li> <li>7. Python Program to Find the Size (Resolution) of a Image</li> </ol>			
<b>Suggested Mini Project on Python Programming</b>			
It is expected to develop a mini project based on concepts learnt in the course. The mini project should demonstrate the concepts and critical thinking of students. However, the scope of project is not restricted up to syllabus. Preferably project should address the real life problem.			
Books:			
<b>Reference Books (R):</b>			
R1. Mark Lutz, Programming Python, O`Reilly, 4th Edition, 2010 R2.Allen B Downey, “Think PYTHON”, O`Rielly, ISBN: 13:978-93-5023-863-9, 4th Indian Reprint 2015			
<b>Text Books(T):</b>			
T1. Michael Urban and Joel Murach, Python Programming, Shroff/Murach, 2016. T2.Learn Python the Hard Way, Zed A. Shaw (3rd Edition) T3.Kenneth A Lambert and B L Juneja, “Fundamentals of PYTHON”, CENGAGE Learning, ISBN:978-81-315-2903-4			

**Bucket-2**  
**Web Development using HTML & Java Script**

**Course Objectives:**

1. To Learn Client Side Scripting Using HTML
2. To Learn CSS to decorate the HTML Page
3. To Validate and add Dynamic essence to HTML pages using JS

**Course Outcome (COs):** On completion of the course, students will be able to-

Course Outcomes	Blooms Taxonomy	
	Level	Descriptor
1. <b>Explore</b> Client side technologies using HTML	2	Understand
2. <b>Apply</b> CSS for designing attractive web pages	3	Apply
3. <b>Apply</b> the concept of JS for validating HTML forms	3	Apply
4. <b>Design</b> and develop static websites	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	1	-		-		-	3	-	-	-	-	3	-	-	--
CO2	1	-		-		-	3	-	-	-	-	3	-	-	--
CO3	1	-		-		-	3	-	-	-	-	3	-	-	---
CO4	1	-		-		-	3	-	-	-	-	3	-	-	--



<b>COURSE CONTENTS</b>			
<b>I</b>	<b>INTRODUCTION</b>	<b>No. of Hours</b>	<b>COs</b>
	HTML,HTTP, Server side Scripting, Client side scripting, Session, Cookies What Is SVN, Usage Of SVN <b>Introduction to WWW and HTML</b> - HTML/HTML5 Tags - Creating a Webpage Document - XHTML - CSS <b>Essential HTML Tags</b> - Linking Pages Together - Adding Images - Creating Lists and Tables - Testing and Validation	4	1,4
<b>II</b>	<b>CSS</b>	<b>No. of Hours</b>	<b>COs</b>
	<b>CSS Basics</b> - Separation of Content and Style - How CSS Works - Selectors and Properties - Text, Margins, Borders and Backgrounds <b>CSS Selectors and Layout</b> - More Powerful CSS Selectors - HTML DIV and SPAN Tags - Understanding the Box Model - Creating Layout in CSS <b>More Advanced Topics</b> - Creating a CSS Rollover Navigation - Adding Interactivity - Getting onto the Web - Resources for Continuing On Laying out a site with CSS	5	2,4
<b>III</b>	<b>JAVASCRIPT BASICS WITH CODING STANDARDS</b>	<b>No. of Hours</b>	<b>COs</b>
	JS How To, JS Where To, JS Statements,JS Comments, JS Variables, JS Operators, JS Comparisons, JS If...Else, JS Switch, JS Popup Boxes, JS Functions, JS For Loop, JS While , Loop, JS Break Loops, JS For...In,JS Events, JS Try...Catch, JS Throw, JS Special Text, JS Guidelines	4	3,4
<b>IV</b>	<b>JAVA SCRIPT ADVANCE</b>	<b>No. of Hours</b>	<b>COs</b>

