KUMARAGURU COLLEGE OF TECHNOLOGY,

An autonomous Institution affiliated to Anna University, Chennai

COIMBATORE – 641 049.

B.E., COMPUTER SCIENCE AND ENGINEERING

REGULATIONS 2017

CURRICULUM AND SYLLABI

III to VIII Semesters

Department of Computer Science and Engineering

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VISION

To evolve as a School of Computer Science with centers of excellence having international reputation to serve the changing needs of Indian industry and society.

MISSION

- Computer Science and Engineering department is committed to bring out career oriented graduates who are industry ready through innovative practices of teaching-learning process.
- To cultivate professional approach, strong ethical values and team spirit along with leadership qualities among the graduates by organizing workshops, seminars and conferences periodically. Association with professional bodies and invitation to external experts should help this.
- To contribute towards techno-economic and social development of the nation through quality human resource and encouraging entrepreneurship among the young graduates.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

The objectives of the Under Graduate programme in Computer Science and Engineering are to:

I. Enable graduates to be successful in their chosen careers, by applying their continual learning of Computer Science and Engineering in their work and life situations.

II. Enable graduates of the program to continue to adopt latest technologies and be critical learners displaying creativity and demonstrate to be leaders.

III. Prepare graduates of the program to be innovative product engineers catering to the requirements of the enterprises and society.

PROGRAM OUTCOMES (POs)

Graduates of BE-CSE programme will have the following abilities:

PO 1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO 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.

PO 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.

PO 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.

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PO 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.

PO 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.

PO 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.

PO 8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 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.

PO 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.

PO 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.

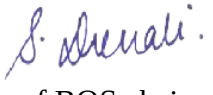
PROGRAM SPECIFIC OUTCOMES (PSOs)

Graduates of the Computer Science and Engineering Undergraduate Program will have the ability to:

PSO 1: Proficiently develop useful products by applying appropriate hardware and software technologies.

PSO 2: Organize heterogeneous data for accurate large-scale data processing using appropriate algorithms and tools.

PSO 3: Understand modern networking technologies and apply programming skills to create scalable real-time applications.



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REGULATIONS 2017

B.E. COMPUTER SCIENCE AND ENGINEERING

CURRICULUM

Semester III										Pre-requisite
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**	
1	U17MAT3104	Discrete Mathematics	Theory	BS	3	1	0	0	4	-------
2	U17CSI3201	Data Structures	Embedded - Theory & Lab	PC	3	0	2	0	4	-------
3	U17CSI3202	Object Oriented Programming	Embedded - Theory & Lab	PC	3	0	2	0	4	-------
4	U17CST3003	Computer Architecture	Theory	PC	3	0	0	0	3	-------
5	U17CSI3204	Database Management Systems	Embedded - Theory & Lab	PC	3	0	2	0	4	-------
6	U17INI3600	Engineering Clinic-I	Project based course with lab	ES	0	0	4	2	3	-------
								Total Credits	22	
								Total Contact Hours/week	28	

Semester IV										Pre-requisite
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**	
1	U17MAI4201	Probability and Statistics	Embedded - Theory & Lab	BS	3	0	2	0	4	-------
2	U17CST4001	Design and Analysis of Algorithms	Theory	PC	3	0	0	0	3	U17CSI3201
3	U17CSI4202	Operating Systems	Embedded - Theory & Lab	PC	3	0	2	0	4	U17CST3003
4	U17CST4003	Theory of Computation	Theory	PC	3	0	0	0	3	U17MAT3104
5	U17CSI4204	Software Engineering	Embedded - Theory & Lab	PC	3	0	2	0	4	U17CSI3202
6	U17INI4600	Engineering Clinic-II	Project based course with lab	ES	0	0	4	2	3	U17INI3600
								Total Credits	21	
								Total Contact Hours/week	27	

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Semester V										Pre-requisite
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**	
1	U17CSI5201	Computer Networks	Embedded - Theory & Lab	PC	3	0	2	0	4	-------
2	U17CST5002	Agile Software Development	Theory	PC	3	0	0	0	3	U17CSI4204
3	U17CSI5203	No SQL Databases	Embedded - Theory & Lab	PC	3	0	2	0	4	U17CSI3204
4	U17CST5004	Social Media Marketing	Theory	PC	3	0	0	0	3	-------
5	U17INI5600	Engineering Clinic-III	Project based course with lab	ES	0	0	4	2	3	U17INI4600
6	U17CSE----	Programme Elective-I	Theory	PE	3	0	0	0	3	-------
7	U17OE----	Open Elective	Theory	OE	3	0	0	0	3	-------
Total Credits									23	
Total Contact Hours/week									28	

Semester VI										Pre-requisite
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**	
1	U17CSI6201	Internet and Web Programming	Embedded - Theory & Lab	PC	3	0	2	0	4	-------
2	U17CST6002	Wireless Networks and Mobile Systems	Theory	PC	3	0	0	0	3	U17CSI5201
3	U17CSI6203	Data Warehousing and Data Mining	Embedded - Theory & Lab	PC	3	0	2	0	4	U17CSI5203
4	U17INI6600	Engineering Clinic-IV	Project based course with lab	ES	0	0	4	2	3	U17INI5600
5	U17CSE----	Programme Elective-II	Theory	PE	3	0	0	0	3	-------
6	U17OE----	Open Elective	Theory	OE	3	0	0	0	3	-------
Total Credits									20	
Total Contact Hours/week									25	

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Semester VII										Pre-requisite
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**	
1	U17CSI7201	Cloud Computing	Embedded - Theory & Lab	PC	3	0	2	0	4	U17CSI5201
2	U17CST7002	Machine Learning Techniques	Theory	PC	3	0	0	0	3	U17CSI6203
3	U17CST7003	Software Testing	Theory	PC	3	0	0	0	3	U17CST5002
4	U17CSE----	Programme Elective -III	Theory	PE	3	0	0	0	3	-------
5	U17CSE----	Programme Elective - IV	Theory	PE	3	0	0	0	3	-------
6	U17CSP7704	Project Phase-I	Project only Course	PW	0	0	0	6	3	-------
								Total Credits	19	
								Total Contact Hours/week	23	

Semester VIII										Pre-requisite
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**	
1	U17CSP8701	Project Phase-II	Project only Course	PW	0	0	0	24	12	
								Total Credits	12	
								Total Contact Hours/week	24	

Total Credits	**160**

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Mandatory Courses										
S.No	**Couse Code**	**Course Title**	**Course Mode**	**L**	**T**	**P**	**J**	**C**	**CT**	**Semester**
1	U17VEP3503	Human Excellence-Family Values	Lab	0	0	2	0	0	HS	3
2	U17VEP4504	Human Excellence-Professional Values	Lab	0	0	2	0	0	HS	4
3	U17INT5000	Constitution of India	Theory	2	0	0	0	0	MC	5
4	U17VEP5505	Human Excellence-Social Values	Lab	0	0	2	0	0	HS	5
5	U17VEP6506	Human Excellence-National Values	Lab	0	0	2	0	0	HS	6
6	U17VEP7507	Human Excellence-Global Values	Lab	0	0	2	0	0	HS	7

Programme Electives									
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**
Data Analytics									
1.	U17CSE0001	Big Data Technologies	Theory	PE	3	0	0	0	3
2.	U17CSE0002	Data Visualization	Theory	PE	3	0	0	0	3
3.	U17CSE0003	Artificial Intelligence	Theory	PE	3	0	0	0	3
Networking									
1.	U17CSE0004	IoT Architecture and Protocols	Theory	PE	3	0	0	0	3
2.	U17CSE0005	Adhoc and Sensor Networks	Theory	PE	3	0	0	0	3
3.	U17CSE0006	Software Defined Networks	Theory	PE	3	0	0	0	3
4.	U17CSE0007	Cryptography and Network Security	Theory	PE	3	0	0	0	3
5.	U17CSE0014	Blockchain Technology and applications	Theory	PE	3	0	0	0	3
General									
1.	U17CSE0008	Principles of Compiler Design	Theory	PE	3	0	0	0	3
2.	U17CSE0009	Graphics and Multimedia	Theory	PE	3	0	0	0	3
3.	U17CSE0010	Information Security	Theory	PE	3	0	0	0	3
4.	U17CSE0011	Declarative development of customized applications	Theory	PE	2	0	0	2	3
5.	U17CSE0013	ADX 201 Salesforce Administrator	Theory	PE	2	0	0	2	3

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SEMESTER III

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U17MAT3104 **DISCRETE MATHEMATICS**
(Common to CSE, IT, ISE)

L	T	P	J	C
3	1	0	0	4

COURSE OUTCOMES:

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Have a better understanding of sets and application of set theory.
CO2: Apply the knowledge of relations, equivalence relation and their properties.
CO3: Understand different kinds of functions.
CO4: Apply the knowledge of Combinatorics
CO5: Understand logical arguments and constructs simple mathematical proofs.
CO6: Know various graphs and learn different algorithms.

Pre-requisite courses: NIL

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													**CO/PSO Mapping**		
COs	**PROGRAMME OUTCOMES (POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	S	M											M	M	M
CO2	S	M											M	M	
CO3	S	M											M	M	M
CO4	S	S	M										M	M	M
CO5	S	S	M										M	M	M
CO6	S	S	M										M	M	M

COURSE ASSESSMENT METHODS

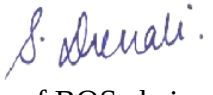
DIRECT
1. Continuous Assessment Test I, II 2. Open book test; Cooperative learning report, Assignment; Journal paper review, Group Presentation, Project report, Poster preparation, Prototype or Product Demonstration etc. (as applicable) 3. End Semester Examination
INDIRECT
1. Course-end survey

THEORY COMPONENT CONTENTS

SET THEORY **9+3 Hours**

Algebra of sets – The power set – Ordered pairs and Cartesian product – principle of inclusion and exclusion.

Relations on sets –Types of relations and their properties - Equivalence relations –Relational matrix and the graph of relation – Operations on relations.



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FUNCTIONS **7+2 Hours**

Functions –Type of functions – Injective, surjective and bijective functions –Composition of functions – Inverse functions –Permutation functions.

COMBINATORICS **9+3 Hours**

Mathematical induction- The basics of counting–Permutations and combinations-Recurrence relations-Solving linear recurrence relations

LOGIC **11+4 Hours**

Propositions- Logical operators- Normal forms –Rules of inference-Consistency and inconsistency-Propositional logic- Proofs-Predicates- Quantifiers- Universe of discourse – Logical equivalences and implications for quantified statements-Rules of specification and generalization – Validity of arguments.

GRAPH THEORY **9+3 Hours**

Graphs- Types of graphs- Matrix representation of graphs- Graph isomorphism- Walk - Path- Cycles-Eulerian graphs -Hamiltonian graphs- Planar graphs- Euler formula- Shortest path algorithms.

Theory: 45	**Tutorial: 15**	**Practical: 0**	**Project: 0**	**Total: 60 Hours**

REFERENCES

1. Liu C.L, "Elements of Discrete Mathematics, Second Edition, McGraw Hill 1985.
2. Mott J.L, Kandel A. and Baker T.P.,"Discrete Mathematics for Computer Scientists and Mathematicians, Second Edition, Prentice Hall India, 1986.
3. J.P.Trembly, R. Manohar, Discrete Mathematical Structures with applications to Computer Science, TMHInternational Edition (Latest Edition).
4. NarsinghDeo, Graph Theory with Applications to Engineering and Computer Science, Prentice – Hall, Engle Cliffs, N. J.
5. Harary F, Graph Theory, Narosa, 1969.
6. Thomas H.C., A Leiserson C.E., Rivest R.L, Stein C.A., "Introduction to a Algorithms(2nd Edition),MIT press and McGraw-Hill.2001.

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U17CSI3201 **DATA STRUCTURES**

L	T	P	J	C
3	0	2	0	4

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Analyze any given algorithm and determine the time and space complexity.

CO2: Implement and analyze the searching problems (Linear and Binary search).

CO3: Implement and analyze a given problem of stack, queue and linked list.

CO4: Summarize the basic tree concepts and its types.

CO5: Implement various sorting algorithms and compare the performance.

CO6: Write and implement the hashing technique.

Pre-requisite :NIL

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M														
CO2	M								L	L					
CO3	S	M							L	L				S	
CO4	S	M							L	L					
CO5	S	M							L	L				S	
CO6	L														

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II (Theory component)
2. Assignment; Group Presentation, Project Demonstration etc (as applicable) (Theory component)
3. Pre/Post - Experiment Test/Viva; Experimental Report for each Experiment (lab Component)
4. Model Examination (lab component)
5.End Semester Examination (Theory and lab components)
INDIRECT
1. Course-end survey

THEORY COMPONENT CONTENTS

INTRODUCTION **6 Hours**

Basic Terminologies: Elementary Data Organizations, Data Structure Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Asymptotic Notations, Time-Space trade off.

Searching: Linear Search and Binary Search Techniques and their complexity analysis.

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STACKS AND QUEUES **9 Hours**

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

LINKED LIST **9 Hours**

Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue, Header nodes, Doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and the complexity analysis

TREES **12 Hours**

Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree; Tree operations on each of the trees and their algorithms with Complexity analysis. Applications of Binary Trees. B Tree, B+ Tree: definitions, algorithms and analysis.

SORTING AND HASHING **9 Hours**

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

Theory: 45	Tutorial: 0	Practical: 0	Project: 0	Total: 45 Hours

REFERENCES

1. "Fundamentals of Data Structures", Illustrated Edition by Ellis Horowitz, SartajSahni, Computer Science Press.
2. M.A.Weiss, "Data Structures and Algorithm Analysis in C++", Fourth Edition, Pearson Education Asia, 2013.
3. "How to Solve it by Computer", 2nd Impression by R. G. Dromey, Pearson Education.

E BOOKS AND ONLINE LEARNING MATERIALS

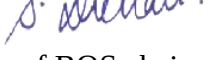
1. http://users.cis.fiu.edu/~weiss/
2. http://nptel.ac.in/courses/10610206

LAB COMPONENT CONTENTS **30 Hours**

LIST OF EXPERIMENTS

1. Array based implementation of Stack, Simple Queue, Circular Queue and Priority Queue ADT.
2. Singly, Doubly and Circular Linked list implementations.
3. Linked list implementations of Stack and Queue ADT.
4. Applications of Stack : Expression Conversion and Evaluation
5. Search Tree ADT - Binary Search Tree and traversal.
6. AVL tree implementation
7. Implementation of Hashing
8. Implement Sorting & Searching algorithms based on scenarios given

Theory: 0	Tutorial: 0	Practical: 30	Project: 0	Total: 30 Hours



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U17CSI3202 OBJECT ORIENTED PROGRAMMING

L	T	P	J	C
3	0	2	0	4

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Identify classes, objects, members of a class and the relationships among them for a specific problem.
CO2: Build applications using various types of Inheritance and Interfaces
CO3: Explain the concepts of exception handling and multithreading to develop an application or program.
CO4: Apply the concepts of data abstraction, encapsulation and polymorphism for problem solving.
CO5: Develop solutions to a given problems using collections, files and streams.
CO6: Design, develop, test and debug Java programs using object-oriented principles in conjunction with development tools including integrated development environments

Pre-requisite :NIL

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S	M		M				M	M		M	M	M	
CO2	S	S	M		M				M	M		M			
CO3	S	S	M		M				M	M		M			
CO4	S	S	M		M				M	M		M			
CO5	S	S	M		M				M	M		M			
CO6	S	S	M		M				M	M		M	M	M	

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II (Theory component)
2. Assignment; Group Presentation, Project Demonstration etc (as applicable) (Theory component)
3. Pre/Post - Experiment Test/Viva; Experimental Report for each Experiment (lab Component)
4. Model Examination (lab component)
5.End Semester Examination (Theory and lab components)
INDIRECT
1. Course-end survey

THEORY COMPONENT CONTENTS

INTRODUCTION TO OBJECT ORIENTED PROGRAMMING AND JAVA 7 Hours

Introduction to OOP– Java Fundamentals -Data Types, Variables, and Arrays - Operators-Control Statements – Classes – Methods –Constructors- Garbage Collection.