	JS Objects, JS Objects Intro, JS String, JS Date, JS Array, JS Boolean, JS Math, JS RegExp, JS Browser, JS Cookies, JS Validation, JS Timing, JS Create Object, JS Summary, JQuery Intro, Java script Assignments	5	3,4
<b>Suggested List of Laboratory Assignments on Web Development using HTML &amp; Java Script</b>			
<ol style="list-style-type: none"> <li>1. Design a simple static web page using Text tags</li> <li>2. Extend the Assignment 1 by applying the concept of Frames, Img, href</li> <li>3. Improve the Assignment 2 by applying Table concept</li> <li>4. Add the simple registration form to Assignment 4</li> <li>5. Apply the Javascript and Validate the registration form designed in Assignment 4</li> <li>6. Make the web page attractive Using the concept CSS</li> </ol>			
<b>Suggested Mini Project on Web Development using HTML &amp; Java Script</b>			
Design and Develop a static website for any organization/company/institute using all possible HTML tags, validate the registration form using Javascript and apply the CSS			
Books:			
<b>Reference Books (R):</b>			
R1. HTML Black Book , by Steven Holzner, Publisher : Dreamtech Press (3 July 2000), ISBN-10 : 8177220861 ISBN-13 : 978-8177220865 R2. Developing Web Applications, Ralph Moseley, John Wiley & Sons, 2007, ISBN 8126512881, 978812651288 R3. Mastering HTML, CSS & Javascript Web Publishing, by Laura Lemay , Rafe Colburn , Jennifer Kyrnin, Publisher : BPB Publications, ISBN-10 : 8183335152 , ISBN-13 : 978-8183335157			

**Bucket-3**  
**Core Java Programming**

**Course Objectives:**

1. To learn the fundamental concept of Java Programming.
2. To study the Inheritance and Package.
3. To learn the Exception Handling and Multi-threading.
4. To understand the concepts of Applet and JDBC.

**Course Outcome (COs):** On completion of the course, students will be able to-

Course Outcomes	Blooms Taxonomy	
	Level	Descriptor
1. <b>Understand</b> the use of Java Programming concepts for application development.	2	Understand
2. <b>Understand</b> how to apply the re-usability concept in development of application.	2	Understand
3. <b>Design</b> and develop the Multi-threaded application.	6	Create
4. <b>Design</b> and develop the application using database connectivity.	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	-	3	-	2	-	-	-	2	2	2	2	-	2	3
CO2	2	-	3	-	2	-	-	-	2	2	2	2	-	2	3
CO3	2	-	3	-	2	-	-	-	2	2	2	2	-	2	3
CO4	2	-	3	-	2	-	-	-	2	2	2	2	-	2	3

**COURSE CONTENTS**

I	FUNDAMENTALS OF JAVA PROGRAMMING	No. of Hours	COs
	Review of Object oriented concepts, History of Java, JVM architecture, Data types, Variables, Scope and life time of variables, arrays, operators, control statements, type conversion and casting, simple java program, constructors, methods, Static block, Static Data, Static Method String and String Buffer Classes, Using Java API Document.	5	1
II	INHERITANCE AND POLYMORPHISM	No. of Hours	COs

	Basic concepts, Types of inheritance, Member access rules, Usage of this and Super key word, Method Overloading, Method overriding, Abstract classes, Dynamic method dispatch, Usage of final keyword. <b>Packages And Interfaces:</b> Defining package, Access protection, importing packages, Defining and Implementing interfaces, and Extending interfaces.	5	2
<b>III</b>	<b>EXCEPTION HANDLING &amp; MULTITHREADED PROGRAMMING</b>	<b>No. of Hours</b>	<b>COs</b>
	The Idea behind Exception, Exceptions & Errors, Types of Exception, Checked and Un-Checked Exceptions ,Control Flow in Exceptions, Use of try and catch block, Multiple catch block, Nested try, finally block, throw keyword, Exception Propagation, throws keyword, Exception Handling with Method Overriding, In-built and User Defined Exceptions. <b>Multi-threaded programming</b> Introduction, Creating Threads, Extending Thread Class, Stopping and Blocking the threads, Life Cycle of Thread, Using Thread Methods, Thread Exceptions, Thread Priority, Synchronization, Implementing the Runnable interface.	4	3
<b>IV</b>	<b>APPLET PROGRAMMING &amp; JDBC</b>	<b>No. of Hours</b>	<b>COs</b>
	Introduction, Local and Remote Applet, How applet Differ from Applications, Preparing to write Applets, Building Applet code, Applet life Cycle, Creating Executable Applet, Designing web page, Applet tag, Adding applet HTML file, Passing parameter to applets, Getting input from user. <b>JDBC</b> The design of JDBC, Basic JDBC program Concept, Drivers, Architecture of JDBC, Making the Connection, Statement, ResultSet, Prepared Statement, Collable Statement, Executing SQL commands, Executing queries	4	4
<b>Suggested List of Laboratory Assignments on Core Java Programming</b>			

1. Develop the application using the basic concepts of java programming.
2. Develop the application using the various types of inheritance and polymorphism in java programming.
3. Develop the application in java programming using the concept of interface.
4. Implement the program in java to demonstrate create and use of package concept in java.
5. Develop the application to demonstrate the exception handling mechanism in java programming.
6. Develop the Multithreaded application in java programming using extending Thread class.
7. Develop the Multithreaded application in java programming using implementing the runnable interface.
8. Develop the GUI application using the concept of applet in java programming.
9. Develop the application using concept of JDBC to perform the various operations with database like mysql.

### **Suggested Mini Project on Core Java Programming**

Students should work in a group of 2 to 4 for each project. They should come up with project topic in the area of systems or business applications. They are free to choose any project title for implementation of project. The group should work on following phases of software development lifecycle. 1)Requirement Analysis 2)System Design 3)Coding 4)Testing  
A mini project should consist of 15-20 pages report and softcopy of project.

Books:

### **Reference Books (R):**

- R1. Java: The Complete Reference Hebert Schildt, 8th Edition, Mc Graw Hill
- R2. Programming with Java A Primer, E. Balaguruswamy Tata McGraw Hill Companies.
- R3. J D B C: Java Database Connectivity Haecke, B. V. IDG Books India Ltd
- R4. Java 2 Programming Shah, Keyur TMH
- R5. Java 2 Programming Bible Walsh, A/ Couch J/ Steinberg, D. IDG Books India Ltd
- R6. Java 2 Programming: Black Book Holzner, Steven 5<sup>th</sup> edition Dreamtech

**Bucket-4**  
**Computer Graphics and Animation**

**Course Objectives:**

1. To acquire fundamental knowledge of Computer Graphics.
2. To learn various algorithms for generating and rendering graphical figures and learn mathematics behind the graphical transformations.
3. To learn various algorithms for polygon filling and curve generation.
4. To acquire fundamental knowledge of Computer Animation

**Course Outcome (COs):** On completion of the course, students will be able to-

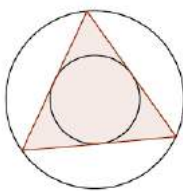
Course Outcomes	Blooms Taxonomy	
	Level	Descriptor
1. <b>Design</b> basic objects in computer graphics using mathematical properties of the object.	6	Create
2. <b>Apply</b> various transformations on 2D objects.	3	Apply
3. <b>Develop</b> non regular geometric shapes using curves and fractals and create animation.	6	Create
4. <b>Develop</b> the graphical simulation using computer graphics and animation concepts.	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	1	1	2		-	-	-	-	-	-		3	1	--
CO2	2	1	2	-		-	-	-	-	-	-		3	1	--
CO3	2	1	2	-		-	-	-	-	-	2		3	1	---
CO4	2	1	2	2		-	-	-	-	-	2		3	1	2

**COURSE CONTENTS**

I	GRAPHICS PRIMITIVES AND SCAN CONVERSION	No. of Hours	COs
	Concepts, applications of computer graphics, pixel, resolution, aspect ratio, Scan conversions, lines, line segments, vectors, pixels and frame buffers, qualities of good line drawing algorithms, line drawing algorithms: Digital Differential Analyzer (DDA), Bresenham, Bresenham Circle drawing algorithm (OpenGL)	4	1