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INHERITANCE AND EXCEPTION HANDLING **10 Hours**

Inheritance –Packages and Interfaces - Exception Handling Fundamentals – Java's Built-in Exceptions-Creating new Exception subclasses.

POLYMORPHISM AND MULTITHREADING IN JAVA **10 Hours**

Polymorphism- Abstract classes and methods-Overloading-Overriding-final methods and classes –Multithreaded programming –The Thread class and the Runnable Interface-Creating multiple threads –Synchronization-Autoboxing, and Annotations (Metadata).

STRING HANDLING AND COLLECTION FRAMEWORK **11 Hours**

String Constructors-String Operations-Generic classes and methods-The Collection Framework-Collections-List-ArrayList,Linked List,Set-HashSet,LinkedHashSet,Queue-PriorityQueue,Map-HashMap,SortedMap, TreeMap.

FILES AND STREAMS IN JAVA **7 Hours**

Files and streams –Byte Stream-I/O stream,File I/O Stream,ByteArray I/O Stream-Character Stream-File Reader and Writer,CharArrayReader and Writer-Serialization.

Theory: 45	**Tutorial: 0**	**Practical: 0**	**Project: 0**	**Total: 45 Hours**

REFERENCES

1. Herbert Schildt, "Java the Complete Reference", Ninth edition Tata McGraw Hills, 2014.
2. Paul Deitel and Harvey Deitel, ―"Java How to Program (Early Objects)", Tenth Edition, Pearson Prentice Hall 2014.
3. Timothy Budd, ―"An Introduction to Object-Oriented Programming", Third Edition, Pearson Education, 2008.
4. E.Balaguruswamy,"Programming with Java", Second Edition, TMH, 2009

E BOOKS AND ONLINE LEARNING MATERIALS

1. Herbert Schildt, "Java the Complete Reference", Eighth edition Tata McGraw Hills, 2011.

LAB COMPONENT CONTENTS **30 Hours**

LIST OF EXPERIMENTS

1. Simple Programs in java using classes and methods.
2. Program for User Defined Exception Handling.
3. Program for Method Overloading and Method Overriding
    a) Use the concept of Packages and Interfaces
4. Thread Creation
    a) Using Thread Class and Runnable Interface
    b) Inter Thread Communication
5. Program using inbuilt methods of String class.
6. Program using collection framework
    a) Use the concept of List,Set,Map.
7. Program using Input streams and Output streams.
8. Program to access and perform various operations in file contents.
9. Use case/Project to implement Object oriented concepts using java

Theory: 0	**Tutorial: 0**	**Practical: 30**	**Project: 0**	**Total: 30 Hours**

ONLINE COURSES AND VIDEO LECTURES:https://www.javatpoint.com/java-tutorial

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U17CST3003 COMPUTER ARCHITECTURE

L	T	P	J	C
3	0	0	0	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

- **CO1** Understand micro level operations of computer using the concepts of hardware and software coordination.
- **CO2** Apply the knowledge of binary arithmetic operations to understand the design of hardware components.
- **CO3** Enumerate various control methodologies using programming and their effect on the hardware components
- **CO4** Compare different types of memories and their performances
- **CO5** Understand the performance enhancement techniques for data handling and I/O handling

Pre-requisite: NIL

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S														
CO2	M	M										M	M		
CO3	S														
CO4	S	M													
CO5		S											M		

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II 2. Assignment; Group Presentation 3. End Semester Examination
INDIRECT
1. Course-end survey

THEORY COMPONENT CONTENTS

BASIC STRUCTURE OF COMPUTERS **7 Hours**

Functional Units - Basic Operational Concepts - Bus Structures - Software Performance - Memory Locations and Addresses - Memory Operations - Instruction and Instruction Sequencing - Addressing Modes - Assembly Language - Basic I/O Operations - Stacks and Queues.

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ARITHMETIC UNIT **11 Hours**

Addition and Subtraction of Signed Numbers - Design of Fast Adders - Multiplication of Positive Numbers - Signed Operand Multiplication and Fast Multiplication - Integer Division - Floating Point Numbers and Operations.

BASIC PROCESSING UNIT **9 Hours**

Fundamental Concepts - Execution of a Complete Instruction - Multiple Bus Organization - Hardwired Control – Microprogrammed Control – Microinstructions- Microprogram Sequencing-Wide Branch Addressing

MEMORY SYSTEM **8 Hours**

Basic Concepts - Semiconductor RAM- Internal Organization of Memory Chips- Static Memories- ROM- Speed, Size and Cost - Cache Memories - Performance Considerations - Virtual Memory

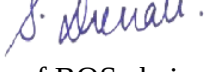
PIPELINING AND I/O ORGANIZATION **10 Hours**

Pipelining - Basic Concepts - Data Hazards - Instruction Hazards -Superscalar operation- Out –of-Order Execution- Interrupts - Direct Memory Access.

Theory: 45	**Tutorial: 0**	**Practical: 0**	**Project: 0**	**Total: 45 Hours**

REFERENCES

1. Carl Hamacher, ZvonkoVranesic and SafwatZaky, “Computer Organization”, 5th Edition McGraw-Hill, 2014.
2. William Stallings, “Computer Organization and Architecture - Designing for Performance”, 9th Edition, Prentice Hall, 2012.
3. David A.Patterson and John L.Hennessy, “Computer Organization and Design: The hardware / software interface”, 4th Edition, Morgan Kaufmann, 2011.
4. John P.Hayes, “Computer Architecture and Organization”, 3rd Edition, McGraw Hill, 2002.



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U17CSI3204 **DATABASE MANAGEMENT SYSTEMS**

L	T	P	J	C
3	0	2	0	4

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

- **CO1** Understand the functional components of DBMS and Relational Model.
- **CO2** Devise queries using SQL to develop database application
- **CO3** Describe the database design approaches.
- **CO4** Understand data storage and retrieval techniques.
- **CO5** Explore concepts for transaction processing, concurrency control and NOSQL.

Pre-requisite :NIL

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M					S		M					M	
CO2				M	S			M		M	S	M		M	
CO3			M				M						M		
CO4			M				S								
CO5	S						S			M					

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II (Theory component)
2. Assignment; Group Presentation, Project Demonstration etc (as applicable) (Theory component)
3. Pre/Post - Experiment Test/Viva; Experimental Report for each Experiment (lab Component)
4. Model Examination (lab component)
5.End Semester Examination (Theory and lab components)
INDIRECT
1. Course-end survey

THEORY COMPONENT CONTENTS

INTRODUCTION TO DATABASE AND RELATIONAL MODEL **9 Hours**

Introduction: Database applications, Purpose, Accessing and modifying databases, Architecture of DBMS.
Relational Databases: Relational model, Database schema, Keys, Formal Relational Query Languages

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DATABASE APPLICATION DEVELOPMENT **9 Hours**

Guidelines for Database Design. SQL: Data definition, Basic SQL query structure, Specifying integrity constraints in SQL, Set operations, Nested subqueries, Aggregation, Join expressions, Views. Functions, Procedures and Triggers.
Accessing Databases from Programs using JDBC, Building Web Applications using PHP &MySQL.
Case Study: Open Source Relational DBMS

DATABASE DESIGN **9 Hours**

Database Design: E-R model, E-R diagram, Reduction to relational schema, E-R design issues, Relational Database Design: features of good design, Functional Dependency theory, decomposition using functional dependency, Normal forms. (optional: multi-valued dependency and 4th normal form).

STORAGE AND INDEXING **7 Hours**

Storage and File structure: File Organization, RAID. Indexing: Concepts, Clustered and Non-clustered Indices, B-tree and B+-tree. Basics of Hashing (Static, Dynamic).Overview of Query processing.

TRANSACTION MANAGEMENT **11 Hours**

Transactions: Concept and purpose, ACID properties and their necessity, transactions in SQL .Transaction Schedules: Conflicts and Aborts, Serializability, Recoverability. Concurrency Control: lock-based protocols, 2-phase locking, Timestamp based protocols. Deadlock handling

Case Study: NoSQL: CAP Theorem and BASE Properties, Types of NoSQL Systems.

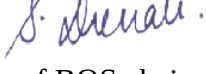
Theory: 45	**Tutorial : 0**	**Practical: 0**	**Project: 0**	**Total: 45 Hours**

REFERENCES

1. Abraham Silberschatz, Henry Korth, and S. Sudarshan, “Database System Concepts”, Sixth Edition, McGraw-Hill.2016.
2. R. Elmasri and S. Navathe, “Fundamentals of Database Systems”, Sixth Edition, Pearson Education, 2011.
3. Raghu Ramakrishnan, Johannes Gehrke, Database Management Systems, 3nd Edition, McGraw Hill, 2003.
4. Thomas M. Connolly and Carolyn E. Begg, “Database Systems - A Practical Approach to Design, Implementation and Management”, Fifth edition, Pearson Education, 2010.
5. C.J.Date, A.Kannan and S.Swamynathan, “An Introduction to Database Systems”, Eighth Edition, Pearson Education, 2006.

OTHER REFERENCES

1. https://onlinecourses.nptel.ac.in/noc17_cs33/course
2. http://www.db-book.com
3. http://nptel.ac.in/courses/IIT-MADRAS/Intro_to_Database_Systems_Design
4. http://www.iitg.ernet.in/awekar/teaching/cs344fall11/
5. www.w3schools.com/sql/



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LAB COMPONENT CONTENTS

LIST OF EXPERIMENTS: (Open Source RDBMS-MYSQL/POSTGRES)

1. Creation of a database and writing SQL queries to retrieve information from the database.
2. Performing Insertion, Deletion, Modifying, Altering, Updating and Viewing records based on conditions.
3. Creation of Views, Synonyms, Sequence, Indexes.
4. Creating an Employee database to set various constraints.
5. Working on TCL,DCL commands
6. Creating relationship between the databases.
7. Accessing Databases from Programs using JDBC
8. Building Web Applications using PHP & MySQL
9. Mini Project

Theory: 0	**Tutorial : 0**	**Practical: 30**	**Project: 0**	**Total: 30 Hours**

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U17INI3600 **ENGINEERING CLINIC - I**

L	T	P	J	C
0	0	4	2	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO:

CO1: Identify a practical problems and find a solution
CO2: Understand the project management techniques
CO3: Demonstrate their technical report writing and presentation skills

Pre-requisite: NIL

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S	S	S	S	M	W		S			S	S		
CO2											S		S		
CO3										S					

COURSE ASSESSMENT METHODS

DIRECT
1. Project reviews 50% 2. Workbook report10% 3. Demonstration & Viva – voce 40%
INDIRECT
1. Course-end survey

CONTENT

The course will offer the students with an opportunity to gain a basic understanding of computer controlled electronic devices and apply the concepts to design and build simple to complex devices. As a practical project based embedded course, the students will be taught the concepts using a variety of reference material available in the public domain. While the course will start with formal instruction on hardware, programming and applications, the major portion of the course will provide the students with ample opportunity to be innovative in designing and building a range of products from toys to robots and flying machines.
In the third semester, students will focus primarily on IOT with C programming using Arduino.

GUIDELINES

1. Practical based learning carrying credits.
2. Multi-disciplinary/ Multi-focus group of 5-6 students.
3. Groups can select to work on a specific tasks, or projects related to real world problems.
4. Each group has a faculty coordinator/Instructor who will guide/evaluate the overall group as well as individual students.
5. The students have to display their model in the ‘Engineering Clinics Expo’ at the end of semester.
6. The progress of the course is evaluated based on reviews and final demonstration of prototype.

Total Hours: 90

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U17VEP3503 **FAMILY VALUES**
(Mandatory course)

L	T	P	J	C
0	0	2	0	0

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO 1: Develop skills in maintaining the harmony in the family.
CO 2: Create impulsive activities for healthy family
CO 3: Be receptive to troubled Individuals
CO 4: Gain healthy life by practicing Kundalini Yoga &Kayakalpa
CO 5: Possess Empathy among family members.
CO 6: Reason the life and its significance

Pre-requisites :

1. U17VEP1501 / PERSONAL VALUES
2. U17VEP2502 / INTERPERSONAL VALUES

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1									S						
CO2							M								
CO3										M					
CO4												S			
CO5						S									
CO6								M							

COURSE ASSESSMENT METHODS

Direct
1.Group Activity / Individual performance and assignment 2.Assessment on Value work sheet / Test
Indirect
1. Mini project on values / Goodwill Recognition

VALUES THROUGH PRACTICAL ACTIVITIES

30 hours

FAMILY SYSTEM

Introduction to Family Values – elements of family values - Adjustment, Tolerance, Sacrifice - Family structure in different society – work life balance.

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PEACE IN FAMILY
Family members and their responsibility - Roles of parents, children, grant parents -. Respectable women hood

CORE VALUE: EMPATHY
Unconditional love - Respect - Compassion - sacrifice–Care &share - helping – emotional support- hospitality – cleanliness

BLESSING
Blessing - methods - Vibration effect - Benefits - Reason for misunderstanding in the Family and resolution through blessings.

HEALTHY FAMILY
Good relationship with neighbors - Counseling - Simplified Kundalini Yoga - Kaya Kalpa Yoga

Theory: 0	Tutorial: 0	Practical: 30	Project: 0	Total: 30 hours

REFERENCES

1. FAMILY - www.download.nos.org/331courseE/L-13%20FAMILY.pdf

2. FRAMEWORK FOR ACTION ON VALUES EDUCATION IN EARLY CHILDHOOD – UNESCO – PDF –www.unesdoc.unesco.org/images/0012/001287/128712e.pdf

3. TRUE FAMILY VALUES Third Edition - Tparents Home www.tparents.org/Library/Unification/Books/TFV3/_TFV3.pdf

4. FAMILY VALUES IN A HISTORICAL PERSPECTIVE - The Tanner Lectures on www.tannerlectures.utah.edu/_documents/a-to-z/s/Stone95.pdf

5. PROBLEMS OF INDIA'S CHANGING FAMILY AND STATE ... - the United Nations - www.un.org/esa/socdev/family/docs/egm09/Singh.pdf

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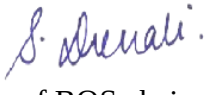
SEMESTER IV



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U17MAI4201 PROBABILITY AND STATISTICS
(Common to CSE and IT)

L	T	P	J	C
3	0	2	0	4

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Compute correlation between variables, and predict unknown values using regression.
CO2: Understand and apply the concept of probability and random variables and predict probabilities of events in models following normal distribution.
CO3 : Perform hypothesis testing and interpret the results.
CO4 : Understand the principles of design of experiments and perform analysis of variance.
CO5: Sketch control charts and comment on the process control.
CO6: Apply the above concepts to solve problems using R Studio.

Pre-requisites: NIL

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S							M	M		M		M	M
CO2	S	S							M	M		M		M	M
CO3	S	S							M	M		M		M	M
CO4	S	S							M	M		M		M	M
CO5	S	S							M	M		M		M	M
CO6	S	S							M	M		M		M	M

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II (Theory component) 2. Open Book Test; Cooperative Learning Report, Assignment; Journal Paper Review, Group Presentation, Project Report, Poster Preparation, Prototype or Product Demonstration etc (as applicable) (Theory component) 3. Pre/Post - Experiment Test/Viva; Experimental Report for each Experiment (lab Component) 4. Model Examination (lab component) **5.** End Semester Examination (Theory and lab components)
INDIRECT
1. Course-end survey

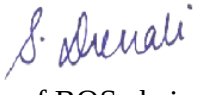
THEORY COMPONENT CONTENTS

CORRELATION AND REGRESSION **6 Hours**

Correlation – Karl Pearson's Correlation coefficient – Spearman's Rank Correlation – Regression lines.

PROBABILITY AND RANDOM VARIABLES **12 Hours**

Axioms of probability - Conditional probability – Total probability – Bayes' theorem - Random variable – Distribution function – properties – Probability mass function – Probability density function – moments-moment generating functions.



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NORMAL DISTRIBUTION **5 Hours**

Normal distribution – Moments, Moment Generating functions and properties.

TESTING OF HYPOTHESIS **9 Hours**

Small samples tests based on t and F distributions (single mean, difference of means, paired *t*- test and variance ratio test) – Chi-square test for independence of attributes and goodness of fit

DESIGN OF EXPERIMENTS **8 Hours**

Analysis of Variance (ANOVA) – Completely Randomized Design (CRD) – Randomized Block Design (RBD) – Latin Square Design (LSD).

STATISTICAL QUALITY CONTROL **5 Hours**

Concept of process control - Control charts for variables: Mean and Range charts – Control charts for attributes: p, np, c – charts.

REFERENCES

1. Veerarajan T., Probability, Statistics and Random Processes, Tata McGraw Hill,3rd edition, 2008.
2. Gupta S. P, "Statistical Methods", Sultan Chand & Sons Publishers, 2014.
3. Johnson R. A., Miller & Freund's "Probability and Statistics for Engineers", Sixth Edition, Pearson Education, Delhi, 2000.
4. Gupta.S.C and Kapoor.V.K, Fundamentals of Mathematical Statistics, 11th extensively revised edition, Sultan Chand & Sons, 2007.
5. Walpole R. E., Myers S.L. & Keying Ye, "Probability and Statistics for Engineers and Scientists", Pearson Education Inc, 9th edition, 2012.
6. Gupta S.C, and KapurV.K "Fundamentals of Applied Statistics", Sultan Chand, New Delhi, 4th Edition, 2014.
7. Charles Henry Brase and CorrinnePellilloBrase "Understandable Statistics", D.C. Heath and Company, Toronto, 9th edition, 2007.

Theory: 45	Tutorial: 0	Practical: 0	Project: 0	Total: 45 Hours

LAB COMPONENT CONTENTS

LIST OF EXPERIMENTS : Using R Studio **30 Hours**

1. Introduction to R programming
2. Application of descriptive statistics – Mean, Median, Mode and standard deviation
3. Applications of Correlation and Regression
4. Application of Normal distribution
5. Application of Student – t test
6. Application of F test
7. Application of Chi-square test
8. ANOVA – one way classification
9. ANOVA - two way classification
10. Control charts for variables (mean and range chart)

Theory: 0	Tutorial: 0	Practical: 30	Project: 0	Total: 30 Hours

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U17CST4001 DESIGN AND ANALYSIS OF ALGORITHMS

L	T	P	J	C
3	0	0	0	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Compare various graph traversal techniques(K4,S2)
CO2: Apply algorithm analysis techniques for a given algorithms(K3)
CO3: Examine algorithm design techniques for a given application(K4,S3)
CO4: Analyse different algorithms for solving a given problem (K4,S2)
CO5: Develop application using chosen algorithm technique (K5,S2)

Pre-requisites : U17CSI3201/Data Structures

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M													
CO2	S	w													
CO3	S	S	M	M						M		M			
CO4		S		M						M			M		
CO5	S	S	M							M		M	M		

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II (Theory component)
2. Assignment, Group Presentation (Theory component)
3. End Semester Examination
INDIRECT
1. Course-end survey

THEORY COMPONENT CONTENTS

GRAPH AND TREE ALGORITHMS **9 Hours**

Introduction to graph – types of graphs - Graph representations - Traversal algorithms- Depth First Search (DFS) and Breadth First Search (BFS) - Shortest path algorithms, Transitive closure, Minimum Spanning Tree, Topological sorting.

ALGORITHM ANALYSIS TECHNIQUES **8 Hours**

Fundamentals of algorithmic problem solving – Important problem types – Analysis framework - Analysis of recursive algorithms through recurrence relations: Substitution method, Recursion tree method and Masters' theorem – Algorithm visualization.

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BRUTE FORCE AND DIVIDE AND CONQUER TECHNIQUES **9 Hours**

Brute-Force: Sequential Search- Brute-Force string matching.

Divide and Conquer Method: Multiplication of large integers-Strassen's Matrix Multiplication.

GREEDY AND DYNAMIC PROGRAMMING TECHNIQUES **9 Hours**

Greedy Technique: Job sequencing with deadlines - Knapsack problem,

Dynamic Programming: Traveling Salesman Problem - Optimal Binary Search Tree

BACKTRACKING AND BRANCH AND BOUND TECHNIQUES **10 Hours**

Backtracking: N-Queen's Problem -Graph colouring.

Branch and Bound: Assignment Problem - Traveling Salesman Problem.

Computability classes – P, NP, NP-complete and NP-hard.

Theory: 45	Tutorial: 0	Practical: 0	Project: 0	Total: 45 Hours

REFERENCES

1. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Third Edition, Pearson Education Asia, 2012.
2. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Fundamentals of Computer Algorithms, Second Edition, Universities Press, Hyderabad, 2008.
3. Thomas H Cormen, Charles E Leiserson, Ronald L Rivest and Clifford Stein, Introduction to Algorithms, Second Edition, Prentice Hall of India,New Delhi, 2007
4. Sara Baase and Allen Van Gelder, "Computer Algorithms - Introduction to Design and Analysis", Pearson Education Asia, 2003.
5. A.V.Aho, J.E. Hopcroft and J.D.Ullman, "The Design and Analysis of Computer Algorithms",Pearson Education Asia, 2003.

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L	T	P	J	C
3	0	2	0	4

U17CSI4202 **OPERATING SYSTEMS**

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Apply the concepts of CPU scheduling and Process synchronization (K3,S2)
CO2: Experiment creation of different virtual machines in a hypervisor (K5, S3)
CO3: Simulate the principles of memory management (K3,S2)
CO4: Identify appropriate file system and disk organizations for a variety of computing scenario (K3)
CO5: Examine the features of various open source operating systems. (K4)

Pre-requisite:U17CST3003/Computer Architecture

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	M							M		M			M
CO2	S	S			S				M	M		M			M
CO3	S	M								M					
CO4	S	M								M					
CO5	S	S			M				M	M		M	M		

COURSE ASSESSMENT METHODS

DIRECT

1. Continuous Assessment Test I, II (Theory component)
2. Assignment (Theory component) Demonstration etc. (as applicable) (Theory component)
3. Pre/Post - Experiment Test/Viva; Experimental Report for each Experiment (lab Component)
4. Model Examination (lab component)
5. End Semester Examination (Theory and lab components)

INDIRECT

1. Course-end survey

THEORY COMPONENT CONTENTS

INTRODUCTION AND PROCESS CONCEPT **9 Hours**

Operating System Structure – Operating System Operations – Process Management – Memory Management – Storage Management – Protection and Security – System Structures: Operating System Services – User and Operating System Interface – System Calls – Types of System Calls – System Programs. Process Scheduling – Operations on Processes – Inter-process Communication.

Case Study: Kernel data structures for various open source operating systems.

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MULTITHREADED PROGRAMMING AND PROCESS SCHEDULING **9 Hours**

Overview of threads – Multicore programming-Multithreading Models – Threading Issues
Basic Concepts of process scheduling – Scheduling Criteria – Scheduling Algorithms – Multiple-Processor Scheduling – Synchronization – The Critical-Section Problem – Peterson's Solution Synchronization Hardware – Semaphores – Classic problems of Synchronization – Monitors.
Case Study: Linux Scheduling.

DEADLOCK AND MEMORY MANAGEMENT STRATEGIES **9 Hours**

System Model – Deadlock Characterization – Methods for Handling Deadlock – Deadlock Prevention – Deadlock Avoidance – Deadlock Detection – Recovery from Deadlock.
Swapping – Contiguous Memory Allocation – Paging – Structure of the Page Table- Segmentation.

VIRTUAL MEMORY MANAGEMENT AND FILE SYSTEM **9 Hours**

Demand Paging – Copy on Write – Page Replacement – Allocation of Frames – Thrashing
File Concept – Access Methods – Directory Structure – File Sharing – Protection.

IMPLEMENTING FILE SYSTEMS AND SECONDARY STORAGE STRUCTURE **9 Hours**

File System Structure – File System Implementation – Directory Implementation – Allocation Methods – Free-space Management.
Disk Structure – Disk Scheduling – Disk Management – Swap-Space Management.
Case Study: Linux File system

Theory: 45	**Tutorial: 0**	**Practical: 0**	**Project: 0**	**Total: 45 Hours**

REFERENCES

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", John Wiley & Sons (Asia) Pvt. Ltd, Ninth Edition, 2016.
2. Andrew S. Tanenbaum, "Modern Operating Systems", Third Edition Prentice Hall of India Pvt. Ltd, 2010.
3. Harvey M. Deitel, "Operating Systems", Pearson Education Pvt. Ltd, Second Edition, 2002.
4. William Stallings, "Operating System", Pearson Education, Sixth Edition, 2012.

ONLINE COURSES AND VIDEO LECTURES:

1. http://nptel.ac.in

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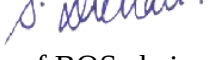
LAB COMPONENT CONTENTS **30 Hours**

LIST OF EXPERIMENTS

1. Develop programs for process creation and communication.
   To write simple shell programs.
   Creation of process and child process
   Demonstration of inter-process communication
   Creation of Zombie and Orphan process
   Creation of threads
2. Demonstration of shared memory concept
3. Simulation of the CPU scheduling algorithms
4. Demonstration of Semaphores
5. Implementation of Producer-Consumer problem
6. Simulation of Bankers algorithm for deadlock avoidance
7. Creation of virtual machine in a hypervisor

Theory: 0	Tutorial: 0	Practical: 30	Project: 0	Total: 30 Hours



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U17CST4003 **THEORY OF COMPUTATION**

L	T	P	J	C
3	0	0	0	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Design or convert an automaton for any given problem and experiment and document using JFLAP tool (K5).

CO2: List the various closure properties of languages in Chomsky hierarchy (K4).

CO3: Construct Context Free Grammars to generate strings from a context free language and convert them into normal forms (K3).

CO4: Identify the hierarchy of formal languages, grammars and machines.(K3)

CO5: Distinguish between computability and non-computability; decidability and undecidability (K4)

Pre-requisite :U17MAT3104/Discrete Mathematics

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S	S		S							M	M		
CO2	S				M							M	M		
CO3	S		M									M	M		
CO4	S	M										M	M		
CO5	S											M	M		

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II 2. Assignment; Simulation using tool 3. End Semester Examination
INDIRECT
1. Course-end survey

THEORY COMPONENT CONTENTS

AUTOMATA **9 Hours**

Introduction: Alphabets, languages, Chomsky hierarchy of languages.
Basic Machines Finite Automata(FA)-Deterministic Finite Automata(DFA)-Non-Deterministic Finite Automata (NFA) – Finite Automata with Epsilon transitions- Equivalence of DFA and NFA- NFA to DFA conversion-Applications of finite automata

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REGULAR EXPRESSIONS AND LANGUAGES **9 Hours**

Regular Expression (RE) - Converting Regular Expression to FA- Converting FA to Regular Expression - Closure and Decision properties of Regular Expression - Equivalence and minimization of Automata.

CONTEXT-FREE GRAMMAR AND LANGUAGES **11 Hours**

Context-Free Grammar (CFG) - Parse Trees - Ambiguity in grammars and languages - Definition of the Pushdown automata - Languages of a Pushdown Automata - Equivalence of Pushdown automata and CFG, Deterministic Pushdown Automata-Normal forms for CFG – Chomsky Normal Form (CNF) – Greibach Normal Form (GNF)- Closure Properties of CFL.

TURING MACHINES **9 Hours**

The basic model for Turing machines (TM), Techniques for Turing machine construction, Turing recognizable (recursively enumerable) and Turing-decidable (recursive) languages, variants of Turing machines, unrestricted grammars

UNDECIDABILITY **7 Hours**

Church-Turing thesis, universal Turing machine, the universal and diagonalization languages, reduction between languages and Rice's theorem, undecidable problems about languages-PCP.
Case Study: Realization of the automaton using JFLAP tool.

Theory: 45	**Tutorial: 0**	**Practical: 0**	**Project: 0**	**Total: 45 Hours**

REFERENCES

1. J.E.Hopcroft, R.Motwani and J.D Ullman, "Introduction to Automata Theory, Languages and Computations", Third Edition, Pearson Education, 2011
2. John C.Martin, "Introduction to Languages and the Theory of Computation", Fourth Edition, Tata McGraw Hill, 2010.
3. Kavi Mahesh, "Theory of Computation, A Problem-solving Approach" Wiley India Pvt, Ltd, 2012.
4. H.R.Lewis and C.H.Papadimitriou, "Elements of The theory of Computation", Second Edition, Pearson Education/PHI, 2003.
5. MichealSipser, "Introduction of the Theory and Computation", Thomson Brokecole,1997

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U17CSI4204 **SOFTWARE ENGINEERING**

L	T	P	J	C
3	0	2	0	4

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS WILL BE ABLE TO:

CO1	Design an application using UML modeling.	**[K4,S2]**
CO2	Test the given application with various test case using a testing tool	**[K4,S2]**
CO3	Create an application with all the stages of software engineering lifecycle	**[K5,S3]**
CO4	Apply project management and change management	**K3**

Pre-requisite: U17CSI3202 - Object Oriented Programming

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	S				M				M			M		
CO2	M	M	S						M	M		M	M		
CO3	M		M						M	M	M	M	M		
CO4	M										S	M			

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II 2. Assignment; Project Demo and Presentation 3. End Semester Examination
INDIRECT
1. Course-end survey

THEORY COMPONENT CONTENTS

INTRODUCTION TO SOFTWARE ENGINEERING AND UML **9 Hours**

The Nature of Software -Software Engineering Failures- Software Engineering - Software Process Structure - Software Lifecycle Models - Agile Development - Scrum - Prototyping- Modeling with UML -Modeling Concepts

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PROJECT MANAGEMENT AND REQUIREMENTS ANALYSIS **9 Hours**

Project Organization Concepts - Project Communication Concepts - UML Activity Diagram- Requirements Elicitation - Usability - Requirement Analysis - UML Use Case Diagram - UML Analysis Object Class Diagram

DESIGN **9 Hours**

System Design Concepts-System Design Activities: From Objects to Subsystems- Patterns - Architectural Patterns - UML Component and Deployment Diagram - Object Design - Design Patterns - UML Class and Communication Diagram

MAPPING MODELS TO CODE & TESTING **9 Hours**

Mapping Models to Code- Overview of Mapping - Mapping Concepts- Mapping Activities - Managing Implementation-Testing- Overview of Testing- Testing Concepts-Faults, Erroneous States, Failures-Test Cases-Test Stubs and Drivers- Corrections-Testing Activities- Component Inspection – Usability Testing-Unit Testing-Integration Testing-System Testing-Managing Testing-Planning Testing-Documenting Testing-Assigning Responsibilities-Regression Testing-Automating testing

MANAGING CHANGE **9 Hours**

Rationale Management- Overview of Rationale - Rationale Concepts- Rationale Activities: from Issues To Decisions-Managing Rationale- Configuration Management Concepts- Configuration Management Activities - Managing Configuration Management

Theory: 45	**Tutorial: 0**	**Practical: 0**	**Project: 0**	**Total: 45 Hours**

REFERENCES

1. Bernd Bruegge & Allen H. Dutoit, “Object-Oriented Software Engineering”, Third Edition, 2014.
2. R.S. Pressman, “Software Engineering – A Practitioner‟s Approach”, Eighth Edition, McGraw Hill International Edition, 2015
3. Ivar Jacobson, “Object-Oriented Software Engineering”, Pearson Education, Revised Edition 2009.
4. Stephen R.Schach, “Object-Oriented Classical Software Engineering”, Mcgraw Hill, Eighth Edition 2010.
5. S. Thangasamy, “Essentials of Software Engineering”, Wiley India, First Edition, 2012.
6. Yogesh Singh, “Object-Oriented Software Engineering”, 2012.
7. M. Blaha and J. Rumbaugh, “Object Oriented Modeling and Design with UML”, Second Edition, Prentice-Hall India, 2007.