II	POLYGONS	No. of Hours	COs
	Introduction to polygon, types: convex, concave and complex. Representation of polygon, Inside test, polygon filling algorithms – flood fill, seed fill, scan line fill and filling with patterns.	3	2
III	TRANSFORMATIONS	No. of Hours	COs
	2-D transformations: introduction, matrices, Translation, scaling, rotation, homogeneous coordinates and matrix representation, translation, coordinate transformation, rotation about an arbitrary point, inverse and shear transformation. (Blender)	4	2
IV	HIDDEN SURFACES , CURVES AND FRACTALS	No. of Hours	COs
	Hidden Surfaces Introduction, Back face detection and removal, Algorithms: Depth buffer (z), Depth sorts (Painter), Area subdivision (Warnock) Curves: Introduction, Interpolation and Approximation, Blending function, B-Spline curve, Bezier curve, Fractals: Introduction, Classification, Applications, Fractal generation: snowflake, Triadic curve, Hilbert curve.	3	3
V	ANIMATION	No. of Hours	COs
	Segment: Introduction, Segment table and operation on segment, Animation: Introduction, Principles of animation, Design of animation sequences (Blender)	3	3,4
<b>Suggested List of Laboratory Assignments on Computer Graphics and Animation</b>			
<p>1. Write C++ program to draw line using Bresenham's algorithm.</p> <p>2. Write C++ program to draw circle using Bresenham's algorithm in OpenGL.</p> <p>3. Write C++ program to draw inscribed and Circumscribed circles in the triangle as shown as an example below. (Use any Circle drawing and Line drawing algorithms)</p> <div style="text-align: center;">  </div> <p>4. Write C++ program to draw a polygon and fill it with desired color using Seed fill algorithm.</p> <p>5. Write program to draw 2D object in Blender and perform following basic transformations,</p> <p>a) Scaling</p> <p>b) Translation</p> <p>c) Rotation</p>			

6. Write C++ program to draw waves using any curve generation technique

### Suggested Mini Project on Computer Graphics and Animation

Implement a mini project in computer graphics and animation for scenes in Blender like

- a. Train Signal Simulation
- b. Traffic Signal Simulation
- c. Tic Tac Toe Game
- d. Satellite Launch
- e. Clock
- f. Tower of Hanoi
- g. Aquarium

Books:

#### Reference Books (R):

- R1. D. Rogers, J. Adams, —Mathematical Elements for Computer Graphics, 2nd Edition, Tata McGrawHill Publication, 2002, ISBN 0 – 07 – 048677 – 8.
- R2. Suzanne weixel, “Graphics and Animation Basic”, Thomson Publisher, ISBN-10:0619055340 ISBN-13:978-0619055349
- R3. Shirley, P. & Marschner, S. (2009). Fundamentals of Computer Graphics. CRC Press (4th ed.). University of Cambridge need to purchase, Stanford University

#### Text Books(T):

- T1. S. Harrington, —Computer Graphics, 2nd Edition, McGraw-Hill Publications, 1987, ISBN 0 – 07 – 100472 – 6 , NIT Hamirpr
- T2. D. Rogers, —Procedural Elements for Computer Graphics, 2nd Edition, Tata McGraw-Hill Publication, 2001, ISBN 0 – 07 – 047371 – 4., IIT Kanpur
- T3. J. Foley, V. Dam, S. Feiner, J. Hughes, —Computer Graphics Principles and Practice, 3rd Edition, Pearson Education, 2003, ISBN 81 – 7808 – 038 – 9. University of Cambridge need to purchase , IIT Bombay, Stanford University, IIT Kanpur
- T4. Donald D. Hearn, M. Pauline Baker, Computer Graphics C Version, 2<sup>nd</sup> Edition, Pearson.

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## MC218: Innovation - Project based – Science and Technology, Social, Design & Innovation

<b>Teaching Scheme</b>	<b>Examination Scheme</b>
<b>Practical : 2Hrs. / Week</b>	
<b>Credits: No Credit</b>	

### 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

**Course Outcomes:** On completion of the course, students will be able to-

Course Outcomes	Blooms Taxonomy	
	Level	Descriptor
1. <b>Understand</b> the role of innovation and technical change in enterprise and national level economic performance	2	Understanding
2. <b>Develop</b> strategic thinking to solve social problems	3	Applying
3. <b>Recognize</b> 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 expected to come up with novel and useful ideas on social problems. 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 student, be encouraged to undertake technology projects of social relevance

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