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LAB COMPONENT CONTENTS

LIST OF EXPERIMENTS **30 Hours**

To choose a real use case-based software development project, design, develop and test the software system with following milestones.

Milestones

1 Identify a application and model it using UML Use-Case Diagrams.(Star UML/ArgoUML/..)
2 Software Requirement Specification & UML Analysis Object Design Diagram
3 Module Description, Design & UML Component Diagram
4 Detailed Design & UML Deployment Diagram
5 Implementation & UML Object Design Class Diagram
6 Testing (Selenium tool/SonarQube/…)

Theory: 0	Tutorial: 0	Practical: 30	Project: 0	Total: 30 Hours

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U17INI4600 **ENGINEERING CLINIC - II**

L	T	P	J	C
0	0	4	2	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO:

CO1: Identify a practical problems and find a solution
CO2: Understand the project management techniques
CO3: Demonstrate their technical report writing and presentation skills

Pre-requisite: U17INI3600/Engineering Clinic-I

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S	S	S	S	M	W		S			S	S		
CO2											S		S		
CO3										S					

COURSE ASSESSMENT METHODS

DIRECT
1. Project reviews 50% 2. Workbook report10% 3. Demonstration & Viva – voce 40%
INDIRECT
1. Course-end survey

CONTENT

The course will offer the students with an opportunity to gain a basic understanding of computer controlled electronic devices and apply the concepts to design and build simple to complex devices. As a practical project based embedded course, the students will be taught the concepts using a variety of reference material available in the public domain. While the course will start with formal instruction on hardware, programming and applications, the major portion of the course will provide the students with ample opportunity to be innovative in designing and building a range of products from toys to robots and flying machines.

In the fourth semester, students will focus primarily on Raspberry pi based controllers with Python programming Audino.

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GUIDELINES

1. Practical based learning carrying credits.
2. Multi-disciplinary/ Multi-focus group of 5-6 students.
3. Groups can select to work on a specific tasks, or projects related to real world problems.
4. Each group has a faculty coordinator/Instructor who will guide/evaluate the overall group as well as individual students.
5. The students have to display their model in the 'Engineering Clinics Expo' at the end of semester.
6. The progress of the course is evaluated based on reviews and final demonstration of prototype.

Total Hours: 90

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U17VEP4504 **PROFESSIONAL VALUES**
(Mandatory course)

L	T	P	J	C
0	0	2	0	0

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO 1: Develop the ethical values in both professional and personal life
CO 2: Develop ability to take decision to reinforce professional life
CO 3: Rational in professional skills required for diverse society
CO 4: Excel in ingenious attitude to congregate professional life
CO 5: Research into the professional stand
CO 6: Spruce an Individual with decorum to achieve professional life

Pre-requisites :

1. U17VEP1501 / PERSONAL VALUES
2. U17VEP2502 / INTERPERSONAL VALUES
3. U17VEP3503 / FAMILY VALUES

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1								S							
CO2				M											
CO3			S												
CO4												S			
CO5								M							
CO6										M					

COURSE ASSESSMENT METHODS

Direct
1.Group Activity / Individual performance and assignment 2.Assessment on Value work sheet / Test
Indirect
1. Mini project on values / Goodwill Recognition

30 hours

VALUES THROUGH PRACTICAL ACTIVITIES

PROFESSIONAL SKILLS WITH VALUES
Positive Attitude, Adaptability, Responsibility, Honesty and Integrity, Self Esteem, & Self Confidence

BUILDING INNOVATIVE WORK CULTURES
Creative thinking, Critical thinking, Conflict Resolution, Problem Solving, & Decision making

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PROFESSIONAL WORK ETHICS

Types of Ethics, Etiquette, personality Grooming, Emotional quotient, Human Dignity, Safety & Role of Professional in Social Responsibility

ENGINEERING ETHICS

Engineering Council of India - Objectives - Code of Ethics - Social responsibility -Professional Quality - Ethical issues - Effects - Strategy – Corruption, Consequences, Cures

CASE STUDIES IN ENGINEERING ETHICS

Discussion of case studies relating to Public safety, health, welfare, Quality of product, Improper conduct by management, Product responsibility, Intellectual property

Theory: 0	Tutorial: 0	Practical: 30	Project: 0	Total: 30 Hours

REFERENCES

1. LEARNING TO DO SOURCEBOOK 3 - UNESCO-UNEVOC -PDF
   www.unevoc.unesco.org/fileadmin/user_upload/pubs/LearningToDo.pdf

2. DECLARATION OF PROFESSIONAL VALUES AND ETHICAL STANDARDS
   www.garda.ie/Documents/User/declarationvalues.pdf

3. KARMA YOGA - SWAMI VIVEKANANDA
   www.vivekananda.net/PDFBooks/KarmaYoga.pdf

4. PROFESSIONAL ETHICS IN ENGINEERING - Sasurie College of Engineering
   www.sasurieengg.com/.../GE2025%20Professional%20Ethics%20in%20Engineering.

5. ENGINEERING ETHICS CASE STUDY; Challenger
   www.ucc.ie/en/processeng/staff/academic/ebyrne/.../PE1006PptNotesLect7.pdf

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SEMESTER - V

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L	T	P	J	C
3	0	2	0	4

U17CSI5201 COMPUTER NETWORKS

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

- **CO1:** Summarize the functionality and protocols operating in each layer of OSI reference model. [K3]
- **CO2:** Compare network topology, devices and transmission medium. [K4]
- **CO3:** Analyze error control, flow control and routing protocols. [K3][S2]
- **CO4:** Analyze IP, TCP and UDP header formats. [K4] [S2]
- **CO5:** Analyze Network traffic characteristics and congestion control mechanism. [K5][S3]

Pre-requisite :NIL

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S									M					
CO2	S	S	M	S						M		M			
CO3	S	M	M	M	M				M	M		M			M
CO4	S	S		S	M					M		M		M	
CO5	S	S		S	S			M	M	M		M			M

COURSE ASSESSMENT METHODS

DIRECT

1. Continuous Assessment Test I, II (Theory component)
2. Open Book Test; Cooperative Learning Report, Assignment; Journal Paper Review, Group Presentation, Project Report, Poster Preparation, Prototype or Product Demonstration etc (as applicable) (Theory component)
3. Pre/Post - Experiment Test/Viva; Experimental Report for each Experiment (lab Component)
4. Model Examination (lab component)
5. End Semester Examination (Theory and lab components)

INDIRECT

1. Course-end survey

THEORY COMPONENT CONTENTS

DATA COMMUNICATIONS **8 Hours**

Data Communication – The OSI Model – TCP/IP Protocol Suite – Addressing – Transmission Media – Networking devices – Network Topologies.

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DATA LINK LAYER **8 Hours**

Encoding - Error Detection – Reliable Transmission – MAC protocols – CSMA/CD – CSMA/CA.

NETWORK LAYER **11 Hours**

Circuit Switching – Packet Switching – Bridges and LAN Switches: Spanning Tree algorithm – Internetworking – IPv4 - Subnetting– IPv6 – Routing Techniques: Distance vector (RIP) – Link state (OSPF) — Interdomain Routing (BGP).

TRANSPORT LAYER **11 Hours**

UDP – TCP – Congestion Control and Resource Allocation: TCP Congestion Control – Congestion Avoidance Mechanisms – Quality of Service: Integrated Services – Differentiated Services – Network Traffic Analysis.

APPLICATION LAYER **7 Hours**

Domain Name System – Electronic Mail (SMTP, MIME, IMAP) – File Transfer (FTP) – WWW (HTTP).

Theory: 45	Tutorial: 0	Practical: 0	Project: 0	Total: 45 Hours

REFERENCES

1. Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", Fifth edition, Morgan Kaufmann Publishers Inc., 2011.
2. William Stallings, "Data and Computer Communications", Tenth edition, Pearson Education, 2013.
3. Behrouz A Forouzan, "Data Communications and Networking", Fifth edition, Tata McGraw–Hill, New Delhi, 2013.
4. James F. Kurose, Keith W. Ross, "Computer Networking, A Top–Down Approach Featuring the Internet", Sixth edition, Pearson Education, 2012.

ONLINE COURSES AND VIDEO LECTURES:

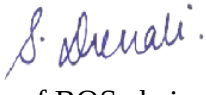
https://www.coursera.org/specializations/computer-communications#courses
https://nptel.ac.in/courses/106105080/
https://nptel.ac.in/courses/106105081/

LAB COMPONENT CONTENTS **30 Hours**

LIST OF EXPERIMENTS

1. Develop client server based TCP applications using UNIX socket programming functions.
2. Develop client server based UDP applications using UNIX socket programming functions.
3. Simulation of datalink and network layer protocols.
4. Performance analysis of TCP and UDP protocol using simulation tool.
5. Performance analysis of routing protocols using simulation tool.
6. Demonstrate the working of network tools such as Ping, TCPDump, Traceroute, Netstat, IPconfig.
7. Analyze the network traffic using Wireshark tool/Packet tracer tool.

Theory: 0	Tutorial: 0	Practical: 30	Project: 0	Total: 30 Hours



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U17CST5002 AGILE SOFTWARE DEVELOPMENT

L	T	P	J	C
3	0	0	0	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Apply design principles and refactoring to achieve Agility [K3]
CO2: Analyze automated build tools, version control and continuous integration [K4]
CO3: Perform testing activities within an Agile project [K4, S2]
CO4: Finding initial product backlog items as user stories, order your product backlog.[K4]
CO5: Choose the size of the backlog items and perform sprint planning [K5]

Pre-requisite :U17CSI4204/Software Engineering

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S											M			
CO2	M				M				M			M			
CO3					M							M	M		
CO4	S				M				S	M		M	S		M
CO5	S				S				S	M		M			

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II 2. Assignment; Group Presentation 3. End Semester Examination
INDIRECT
1. Course-end survey

THEORY COMPONENT CONTENTS

FUNDAMENTALS OF AGILE **9 Hours**

The Genesis of Agile, Introduction and background, Agile Manifesto and Principles, Overview of Scrum, Extreme Programming, Feature Driven development, Lean Software Development, Agile project management, Design and development practices in Agile projects, Test Driven Development, Continuous Integration, Refactoring, Pair Programming, Simple Design, User Stories, Agile Testing, Agile Tools

AGILE SCRUM FRAMEWORK **9 Hours**

Introduction to Scrum, Project phases, Agile Estimation, Planning game, Product backlog, Sprint backlog, Iteration planning, User story definition, Characteristics and content of user stories, Acceptance tests and Verifying stories, Project velocity, Burn down chart, Sprint planning and retrospective, Daily scrum, Scrum roles – Product Owner, Scrum Master, Scrum Team, Scrum case study, Tools for Agile project management.

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AGILE TESTING **9 Hours**

The Agile lifecycle and its impact on testing, Test-Driven Development (TDD), Unit framework and tools for TDD, Testing user stories - acceptance tests and scenarios, Planning and managing testing cycle, Exploratory testing, Risk based testing, Regression tests, Test Automation, Tools to support the Agile tester

AGILE SOFTWARE DESIGN AND DEVELOPMENT **9 Hours**

Agile design practices, Role of design Principles including Single Responsibility Principle, Open Closed Principle, Liskov Substitution Principle, Interface Segregation Principles, Dependency Inversion Principle in Agile Design, Need and significance of Refactoring, Refactoring Techniques, Continuous Integration, Automated build tools, Version control

AGILE INDUSTRY TRENDS **9 Hours**

Market scenario and adoption of Agile, Agile ALM, Roles in an Agile project, Agile applicability, Agile in Distributed teams, Business benefits, Challenges in Agile, Risks and Mitigation, Agile projects on Cloud, Balancing Agility with Discipline, Agile rapid development technologies

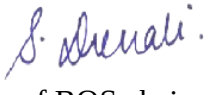
Theory: 45	Tutorial: 0	Practical: 0	Project: 0	Total: 45 Hours

REFERENCES

1. David J. Anderson and Eli Schragenheim, ―Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results, Prentice Hall, 2003.
2. Hazza and Dubinsky, ―Agile Software Engineering, Series: Undergraduate Topics in Computer Science, Springer, 2009.
3. Craig Larman, ―Agile and Iterative Development: A Managers Guide, Addison-Wesley, 2004.
4. Kevin C. Desouza, ―Agile Information Systems: Conceptualization, Construction, and Management, Butterworth-Heinemann, 2007.

OTHER REFERENCES

1. Agile Software Development with Scrum By Ken Schawber, Mike Beedle Publisher: Pearson
2. Agile Testing: A Practical Guide for Testers and Agile Teams By Lisa Crispin, Janet Gregory Publisher: Addison Wesley
3. Agile Software Development, Principles, Patterns and Practices By Robert C. Martin Publisher: Prentice Hall
4. Agile Software Development: The Cooperative Game By Alistair Cockburn Publisher: Addison Wesley
5. User Stories Applied: For Agile Software By Mike Cohn Publisher: Addison Wesley



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U17CSI5203 **NOSQL DATABASES**

L	T	P	J	C
3	0	2	0	4

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Outline fundamental concepts in the context of a number of different NOSQL products.[K3]
CO2: Construct refined logical database model with consideration of data semantics and dependency. [K4]
CO3: Build a database system and demonstrate competence with the fundamental tasks involved with its modeling, designing, and implementation.[K4, S2]
CO4: Examine MongoDB tools to develop and deploy various applications.[K5,S3]

Pre-requisite:U17CSI3204/Data Base Management Systems

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S									M		M		M	
CO2		M		M						M		M		M	
CO3		M		M	M					M				M	
CO4		S		S	M					M				M	

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II (Theory component)
2. Open Book Test; Cooperative Learning Report, Assignment; Journal Paper Review, Group Presentation, Project Report, Poster Preparation, Prototype or Product Demonstration etc (as applicable) (Theory component)
3. Pre/Post - Experiment Test/Viva; Experimental Report for each Experiment (lab Component)
4. Model Examination (lab component)
5. End Semester Examination (Theory and lab components)
INDIRECT
1. Course-end survey

THEORY COMPONENT CONTENTS

INTRODUCTION TO NOSQL **9 Hours**

Definition of NOSQL, History of NOSQL and Different NOSQL products, Exploring MondoDB Java/Ruby/Python, Interfacing and Interacting with NOSQL

NOSQL BASICS **9 Hours**

NOSQL Storage Architecture, CRUD operations with MongoDB, Querying

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NOSQL MANAGEMENT **9 Hours**

Modifying and Managing NOSQL Data stores, Indexing and ordering datasets(MongoDB/CouchDB/Cassandra)

WORKING WITH NOSQL **9 Hours**

Surveying Database Internals, migrating from RDBMS to NOSQL, Web Frameworks and NOSQL, using MySQL as a NOSQL

DEVELOPING WEB APPLICATION WITH NOSQL AND NOSQL ADMINISTRATION

9 Hours

Php and MongoDB, Python and MongoDB, Creating Blog Application with PHP, NOSQL Database Administration

Theory: 45 Hours	**Tutorial: 0**	**Practical: 0**	**Project: 0**	**Total: 45 Hours**

REFERENCES

1. "Professional NOSQL" by Shashank Tiwari, 2011, WROX Press (Chapter 1,2,3,4,5,6,7, 8, 9,10.11.12.13.15)
2. The Definitive guide to MongoDB, The NoSQL Database for Cloud and Desktop Computing, Apress 2010 (Chapter 6,7,8,9).
3. David Hows, "The definitive guide to MongoDB", 2nd edition,Apress Publication, 2009, 8132230485.
4. Shakuntala Gupta Edward, "Practical Mongo DB ", Second edition,Apress Publications, 2016, ISBN 1484206487
5. Daniel Perkins, "Mongo DB, Third Edition, CreateSpace Independent Publishing Platform, 2016, ISBN 152396300
6. Steve Hoberman, "Data Modelling for Mongo DB", First Edition, Technics Publication, 2014, ISBN 9781935504702

LAB COMPONENT CONTENTS **30 Hours**

LIST OF EXPERIMENTS

1. Implement database with suitable example using MongoDB and implement all basic operations and administration commands using two tier architecture.
2. Use MongoDB to process semi structured and unstructured data collections such as Rfid, images, blogs use python/Java MongoDB interface.
3. Implement python/Java application using MongoDB to maintain the blog for composing the blog consists of text columns, images and videos also calculate the hit or users visited by drawing 2D graphs.
4. Implement using MongoDB to compose a web news-letter consisting of videos, images, text use python MongoDB interface.
5. Aggregation with suitable example using MongoDB.
6. Indexing with suitable example using MongoDB.
7. Querying with MongoDB using suitable example.
8. Aggregation and indexing with suitable example using RdfID based employees' attendance system
9. Connectivity with MongoDB using any Java application.
10. Using MongoDB create a database of employee performance, employee attendance on the workstation.

Theory: 0	**Tutorial: 0**	**Practical: 30**	**Project: 0**	**Total: 30 Hours**

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U17CST5004 **SOCIAL MEDIA MARKETING**

L	T	P	J	C
3	0	0	0	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Identify and describe the different social media services, tools, and platforms.[K3]
CO2: Demonstrate understanding and evaluate new tools and social media platforms[K3]
CO3: Develop skills in using the predominant social media tools for business marketing.[K5]
CO4: Discover innovative uses for social media in a variety of business areas and processes [K4]
CO5: Develop a strategic plan for identifying opportunities for using social media.[K5]

Pre-requisite: NIL

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S									M		M			
CO2	S	S			S					M		M			
CO3	S		S							M		M			
CO4	S									M		M			
CO5	S	S	S		S	S			M	M	S	M	M		

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II 2. Assignment 3. Mini Project 4. End Semester Examination
INDIRECT
1. Course-end survey

THEORY COMPONENT CONTENTS

UNDERSTANDING FACEBOOK AND LEVERAGING FACEBOOK FOR MARKETING **8 Hours**

Introduction to basic FB terminologies-Creating a powerful personal profile for business-Marketing applications of Face book- Fundamentals of creating and maintaining fan pages- Creating groups for marketing-Face book marketing checklist-Basics of Sentimental analysis

INTRODUCTION TO TWITTER AS A MARKETING TOOL **10 Hours**

Setting up a Twitter profile- Fundamental of Twitter: Tweet, direct messages, replies and Trending topics-Managing your Twitter experience- Fundamentals of Tweet Deck-Managing multiple Twitter accounts- Tweet management-Twitter Grader- Twitter Counter-Tweet burner- Twitter marketing checklist- Tree induction techniques.

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FUNDAMENTALS OF YOUTUBE FOR CREATING COMPELLING ONLINE PRESENCE 10 Hours

Fundamentals of video marketing- Creating a YouTube channel- Creating your own Internet TV channel for marketing

USING LINKEDIN FOR MARKETING 8 Hours

LinkedIn for B2b marketing- creating a profile in LinkedIn Powerful corporate searches and connections - Recommendations and testimonials.

UNDERSTANDING CONTENT MARKETING AND USING BLOGS TO BUILD AND ENGAGE AUDIENCE 9 Hours

Basics of inbound marketing-Webinars and tele- seminars-Podcasting basics- creating blogs and building a following White papers and info graphics- Fundamentals of content curation

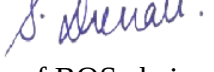
Theory: 45	Tutorial: 0	Practical: 0	Project: 0	Total: 45 Hours

REFERENCES

1. Liana Li Evans, "Social Media Marketing :Strategies for Engaging in Facebook, Twitter & Other Social Media", Que Press; Ed 2010
2. Andrew Macarthy," 500 Social Media Marketing Tips: Essential Advice, Hints and Strategy for Business: Facebook, Twitter, Pinterest, Google+, YouTube, Instagram, LinkedIn, and More!" ,Springer 2017
3. Ann Handley, "Content Rules: How to Create Killer Blogs, Podcasts, Videos, Ebooks, Webinars (and More) That Engage Customers and Ignite Your Business ",Johnwiley and sons,2012
4. Barker, "Social Media Marketing: A Strategic Approach" ,Cengage; 1 edition 2013

OTHER REFERENCES

https://learndigital.withgoogle.com/digitalunlocked
http://www.digitalvidya.com/blog/best-social-media-marketing-books-2016-top-10/



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U17INI5600 **ENGINEERING CLINIC - III**

L	T	P	J	C
0	0	4	2	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO:

CO1: Identify a practical problems and find a solution
CO2: Understand the project management techniques
CO3: Demonstrate their technical report writing and presentation skills

Pre-requisite: U17INI4600/Engineering Clinic-II

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S	S	S	S	M	W		S			S			
CO2											S				
CO3										S					

COURSE ASSESSMENT METHODS

DIRECT
1. Project reviews 50% 2. Workbook report10% 3. Demonstration & Viva – voce 40%
INDIRECT
1. Course-end survey

CONTENT

The course will offer the students with an opportunity to gain a basic understanding of computer controlled electronic devices and apply the concepts to design and build simple to complex devices. As a practical project based embedded course, the students will be taught the concepts using a variety of reference material available in the public domain. While the course will start with formal instruction on hardware, programming and applications, the major portion of the course will provide the students with ample opportunity to be innovative in designing and building a range of products from toys to robots and flying machines.

In the fifth semester, students will focus primarily on Design project combining concepts learnt in Engineering clinics I and II.

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GUIDELINES

1. Practical based learning carrying credits.
2. Multi-disciplinary/ Multi-focus group of 5-6 students.
3. Groups can select to work on a specific tasks, or projects related to real world problems.
4. Each group has a faculty coordinator/Instructor who will guide/evaluate the overall group as well as individual students.
5. The students have to display their model in the 'Engineering Clinics Expo' at the end of semester.
6. The progress of the course is evaluated based on reviews and final demonstration of prototype.

Total Hours: 90

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U17INT5000 **CONSTITUTION OF INDIA (Mandatory course)**

L	T	P	J	C
2	0	0	0	0

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO 1: Gain Knowledge about the Constitutional Law of India
CO 2: Understand the Fundamental Rights and Duties of a citizen
CO 3: Apply the concept of Federal structure of Indian Government
CO 4: Analyze the Amendments and Emergency provisions in the Constitution
CO 5: Develop a holistic approach in their life as a Citizen of India

Pre-requisites : NIL

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1						M			W			S			
CO2						S		S				M			
CO3									M	S		W			
CO4								W	M			M			
CO5						M		M				S			

COURSE ASSESSMENT METHODS

DIRECT
1. Group Activity / Quiz/ Debate / Case studies 2. Class test / Assignment
INDIRECT
1. Surveys

THEORY COMPONENT CONTENTS

MODULE.1: INTRODUCTION TO INDIAN CONSTITUTION **4 Hours**

Meaning of the constitution law and constitutionalism - Historical perspective of the Constitution - Salient featı characteristics of the Constitution of India

MODULE.2: FUNDAMENTAL RIGHTS **8 Hours**

Scheme of the fundamental rights - Right to Equality - Fundamental Right under Article 19 - Scope of the Right to Life and Liberty - Fundamental Duties and its legal status - Directive Principles of State Policy – Its importance and implementation

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MODULE.3: FEDERAL STRUCTURE **8 Hours**

Federal structure and distribution of legislative and financial powers between the Union and the States - Parliamentary Form of Government in India -

The constitutional powers and status of the President of India

MODULE.4: AMENDMENT TO CONSTITUTION **6 Hours**

Amendment of the Constitutional Powers and Procedure - The historical perspectives of the constitutional amendments in India

MODULE.5: EMERGENCY PROVISIONS **4 Hours**

National Emergency, President Rule, Financial Emergency Local Self Government – Constitutional Scheme in India

Theory: 30	Tutorial: 0	Practical: 0	Project: 0	Total: 30 Hours

REFERENCES

1.Constitution of India - Ministry of Law & Justice – PDF format
awmin.nic.in/coi/coiason29july08.pdf
2. Introduction to the Constitution of India by DurgadasBasu

3. The Constitution of India – Google free material - www.constitution.org/cons/india/const.html
4. Parliament of India – PDF format
download.nos.org/srsec317newE/317EL11.pdf
5. The Role of the President of India – By Prof.Balkrishna
6. Local Government in India – E Book - Pradeep Sachdeva
https://books.google.com/books/.../Local_Government_in_In...

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U17VEP5505 **SOCIAL VALUES**
(Mandatory course)

L	T	P	J	C
0	0	2	0	0

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO 1: Understand the transformation from self to society
CO 2: Acquire knowledge about disparity among Human Beings
CO 3: Realize the new ethics in creating a more sustainable Society
CO 4: Develop skills to manage challenges in social issues
CO 5: Acquire the skills for Management of Social work & Holistic Society
CO 6: Validate the social liabilities at dissimilar situations

Pre-requisites :

1. U17VEP1501 / PERSONAL VALUES
2. U17VEP2502 / INTERPERSONAL VALUES
3. U17VEP3503 / FAMILY VALUES
4. U17VEP4504 / PROFESSIONAL VALUES

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1						S									
CO2							S								
CO3								M							
CO4											S				
CO5												S			
CO6									M						

COURSE ASSESSMENT METHODS

DIRECT
1.Group Activity / Individual performance and assignment 2.Assessment on Value work sheet / Test
INDIRECT
1. Mini project on values / Goodwill Recognition

VALUES THROUGH PRACTICAL ACTIVITIES **30 hours**

SELF AND SOCIETY
Relation between self and society – Different forms of society - Elements of Social structures – Realization of Duties and Responsibilities of Individual in the Society

SOCIAL VALUES
Tolerance – Responsibility – Sacrifice – Sympathy - Service – peace- nonviolence - right conduct- Unity – forgive – dedication – Honest

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SOCIAL ISSUES

Disparity among Human beings- Poverty-Sanitation -corruption- un employment-superstition – religious intolerance & castes – terrorism.

EMERGING ETHICS FOR SUSTAINABLE SOCIETY

Unison of Men in Society - Positive Social Ethics - Cause and Effect - Ensuring an Equitable Society- Effect of Social Media in society - development of Education and Science in the Society

SOCIAL WELFARE

Social welfare Organization - Programme by Government and NGO's - Benefits of Social Service - Balancing the Family and Social Life – Development of Holistic Society

Theory: 0	Tutorial: 0	Practical: 30	Project: 0	Total: 30 hours

REFERENCES

1. SOCIAL PROBLEMS IN INDIA - ForumIAS.com – PDF discuss.forumias.com/uploads/File upload/.../711b18f321d406be9c79980b179932.pd...

2. INVESTING IN CULTURAL DIVERSITY AND INTERCULTURAL DIALOGUE: UNESCO ... www.un.org/en/events/culturaldiversityday/pdf/Investing_in_cultural_diversity.pdf

3. INDIAN SOCIETY AND SOCIAL CHANGE - University of Calicut www.universityofcalicut.info/SDE/BA_sociology_indian_society.pdf

4. CULTURE, SOCIETY AND THE MEDIA - E-class www.eclass.uoa.gr/.../MEDIA164/.../%5BTony_Bennett,_James_Curran,_Michael_G

5. SOCIAL WELFARE ADMINISTRATION - IGNOU www.ignou.ac.in/upload/Bswe-003%20Block-2-UNIT-6-small%20size.pdf

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SEMESTER -VI

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U17CSI6201 INTERNET AND WEB PROGRAMMING

L	T	P	J	C
3	0	2	0	4

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE THE STUDENTS SHOULD BE ABLE TO,

CO1: Design a Website using HTML (K5, S3)
CO2: Apply Cascading Style Sheet to design a HTML Webpage (K3, S2)
CO3: Develop a HTML form and validate it using Java Script (K5, S2)
CO4: Develop web application using JSP, Servlet (K5, S3)
CO5: Develop an XML document and validate it using SCHEMA (K5, S2)

Pre-requisite: NIL

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1					S				S	S		M	M		
CO2					M				S	S					
CO3			S						S	S					
CO4			S		S										
CO5			S											M	M

COURSE ASSESSMENT METHODS

DIRECT

1. Continuous Assessment Test I, II (Theory component)
2. Open Book Test, Assignment, Mini Project and Group Presentation, Demonstration etc (as applicable) (Theory component)
3. Pre/Post - Experiment Test/Viva; Experimental Report for each Experiment (lab Component)
4. Model Examination (lab component)
5. End Semester Examination (Theory and lab components)

INDIRECT

1. Course-end survey

THEORY COMPONENT CONTENTS

XHTML AND CSS **9 Hours**

HTML Introduction- Basic XHTML syntax and Semantics- HTML Elements & Attributes -Lists- Tables- Frames-Forms-Defining XHTML Abstract Syntax-Creating HTML Documents; CSS -Features- Syntax- Cascading and Inheritance- Text Properties-Box Model- Flow-Other style Properties.

JAVASCRIPT **9 Hours**

JavaScript introduction-Basic Elements-Variable-Data Types- Operators and Literals-Functions-Objects-Arrays- Built-in- Object. JavaScript Debuggers-Event Handling-Validation.

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SERVLETS **9 Hours**

Java Servlets: Architecture- Overview-Servlet Generating Dynamic Content-Life Cycle-Parameter Data-Sessions-Cookies.

JSP **9 Hours**

JSP Overview- Basic JSP: Architecture- Lifecycle- Directives-Actions-Implicit Objects- JavaBeans Classes and JSP- MVO Paradigm.

XML AND WEB SERVICES **9 Hours**

Xml: Namespaces- XML Processing- -XML Documents- XSL — XSLT, Web services: WSDL-XML Schema —Introduction to SOAP.

Theory: 45	Tutorial: 0	Practical: 0	Project: 0	Total: 45 Hours

REFERENCES

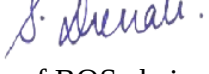
1. Jeffrey C.Jackson, "Web Technologies—A Computer Science Perspective", Person Education, 2013.
2. DeitalDeital Nieto, "Internet & World Wide Web How To Program", 5th ed., 2012.
3. Thomas A.Powell, "The Complete Reference HTML & CSS", 5th ed., 2010.
4. Steve Suehring, "JavaScript-Step by Step",PHI,2nd ed., 2010.
5. Frank. P. Coyle, "XML, Web Services and the Data Revolution", Pearson Education, 2013.
6. https://tutorialspoint.com/jsp

LAB COMPONENT CONTENTS **30 Hours**

LIST OF EXPERIMENTS

1. Develop a webpage using HTML.
2. Apply style specification in HTML page using CSS.
3. Develop a HTML form and validate it using Java script.
4. Demonstrate exception handling using Java Script.
5. Develop a JSP form to collect user registration details.
6. Develop a JSP login form with cookies.
7. Apply JavaBean class to print information about a student class.
8. Develop a servlet program to add two numbers.
9. Develop an XML document and validate it using SCHEMA.
10. Develop an XML document and transform it into HTML using XSLT.

Theory: 0	Tutorial: 0	Practical: 30	Project: 0	Total: 30 Hours



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U17CST6002 WIRELESS NETWORKS AND MOBILE SYSTEMS

L	T	P	J	C
3	0	0	0	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Compare various wireless transmission and media access techniques. K3

CO2: Identify and Interpret fields in GSM and GPRS frame structures. K3

CO3: Analyse physical, link and network layer characteristics of wireless networks K4

CO4: Compare Mechanisms for Improving TCP Performance over Wireless Links. K3

CO5: Understand 4G features and technologies K2

Pre-requisite: U17CSI5201 - Computer Networks

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M										M			
CO2	S	M													
CO3	S	S			M					M		M			
CO4	M	M								M		M	M		
CO5	M	M										M	M		

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II 2. Assignment, Journal paper review, Group Presentation 3. End Semester Examination
INDIRECT
1. Course-end survey

THEORY COMPONENT CONTENTS

MOBILE NETWORKS **9 Hours**

Telecommunication Systems -– modulation – multiple access techniques - Wireless LAN – IEEE 802.11 Standards – GSM – Architecture – Protocols – Localization and calling – Handover – security - GPRS - Broadcast Systems – DAB – DVB

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WIRELESS NETWORKS **8 Hours**

Wireless LANs and PANs– IEEE 802.11 Standard – Architecture – Physical and MAC layer- MAC management– HiperLAN – Bluetooth- Wi-Fi – WiMAX.

ROUTING **9 Hours**

Mobile IP – DHCP – MANET: Routing – Classification – Table driven routing- On-Demand routing- Hybrid routing- Hierarchical state routing- Power-aware routing- Operations of Multicast routing

TRANSPORT AND APPLICATION LAYERS **8 Hours**

Traditional TCP– WWW -WAP – Architecture – WDP – WTLS – WTP – WSP – WAE – WML– WML Scripts- WTA Architecture.

4G & INTERWORKING **7 Hours**

4G features and challenges, 4G Technologies, Overview of LTE, Advanced LTE, Interworking Objectives and requirements, Schemes to connect WLANs and 3G Networks, Session Mobility, Interworking Architectures for WLAN and GPRS.

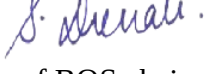
SIMULATION **4 Hours**

Simulation of MANET - media access protocols – routing protocols usingOMNeT++ or NS3

Theory: 45	Tutorial: 0	Practical: 0	Project: 0	Total: 45 Hours

REFERENCES

1. Jochen Schiller, “Mobile Communications”, PHI, Second Edition, 2011.
2. C.Siva Ram Murthy and B.S.Manoj, “Adhoc Wireless Networks: Architectures and Protocols”, Prentice Hall PTR, 2004
3. Vijay. K. Garg, ―Wireless Communication and Networking‖, Morgan Kaufmann Publishers, 2007.
4. JochenBurkhardt, “Pervasive Computing: Technology and Architecture of Mobile Internet Applications”, Addison-Wesley Professional; Third Edition, 2007
5. Frank Adelstein, Sandeep KS Gupta, Golden Richard, “Fundamentals of Mobile and Pervasive Computing”, McGraw-Hill, 2005.
6. William Stallings, ―Wireless Communications and Networks‖, Pearson Education, 2009.
7. Stefano Basagni , et al, “Mobile Ad hoc Networking”, Wiley –IEEE press,2004



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U17CSI6203 DATA WAREHOUSING AND DATA MINING

L	T	P	J	C
3	0	2	0	4

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Demonstrate data warehouse schema and process of data retrieval for real time applications. [K3]

CO2: Identify necessity of data pre-processing and apply the appropriate procedure. [K4, S2]

CO3: Design and deploy appropriate Classification/ Clustering techniques for various problems with high dimensional data using modern tools. [K5, S2]

CO4: Apply the association rules for real life mining applications. [K4, S2]

CO5: Synthesize various mining techniques and work in teams to develop project on complex data objects. [K5, S3]

Pre-requisite: U17CSI5203/No SQL Databases

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S		M		S		S		M	S	M		M	
CO2	S	M		S	M					M		M		M	
CO3	S	S	M	S	S		S		M	M	S	M		M	
CO4	S	M			M					M		M		M	
CO5		S		S	S			S	S	M	S	M	M	M	M

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II (Theory component)
2. Open Book Test, Assignment; Journal Paper Review, Group Presentation, Project Report, Poster Preparation, Case Study, Prototype or Product Demonstration etc (as applicable) (Theory component)
3. Pre/Post - Experiment Test/Viva; Experimental Report for each Experiment (lab Component)
4. Model Examination (lab component)
5. End Semester Examination (Theory and lab components)
INDIRECT
1. Course-end survey

THEORY COMPONENT CONTENTS

DATA MINING INTRODUCTION AND PREPROCESSING **9 Hours**

KDD Process – Kinds of data can be mined – Kind of data can be mined – Technologies used –Kinds of Applications targeted – Issues in data mining - Data Objects and Attribute Types - Data preprocessing overview – Data Cleaning – Data Integration – Data Reduction – Data Transformation and Discretization.

S. Dhenali.

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DATA WAREHOUSING AND ONLINE ANALYTICAL PROCESSING **9 Hours**

Data warehouse – Basic Concepts – Modeling - Data cube and OLAP – Data warehouse Design and Usage – Implementation - Data Generalization by Attribute Oriented Induction.

ASSOCIATION AND CLASSIFICATION **10 Hours**

Frequent Pattern Mining – Basic Concepts – Frequent Itemset Mining methods - Classification Basic Concepts – Decision Tree Induction – Bayesian Classification – Rule Based Classification – Model Evaluation and Selection - Support Vector Machine - Lazy Learners – Other classification methods.

CLUSTERING AND OUTLER ANALYSIS **8 Hours**

Cluster Analysis – Partitioning Methods - Hierarchical Methods – Density Based Methods – Grid Based Methods – Evaluation of Clustering - Outlier Analysis – Outlier detection Methods.

MINING COMPLEX DATA TYPES **9 Hours**

Business Intelligence in the Era of Big Data and Cognitive Business - Time Series and Sequence Mining – Mining graphs and networks – Web Mining – Spatial Mining – Text Mining – Multimedia Mining – Data Mining Applications.

Theory: 45	**Tutorial: 0**	**Practical: 0**	**Project: 0**	**Total: 45 Hours**

REFERENCES

1. Jiawei Han, Micheline Kamber, Jain Pei "Data Mining: Concepts and Techniques", Third edition, Elsevier, Morgan Kaufmann Publishers, 2012.
2. Alex Berson and Stephen J. Smith "Data Warehousing, Data Mining & OLAP", Tata McGraw– Hill Edition, Tenth Reprint 2007.
3. Steve Williams, "Business Intelligence Strategy and Big Data Analytics", First Edition, Elsevier, Morgan Kaufmann Publishers, 2016.
4. K.P. Soman, Shyam Diwakar and V. Ajay "Insight into Data mining Theory and Practice",Easter Economy Edition, Prentice Hall of India, 2006.
5. Hand.D, Mannila H, Smyth.P, "Principles of Data Mining", MIT press, USA,2001.
6. Dunham M, "Data Mining: Introductory and Advanced Topics", Prentice Hall, New Delhi, 2002.

E BOOKS AND ONLINE LEARNING MATERIALS

1. www.db.standford.edu/`ullman/mining/mining.html
2. ocw.mit.edu/ocwweb/slon-School-ofmanagement/15-062DataMiningSpring2003/course home/index.htm
3. https://cs.nyu.edu/courses/spring03/G22.3033-015/
4. https://www.cs.purdue.edu/homes/clifton/cs490d/
5. https://freevideolectures.com/course/3609/data-warehousing
6. https://www.elsevier.com/books/business-intelligence-strategy-and-big-data-analytics/williams/978-0-12-809198-2
7. https://www.sciencedirect.com/science/article/pii/B9780128091982000026

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LAB COMPONENT CONTENTS **30 Hours**

LIST OF EXPERIMENTS

1. Data Migration(Informatica)
2. Identification and Retrieval of dataset. (Kaggle/UCI Repository)
3. Statistical Descriptions of Data (R/Python)
4. Pre-processingof datasets using data mining tools. (Weka)
5. Implementation of Classification Algorithms (Python)
6. Implementation of Clustering Algorithms (Python)
7. Exercise on Discovering Association Rules (Python)
8. Comparison of classifiers model, evaluating and improving accuracy of models using data mining tool. (Weka/R)
9. Evaluation of various clustering methods using data mining tool. (Weka/R)
10. Build prediction/recommender data mining applications for real time problems.

Theory: 0	Tutorial: 0	Practical: 30	Project: 0	Total: 30 Hours

ONLINE COURSES AND VIDEO LECTURES:

1. https://www.edx.org/learn/data-mining
2. https://www.class-central.com/subject/data-mining\
3. https://www.edx.org/course/introduction-to-r-for-data-science
4. https://www.coursera.org/learn/data-mining-project
5. https://www.futurelearn.com/courses/data-mining-with-weka
6. https://www.datacamp.com/courses/intro-to-python-for-data-science

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U17INI6600 **ENGINEERING CLINIC - IV**

L	T	P	J	C
0	0	4	2	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO:

CO1: Identify a practical problems and find a solution
CO2: Understand the project management techniques
CO3: Demonstrate their technical report writing and presentation skills

Pre-requisite: U17INI4600/Engineering Clinic-III

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S	S	S	S	M	W		S			S	S		
CO2											S		S		
CO3										S					

COURSE ASSESSMENT METHODS

DIRECT
1. Project reviews 50% 2. Workbook report10% 3. Demonstration & Viva – voce 40%
INDIRECT
1. Course-end survey

CONTENT

The course will offer the students with an opportunity to gain a basic understanding of computer controlled electronic devices and apply the concepts to design and build simple to complex devices. As a practical project based embedded course, the students will be taught the concepts using a variety of reference material available in the public domain. While the course will start with formal instruction on hardware, programming and applications, the major portion of the course will provide the students with ample opportunity to be innovative in designing and building a range of products from toys to robots and flying machines.

In the sixth semester, students will focus primarily on Reverse engineering project to improve performance of a product.

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GUIDELINES

1. Practical based learning carrying credits.
2. Multi-disciplinary/ Multi-focus group of 5-6 students.
3. Groups can select to work on a specific tasks, or projects related to real world problems.
4. Each group has a faculty coordinator/Instructor who will guide/evaluate the overall group as well as individual students.
5. The students have to display their model in the 'Engineering Clinics Expo' at the end of semester.
6. The progress of the course is evaluated based on reviews and final demonstration of prototype.

Total Hours: 90

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U17VEP6506 **NATIONAL VALUES**
(Mandatory course)

L	T	P	J	C
0	0	2	0	0

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO 1: Acquire knowledge on the Cultural Heritage of India

CO 2: Know the great Indian personalities and follow their trail

CO 3: Understand the specialty of democracy

CO 4: Disseminate our Nation and its values to propagate peace

CO 5: Contribute with their energy and effort for a prosperous India

CO 6: Propagate the youth and the contribution for development of our Nation

Pre-requisites :

1. U17VEP1501 / PERSONAL VALUES
2. U17VEP2502 / INTERPERSONAL VALUES
3. U17VEP3503 / FAMILY VALUES
4. U17VEP4504 / PROFESSIONAL VALUES
5. U17VEP5505 / SOCIAL VALUES

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1						S									
CO2									M						
CO3							M								
CO4								S							
CO5											S				
CO6												M			

COURSE ASSESSMENT METHODS

DIRECT
1.Group Activity / Individual performance and assignment 2.Assessment on Value work sheet / Test
INDIRECT
1. Mini project on values / Goodwill Recognition

VALUES THROUGH PRACTICAL ACTIVITIES **30 hours**

CULTURAL HERITAGE OF INDIA

Indian Unity in Diversity – Universalism - Languages and Literatures - Religion and Philosophy - Art and Architectures.

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GREAT INDIAN LEADERS

Ancient rulers - Freedom fighters - Social reformers -Religious and Spiritual leaders - Noble laureates -Scientists – Statesman.

LARGEST DEMOCRACY

Socialist -Secular - Democratic and Republic – special features of Indian constitution – Three pillar of Indian democracy - Fundamental rights – Duties of a citizen – centre state relationship.

INDIA'S CONTRIBUTION TO WORLD PEACE

Nonaligned Nation – Principle of PanchaSheela – Mutual respect, non-aggression, non-interference, Equality and cooperation – Role of India in UNO -Yoga India's gift to the world.

EMERGING INDIA

World's largest young work force - Stable Economic development - Labor market & Achievement in space technology – Value based Social structure. Emerging economic superpower.

Theory: 0	**Tutorial: 0**	**Practical: 30**	**Project: 0**	**Total: 30 hours**

REFERENCES

1. CULTURAL HERITAGE OF INDIA - SCERT Kerala
   www.scert.kerala.gov.in/images/2014/HSC.../35_Gandhian_Studies_unit-01.pdf

2. LEARNING TO DO: VALUES FOR LEARNING AND WORKING TOGETHER - UNESCO
   www.unesdoc.unesco.org/images/0014/001480/148021e.pdf

3. INDIA AFTER GANDHI.pdf - RamachandraGuha - University of Warwick
   www2.warwick.ac.uk/fac/arts/history/students/modules/hi297/.../week1.pdf

4. INDIA'S CONTRIBUTION TO THE REST OF THE WORLD - YouSigma
   www.yousigma.com/interesting facts/indiasgifttotheworld.pdf

5. INDIA AS AN EMERGING POWER - International Studies Association
   web.isanet.org/Web/Conferences/.../11353cac-9e9b-434f-a25b-a2b51dc4af78.pdf

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SEMESTER - VII

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U17CSI7201 **CLOUD COMPUTING**

L	T	P	J	C
3	0	2	0	4

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, STUDENTS SHOULD BE ABLE TO

CO1: Demonstrate server virtualization concept and create virtual servers [K3,CO2]
CO2: Apply network virtualization and create virtual private cloud [K3,S2]
CO3: Design Web Application in public cloud environment. [K5,S3]
CO4: Build databases in public cloud [K5,S3]

Pre-requisite: U17CSI5201/Computer Networks

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S	S		S				M			M			S
CO2		M	M		M				M			M			S
CO3		M	M		M				M		M	M		M	S
CO4		M	M		M				M		M	M	M		S

COURSE ASSESSMENT METHODS

DIRECT

1. Continuous Assessment Test I, II (Theory component)
2. Open Book Test, Assignment; Journal Paper Review, Group Presentation, Project Report, Poster Preparation, Case Study, Prototype or Product Demonstration etc (as applicable) (Theory component)
3. Pre/Post - Experiment Test/Viva; Experimental Report for each Experiment (lab Component)
4. Model Examination (lab component)
5. End Semester Examination (Theory and lab components)

INDIRECT

1. Course-end survey

THEORY COMPONENT CONTENTS

INTRODUCTION **7 Hours**

Brief history and evolution - History of Cloud Computing, Evolution of Cloud Computing, Traditional vs. Cloud Computing. Why Cloud Computing, Cloud service models (IaaS, PaaS & SaaS). Cloud deployment models (Public, Private, Hybrid and Community Cloud), Benefits and Challenges of Cloud Computing. Introduction to AWS Public Cloud Vendor.

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CLOUD VIRTUALIZATION **7 Hours**

Basics of virtualization, Server virtualization, VM migration techniques, Role of virtualization in Cloud Computing.

PRIVATE AND PUBLIC CLOUD **14 Hours**

Private Cloud Definition, Characteristics of Private Cloud, Private Cloud deployment models, Private Cloud Vendors - CloudStack, Eucalyptus and Microsoft, Private Cloud – Benefits and Challenges. Private Cloud implementation in Amazon EC2 service.

What is Public Cloud, Why Public Cloud, When to opt for Public Cloud, Public Cloud Service Models, and Public Cloud Vendors and offerings (IaaS, PaaS, SaaS). Demonstrating public cloud with AWS, Introduction to EC2 and Storage services of AWS. Private vs. Public Cloud – When to choose.

CLOUD SECURITY **10 Hours**

Explain the security concerns in Traditional IT, Introduce challenges in Cloud Computing in terms of Application Security, Server Security, and Network Security. Security reference model, Abuse and Nefarious Use of Cloud Computing, Insecure Interfaces and APIs, Malicious Insiders, Shared Technology Issues, Data Loss or Leakage, Account or Service Hijacking, Unknown Risk Profile, Shared security model between vendor and customer in IAAS/PAAS/SAAS, Implementing security in AWS.

FUTURE DIRECTIONS IN CLOUD COMPUTING **7 Hours**

When and not to migrate to Cloud, Migration paths for cloud, Selection criteria for cloud deployment,

Issues/risks in cloud computing, Future technology trends in Cloud Computing.

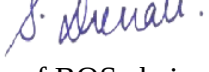
Theory: 45	**Tutorial: 0**	**Practical:0**	**Project:0**	**Total Hours: 45 Hours**

REFERENCES:

1. Raj Kumar Buyya, James Broberg, Andrezei M.Goscinski, Cloud Computing: Principles and paradigms, 2011
2. Judith Hurwitz, Robin Bllor, Marcia Kaufman, Fern Halper, Cloud Computing for dummies, 2009.
3. Michael Miller, Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online, Que Publishing, 2008.
4. Anthony T. Velte, Toby J. Velte, and Robert Elsen peter, Cloud Computing: A Practical Approach, McGraw Hill, 2010.
5. Borko Furht, Handbook of Cloud Computing, Armando Escalante (Editors), Springer, 2010.
6. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, Distributed and Cloud Computing, From Parallel Processing to the Internet of Things, Morgan Kaufmann Publishers, 2012.
7. Rittinghouse John W, Ransome James F, Cloud Computing-Implementation, Management and Security, CRC Press, Taylor and Francis Group, 2012.

OTHER REFERENCES

1. http://www.buyya.com/papers/CloudSim2010.pdf
2. http://thecloudtutorial.com/
3. http://www.top-windows-tutorials.com/cloud
4. https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/ebs-attaching-volume.html



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LAB COMPONENTS CONTENTS **30 Hours**

LIST OF EXPERIMENTS

1. Creating a virtual server in AWS public cloud**.**
2. Attaching AWS EBS volume to Amazon EC2.
3. Attaching additional virtual servers with existing application
4. Create and configure a Virtual Private cloud using Amazon VPC
5. Developing and hosting web applications in cloud (google App engine Heroku cloud application platform)
6. Hosting a static web page in Amazon S3
7. Creating MySQL instances in Amazon.
8. Create and carryout Read and Write operations on DynamoDB.

Theory: 0	Tutorial: 0	Practical: 30	Project: 0	Total: 30 Hours

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U17CST7002 MACHINE LEARNING TECHNIQUES

L	T	P	J	C
3	0	0	0	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Differentiate the implementation of mathematical model to various machine learning methods. (K4)

CO2: Illustrate graphical models and multiple learners. (K4)

CO3: Develop projects using appropriate machine learning approaches for real life problems. (K5, S3)

Pre-requisite:U17CSI6203/Data Warehousing and Data Mining

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S			S	S	S	S		M		M		M	
CO2	S	M	M	S		M	M			M		M		M	
CO3	S	S	S			S	S			M	S	M	M	M	M

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II 2. Open book test; Cooperative learning report, Assignment; Journal paper review, Group Presentation, Project report, Poster preparation, Prototype or Product Demonstration etc (as applicable) 3. End Semester Examination
INDIRECT
1. Course-end survey

THEORY COMPONENT CONTENTS

INTRODUCTION AND SUPERVISED LEARNING 9 Hours

Introduction to Machine Learning – basic concepts in machine learning - Examples of machine learning applications -Supervised Learning: Learning a Class from Examples–Noise–Learning Multiple Classes–Regression–Model Selection and Generalization. Bayesian Decision Theory: Classification–Losses and Risks– Discriminant Functions–Association rules.

PARAMETRIC METHODS 9 Hours

Parametric Classification–Regression–Tuning Model Complexity–Model Selection Procedures. Multivariate Methods: Data–Parameter Estimation–Estimation of Missing Values–Multivariate Normal Distribution–Multivariate Classification and Regression.

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SEMI PARAMETRIC METHODS AND LINEAR MODEL **9 Hours**

Semi parametric method: Clustering k–Means Clustering–Expectation–Maximization Algorithm–Latent Variable Models–Hierarchical Clustering. Linear Model: Generalizing linear model- Geometry of linear Discriminant-Pairwise Separations-Gradient Descent.

NON-PARAMETRIC METHODS **9 Hours**

Nonparametric Methods: Nonparametric Density Estimation and Classification-Generalization to Multivariate Data–Condensed Nearest Neighbor–Smoothing Models. Decision Trees: Univariate Trees–Pruning–Rule Extraction–Learning Rules–Multivariate Trees.

GRAPHICAL MODEL AND MULTIPLE LEARNERS **9 Hours**

Graphical Model- canonical cases for conditional Independence – example graphical models. Combining Multiple Learners: Voting–Error–Correcting Output Codes–Bagging–Boosting–Stacked Generalization–Cascading – Case Studies using machine learning tools.

Theory: 45	**Tutorial: 0**	**Practical: 0**	**Project: 0**	**Total: 45 Hours**

REFERENCES

1. EthemAlpaydin, “Introduction to Machine Learning”, Second Edition, MIT Press, 2013
2. Tom M. Mitchell, ―Machine Learning, McGraw-Hill Education (India) Private Limited, 2013
3. Stephen Marsland, ―Machine Learning: An Algorithmic Perspective, CRC Press, 2009.
4. Y. S. Abu-Mostafa, M. Magdon-Ismail, and H.-T. Lin, “Learning from Data”, AML Book Publishers, 2012
5. K. P. Murphy, “Machine Learning: A probabilistic perspective”, MIT Press, 2012.
6. M. Mohri, A. Rostamizadeh, and A. Talwalkar, “Foundations of Machine Learning”, MIT Press, 2012.

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U17CST7003 **SOFTWARE TESTING**

L	T	P	J	C
3	0	0	0	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1:	Apply software testing fundamentals and testing design strategies to enhance software quality.	K4
CO2:	Design test cases for unit test, integration test, system test, regression and acceptance test	K3
CO3:	Discover how work test plan components, test measurements and reviews	K3
CO4:	Perform Testing in software with various testing tools	K4
CO5:	Develop and validate a test plan.	K4

Pre-requisite: U17CST5002/Agile Software Development

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	**PROGRAMME OUTCOMES (POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	S	S	M	S					M	M			M	M	S
CO2	S	M													
CO3	M		M							M				S	
CO4	S		S						M						
CO5	S	M								M				S	S

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II 2. Assignments / Mini Projects / Group Presentations/ Case Studies, involving analysis of security of any information system / domain, and using security mechanisms to deliver security services 3. End Semester Examination
INDIRECT
1. Course-end survey

THEORY COMPONENT CONTENTS

INTRODUCTION **8 Hours**

Testing as an Engineering Activity - Role of Process in Software Quality - Testing as a Process- The six essentials of software testing - Basic Definitions: Software Testing Principles - The role of a software tester - Origins of defects- Defect classes the defect repository. Analysis of defect for a project

TEST CASE DESIGN STRATEGIES **9 Hours**

Introduction to Testing Design Strategies - Black Box testing - Random Testing - Equivalence Class Partitioning - Boundary Value Analysis - Cause and error graphing and state transition testing -White-Box testing - Test

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Adequacy Criteria - Coverage and Control Flow Graphs-Covering Code Logic Paths - White-box Based Test design. Case study: Additional White box testing approaches.

LEVELS OF TESTING **10 Hours**

The Need for Levels of Testing- Unit Test - Unit Test Planning- Designing the Unit Tests - Integration tests- Designing Integration Tests - system testing - Regression Testing. Alpha -Beta and Acceptance Test- Usability and Accessibility testing – Configuration testing –Compatibility testing – Testing the documentation – Website testing.

TEST MANAGEMENT **9 Hours**

People and organizational issues in testing – Organization structures for testing teams – testing services -Testing and Debugging Goals and Policies - Test Planning - Test Plan Components - Test Plan Attachments - Locating Test Items - Reporting Test Results - The role of three groups in Test Planning and Policy Development - Process and the Engineering Disciplines.

TEST AUTOMATION AND MEASUREMENTS REVIEW **9 Hours**

Software test automation – skills needed for automation – scope of automation – design and architecture for automation -- Measurements and Milestones for Controlling and Monitoring - Status Meetings -Reports and Control Issues - Criteria for Test Completion - SCM - Types of reviews - developing a review program - Components of Review Plans - Reporting review results.

Theory: 45	**Tutorial: 0**	**Practical: 0**	**Project: 0**	**Total: 45 Hours**

REFERENCES

1. S Limaye, Software Testing Principles, Techniques and Tools, McGraw Hill, 2009.
2. Boris Beiser, Software Testing Techniques, Dreamtech press, New Delhi, 2009.
3. Srinivasan Desikan and Gopalaswamy Ramesh, ―Software Testing – Principles and Practices, Pearson Education, 2006.
4. Ron Patton, ―Software Testing, Second Edition, Sams Publishing, Pearson Education, 2007. AU Library.com
5. Introduction to Software Testing, Paul Ammann and Jeff Offutt, Cambridge University Press, 2nd edition, 2016.

ONLINE COURSES

1. http://www.tcs.com/SiteCollectionDocuments/WhitePapers/AFrameworkforAutomatingTesti ngofNetworkingEquipment.pdf
2. https://onlinecourses.nptel.ac.in/noc17_cs32/preview
3. https://www.coursera.org/learn/ruanjian-ceshi
4. https://www.coursera.org/learn/software-processes

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U17CSP7704 **PROJECT PHASE-I**

L	T	P	J	C
0	0	0	6	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS WILL BE ABLE TO :

CO1	Describe the problem statement	**K 2**
CO2	Prepare the software requirement specification	**K3**
CO3	Identify the appropriate problem solving methodology	**K4**
CO4	Analyze and process the experimental information	**K5**
CO5	Evaluate the experimental results	**K5**
CO6	Develop a project report	**K3**

Pre-requisite: NIL

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													**CO/PSO Mapping**		
COs	**PROGRAMME OUTCOMES (POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	S	S	S	M	M	M	M	S	S	S	S	M	M	M	M
CO2	S	M	M	M					M	M			M	M	M
CO3		M			M			M	S		M		M	M	M
CO4	S	M		M				S					M	M	M
CO5			M	S				M					M	M	M
CO6								M	M	M	M		M	M	M

COURSE ASSESSMENT METHODS

DIRECT
1. Project reviews 2. End semester viva voce End Semester Examination
INDIRECT
1. Course-end survey

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U17VEP7507	GLOBAL VALUES (Mandatory course)	L	T	P	J	C
		0	0	2	0	0

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO 1: Aware of the concept of Universal Brotherhood and support the organizations which are working for it

CO 2: Follow the path of Ahimsa in every aspect of their life

CO 3: Uphold the Universal declaration of Human Rights

CO 4: Understand the unequal distribution of wealth in the World and bestow their Effort towards inclusive growth

CO 5: Sensitize the environmental degradation and work for the sustainable development

CO 6: Amalgamate harmony through Non-violence and edify the nation headed for Upholding development

Pre-requisites :

1. U17VEP1501 / PERSONAL VALUES
2. U17VEP2502 / INTERPERSONAL VALUES
3. U17VEP3503 / FAMILY VALUES
4. U17VEP4504 / PROFESSIONAL VALUES
5. U17VEP5505 / SOCIAL VALUES
6. U17VEP6506 / GLOBAL VALUES

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1							M								
CO2								S							
CO3									M						
CO4						S									
CO5											M				
CO6												S			

COURSE ASSESSMENT METHODS

DIRECT
1.Group Activity / Individual performance and assignment 2.Assessment on Value work sheet / Test
INDIRECT
1. Mini project on values / Goodwill Recognition

VALUES THROUGH PRACTICAL ACTIVITIES — 30 Hours

UNIVERSAL BROTHERHOOD

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Meaning of Universal Brotherhood- Functioning of Various organization for Universal human beings -Red Cross, UN Office for Humanitarian Affairs – Case study on humanitarian problems and intervention - Active role of Students/Individual on Universal Brotherhood.

GLOBAL PEACE, HARMONY AND UNITY

Functions of UNO - Principal Organizations - Special organization – Case study relating to disturbance of world peace and role of UNO – Participatory role of Students/Individual in attaining the Global peace and Unity.

NON-VIOLENCE

Philosophy of nonviolence- Nonviolence practiced by Mahatma Gandhi – Global recognition for nonviolence - Forms of nonviolence - Case study on the success story of nonviolence– Practicing nonviolence in everyday life.

HUMANITY AND JUSTICE

Universal declaration of Human Rights - Broad classification - Relevant Constitutional Provisions– Judicial activism on human rights violation - Case study on Human rights violation– Adherence to human rights by Students/Individuals.

INCLUSIVE GROWTH AND SUSTAINABLE DEVELOPMENT

Goals to transform our World: No Poverty - Good Health - Education – Equality - Economic Growth - Reduced Inequality –Protection of environment – Case study on inequality and environmental degradation and remedial measures.

Theory: 0	Tutorial: 0	Practical: 30	Project: 0	Total: 30 Hours

REFERENCES

1. TEACHING ASIA-PACIFIC CORE VALUES OF PEACE AND HARMONY – UNICEF
   www.unicef.org/.../pdf/Teaching%20Asia-Pacific%20core%20values.pdf

2. THREE-DIMENSIONAL ACTION FOR WORLD PROSPERITY AND PEACE- IIM Indore -
   www.iimidr.ac.in/.../Three-Dimensional-Action-for-World-Prosperity-and-Peace-Glo...

3. MY NON-VIOLENCE - MAHATMA GANDHI
   www.mkgandhi.org/ebks/my_nonviolence.pdf

4. HUMAN RIGHTS AND THE CONSTITUTION OF INDIA 8th ... - India Juris
   www.indiajuris.com/uploads/.../pdf/l1410776927qHuman%20Rights%20080914.pdf

5. THE ETHICS OF SUSTAINABILITY – Research Gate
   www.researchgate.net/file.PostFileLoader.html?id...assetKey..

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SEMESTER VIII

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U17CSP8701 **PROJECT PHASE-II**

L	T	P	J	C
0	0	0	24	12

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS WILL BE ABLE TO :

CO1	Plan an experimental design to solve Engineering problems	**K2**
CO2	Prepare the software requirement specification.	**K2**
CO3	Develop an attitude of team work and independent working on real time problems	**K3**
CO4	Analyze and process the experimental information	**K5**
CO5	Evaluate, interpret and justify the experimental results	**K4**
CO6	Develop a dissertation report	**K3**

Pre-requisite: NIL

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S	S	M	M	M	M	S	S	S	S	M	S	S	S
CO2	S	M	M	M					M	M			S	S	S
CO3		M			M			M	S		M		S	S	S
CO4	S	M		M				S				M	S	S	S
CO5	S		M	S				S	M				S	S	S
CO6								M	M	M	M		S	S	S

COURSE ASSESSMENT METHODS

DIRECT
3. Project reviews 4. End semester viva voce End Semester Examination
INDIRECT
2. Course-end survey

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PROGRAMME ELECTIVES

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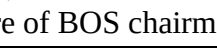
DATA ANALYTICS



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L	T	P	J	C
3	0	0	0	3

U17CSE0001 **BIG DATA TECHNOLOGIES**

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

- **CO1:** Identify the components of Hadoop Distributed File System for big data processing [K4,S3]
- **CO2:** Develop Big Data Solutions using Hadoop Eco System[K3,S3]
- **CO3:** Examine various framework in Big data Processing [K4,S2]
- **CO4:** Illustrate the big data security issues with Hadoop and the need of AWS for Hadoop environment.[K3]

Pre-requisite: NIL

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		S	M										M		
CO2					M				M	M				S	
CO3					M				M	M				S	
CO4		M			W				M	M					

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II (Theory component)
2. Open Book Test; Cooperative Learning Report, Assignment; Journal Paper Review, Group Presentation, Project Report, Poster Preparation, Prototype or Product Demonstration etc (as applicable) (Theory component)
3. Pre/Post - Experiment Test/Viva; Experimental Report for each Experiment (lab Component)
4. Model Examination (lab component)
5. End Semester Examination (Theory and lab components)
INDIRECT
1. Course-end survey

THEORY COMPONENT CONTENTS

INTRODUCTION TO BIG DATA **8 Hours**

Classification of digital data – Characteristics of data – Challenges – Five Vs- Typical Hadoop environment- Classification of analytics- Data science – Terminologies used in big data environments- Parallel Vs Distributed Environment-Big data applications

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INTRODUCTION TO HADOOP ECO SYSTEM **10 Hours**

Introduction to Hadoop Eco system- Hadoop core components- Hadoop distributions- HDFS- Common Hadoop Shell commands- Processing data with Hadoop- NameNode- Secondary NameNode, and DataNode - HadoopMapReduce paradigm- Map and Reduce tasks, Job, Task trackers - Cluster Setup – SSH &Hadoop Configuration – HDFS Administering –Monitoring & Maintenance.

HADOOP ECOSYSTEM COMPONENTS **12 Hours**

Pig: Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators, Hive : Hive Shell, Hive Services, Hive Metastore, HiveQL, Tables, Querying Data and User Defined Functions. Base: HBase Concepts, Clients, Example, Zookeeper - Building applications with Zookeeper, Oozie- Workflows of Oozie

RECOMMENDATION SYSTEM **6 Hours**

Collaborative Recommendation- Content Based Recommendation – Knowledge Based Recommendation- Hybrid Recommendation Approaches.

HADOOP SECURITY AND AWS **9 Hours**

Security challenges – Authentication – Authorization – Network encryption – Security enhancement – Introduction to AWS- Running Hadoop on AWS – EMR Hadoop relationship – AWS S3

Theory: 45	**Tutorial: 0**	**Practical: 0**	**Project: 0**	**Total: 45 Hours**

REFERENCES

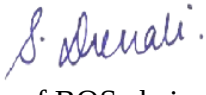
1. Seema Acharya, SubhashiniChellappan, " Big Data and Analytics" Wiley, First Edition, 2015.\
2. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, "Professional Hadoop Solutions", Wiley, ISBN: 9788126551071, 2015.
3. Chris Eaton, Dirk deroos et al. , "Understanding Big data ", McGraw Hill, 2012.
4. Tom White, "HADOOP: The definitive Guide" , O Reilly 2012.
5. VigneshPrajapati, "Big Data Analytics with R and Haoop", Packet Publishing 2013.
6. Tom Plunkett, Brian Macdonald et al, "Oracle Big Data Handbook", Oracle Press, 2014.
7. JyLiebowitz, "Big Data and Business analytics",CRC press, 2013.

E BOOKS AND ONLINE LEARNING MATERIALS

1. https://intellipaat.com/tutorial/hadoop-tutorial/big-data-overview/
2. https://www.guru99.com/learn-oozie-in-5-minutes.html
3. https://www.youtube.com/watch?v=R26Gvoa-Hbc
4. https://www.youtube.com/watch?v=DpgGXN5ubk0
5. https://opensource.com/life/14/8/intro-apache-hadoop-big-data
6. https://www.guru99.com/hive-tutorials.html
7. http://www.bigdatauniversity.com/

ONLINE COURSES AND VIDEO LECTURES:

1. http://www.coreservlets.com/hadoop-tutorial/
2. https://oozie.apache.org/docs/3.1.3-incubating/DG_Examples.html
3. https://oozie.apache.org/docs/4.2.0/AG_Install.html
4. https://www.ukdataservice.ac.uk/media/604456/hiveworkshoppractical.pdf
5. https://aws.amazon.com/blogs/big-data/submitting-user-applications-with-spark-submit/



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U17CSE0002 **DATA VISUALIZATION**

L	T	P	J	C
3	0	0	0	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1 Outline the theoretical foundations of information visualization and use it for better understanding of data [K3]

CO2 Interpret the information available with network visualization, web based visual displays and maps using appropriate tools [K4, S2]

CO3 Examine methods to acquire knowledge to visualize Big data content[K5, S3]

Pre-requisite: NIL

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S				M				M	M		M		M	
CO2		M		S	M				M	M				M	
CO3		M		S	M				M	M				M	

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II 2. Assignment; Group Presentation 3. End Semester Examination
INDIRECT
1. Course-end survey

THEORY COMPONENT CONTENTS

INTRODUCTION TO INFORMATION VISUALIZATION **9 Hours**

Information visualization – Theoretical foundations – Information visualization types – Design principles - A framework for producing data visualization

STATIC DATA VISUALIZATION – tools – working with various data formats

DYNAMIC DATA DISPLAYS **9 Hours**

Introduction to web based visual displays – deep visualization – collecting sensor data – visualization – D3 framework - Introduction to Many eyes and bubble charts

MAPS **9 Hours**

Introduction to building choropleth maps – Normalization – Classification

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TREES **9 Hours**

Network visualizations – Displaying behaviour through network graphs

BIG DATA VISUALIZATION

9 Hours

Visualizations to present and explore big data – visualization of text data and Protein sequences

Theory: 45	**Tutorial: 0**	**Practical: 0**	**Project: 0**	**Total: 45 Hours**

REFERENCES

1. Colin Ware and Kaufman M,, Visual thinking for design‖, Morgan Kaufmann Publishers, 2008.
2. Chakrabarti, S, ―Mining the web: Discovering knowledge from hypertext data ―,Morgan Kaufman Publishers, 2003.
3. Fry, Visualizing data, Sebastopo‖,O'Reily, 2007.

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U17CSE0003 **ARTIFICIAL INTELLIGENCE**

L	T	P	J	C
3	0	0	0	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS WILL BE ABLE TO :

CO1	Develop solutions for problems using various Artificial Intelligence concepts.	**K5,S3**
CO2	Design applications using PROLOG for making inferences	**K4,S2**
CO3	Demonstrate usage of planning and decision making	**K3**
CO4	Apply the concepts of learning using Tensor Flow and any other programming language.	**K4,S2**

Pre-requisite: NIL

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													**CO/PSO Mapping**		
COs	**PROGRAMME OUTCOMES (POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	S	S	M		S	S			S	M		M	M	M	M
CO2	S	S	S		M				M	M		M		M	
CO3	S	M								M		M		M	
CO4	S	S	S		M				M	M		M	M	M	

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II (Theory component)
2. Open Book Test, Assignment, Mini Project and Group Presentation, Demonstration etc (as applicable) (Theory component)
3. Pre/Post - Experiment Test/Viva; Experimental Report for each Experiment (lab Component)
4. Model Examination (lab component)
5. End Semester Examination (Theory and lab components)
INDIRECT
1. Course-end survey

THEORY COMPONENT CONTENTS

INTRODUCTION AND PROBLEM SOLVING **9 Hours**

Definitions of AI - Intelligent Agents.

Problem solving by searching: Problem-solving agents- Example problems – Search for solutions Uninformed search strategies – Informed search strategies – Heuristic functions.

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LOGIC **9 Hours**

Logical agents: Knowledge-based agents – The Wumpus world. Logic – Propositional logic: A very simple logic-Propositional theorem proving.

First order logic: Representation – Syntax and semantics of first order logic – Using first order logic-PROLOG basics

Inference in first order logic: Propositional versus first order inference– Unification and lifting – Forward chaining – Backward chaining – Resolution.

PLANNING AND DECISION MAKING **8 Hours**

Classical Planning: Definition – Algorithms for planning as state-space search-Planning graphs – Other classical planning approaches.

Making simple Decisions-Combining beliefs and desires under Uncertainty-Utility theory-Utility functions-Multiattribute utility functions-Decision networks- The value of information-Decision theoretic expert systems.

LEARNING **10 Hours**

Quantifying uncertainty: Acting under uncertainty - Probability basics – Bayes' Rule and its use. Probabilistic reasoning: Representing knowledge in uncertain domain- The semantics of Bayesian networks. Forms of learning - Supervised learning - Learning decision trees. Reinforcement Learning: Passive Learning – Active Learning – Learning an Action-Value function using Q Learning.

ANN AND DEEP LEARNING **9 Hours**

Introduction to artificial neural networks, Perceptrons, Multi-layer feed forward network, Application of ANN - Deep feed forward networks – Convolution Neural networks – Applications-Use of Tensorflow.

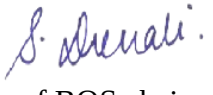
Theory:45	**Tutorial:0**	**Practicals: 0**	**Project: 0**	**Total Hours: 45**

REFERENCES

1. Stuart Russell, Peter Norvig, "Artificial Intelligence – A Modern Approach", 3rd Edition, Pearson Education / Prentice Hall of India, 2015.
2. Elaine Rich, Kevin Knight, Shivashankar.B.Nair, "Artificial Intelligence", Tata McGraw Hill, Third Edition , 2009
3. Nils J. Nilsson, "Artificial Intelligence: A new Synthesis", Harcourt Asia Pvt. Ltd., 2000.
4. George F. Luger, "Artificial Intelligence-Structures and Strategies For Complex Problem Solving", Pearson Education / PHI, 2002
5. David L. Poole, Alan K. Mackworth, "Artificial Intelligence: Foundations of Computational Agents" , Cambridge University Press, 2010.
6. Ian Goodfellow, YoshuaBengio, Aaron Courville, "Deep Learning", An MIT Press Book, 2016.
7. Li Deng , Dong Yu, "Deep Learning: Methods and Applications", Now Publishers, 2014.

OTHER REFERENCES

1.http://aima.cs.berkeley.edu
2. http://www-formal.stanford.edu/jmc/whatisai/
3.http://nptel.ac.in/courses/106106126/4
4. https://www.coursera.org/specializations/deep-learning#courses
5. https://www.coursera.org/specializations/machine-learning-tensorflow-gcp
6. https://www.deeplearningbook.org/
7. https://medium.freecodecamp.org/an-introduction-to-q-learning-reinforcement-learning-14ac0b4493cc



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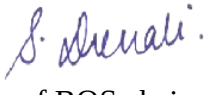
NETWORKING



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U17CSE0004 IOT ARCHITECTURE AND PROTOCOLS

L	T	P	J	C
3	0	0	0	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

- **CO1:** Categorize M2M communication and IoT Technology. [K4]
- **CO2:** Examine IoT Reference Architecture and Real World Design Constraints. [K4]
- **CO3:** Make use of appropriate IoT protocols for various applications. [K3]
- **CO4:** Build applications of IoT in real time scenario. [K3]
- **CO5:** Identify the challenges in developing industrial applications. [K3, S2]

Pre-requisite :NIL

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S									M		M			
CO2	S									M		M			
CO3		M								M		M	M		
CO4			M							M		M			M
CO5	S									M		M	M		

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II 2. Open book test; Cooperative learning report, Assignment; Journal paper review, Group Presentation, Project report, Poster preparation, Prototype or Product Demonstration etc(as applicable) 3. End Semester Examination
INDIRECT
1. Course-end survey

THEORY COMPONENT CONTENTS

OVERVIEW **9 Hours**

IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. M2M and IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service(XaaS), M2M and IoT Analytics, Knowledge Management

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REFERENCE ARCHITECTURE **9 Hours**

IoT Architecture-State of the Art – Introduction, State of the art, Reference Model and architecture, IoT Reference Model - IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, other relevant architectural views. Real-World Design Constraints-Introduction, Technical Design constraints-hardware is popular again, Data representation and visualization, Interaction and remote control.

PHYSICAL AND MAC LAYER PROTOCOLS **9 Hours**

IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN

NETWORK AND APPLICATION LAYER PROTOCOLS **9 Hours**

Network Layer: IP versions, Constrained Nodes and Constrained Networks – Optimizing IP for IoT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks – Application Transport Methods: Supervisory Control and Data Acquisition – Application Layer Protocols: CoAP and MQTT

CASE STUDIES / INDUSTRIAL APPLICATIONS **9 Hours**

Cisco IoT system - IBM Watson IoT platform – Manufacturing - Converged Plantwide Ethernet Model (CPwE) – Power Utility Industry – GridBlocks Reference Model - Smart and Connected Cities: Layered architecture, Smart Lighting, Smart Parking Architecture and Smart Traffic Control

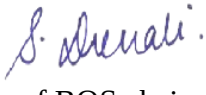
Theory: 45	**Tutorial: 0**	**Practical: 0**	**Project: 0**	**Total: 45 Hours**

REFERENCES

1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, 1st Edition, Academic Press, 2014.
2. Peter Waher, “Learning Internet of Things”, PACKT publishing, BIRMINGHAM – MUMBAI
3. Bernd Scholz-Reiter, Florian Michahelles, “Architecting the Internet of Things”, ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer
4. Daniel Minoli, “Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications”, ISBN: 978-1-118-47347-4, Willy Publications
5. Vijay Madisetti and ArshdeepBahga, “Internet of Things (A Hands-on-Approach)”, 1st Edition, VPT, 2014.
6. http://www.cse.wustl.edu/~jain/cse570-15/ftp/iot_prot/index.html

ONLINE COURSES AND VIDEO LECTURES

1. https://www.coursera.org/learn/internet-of-things-communication
2. https://www.edx.org/course/iot-networks-and-protocols



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U17CSE0005 ADHOC AND SENSOR NETWORKS

L	T	P	J	C
3	0	0	0	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Analyze mobility impact on MAC and routing protocols. [K5][S3]
CO2: Compare and analyze ad hoc network protocol performance.[K5][S3]
CO3: Identify various security threats to ad hoc networks and examine various security solutions. [K3]
CO4: Illustrate the sensor network characteristics, sensor databases and query processing mechanisms. [K3]

Pre-requisite : U17CSI5201/Computer Networks

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S			S				M	M		M			M
CO2	S	S		S	S				M	M		M		M	
CO3	S	M		M						M		M		M	
CO4	S									M		M			

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II 2. Case study report, Project Presentation & Report, Assignment; Group Presentation, Poster preparation, etc (as applicable) 3. End Semester Examination
INDIRECT
1. Course-end survey

THEORY COMPONENT CONTENTS

INTRODUCTION **9 Hours**

Characteristics of wireless channel - Wireless local loop - IEEE 802.16 standard – HIPERACCESS -Ad hoc wireless networks: Introduction and issues - MAC protocols: Design issues - Goals and classification - MACAW: A media access protocol for wireless LANsDistributed packet reservation multiple access protocol-Distributed priority scheduling and Medium access in Ad hoc networks.

ROUTING PROTOCOLS **10 Hours**

Design issues – Classification – Wireless routing protocol - Location aided routing- Zone routing protocol - Hierarchical state routing protocol - Power aware routing protocol – Operation of multicast routing protocols - Classification of multicast routing protocols – Application-Dependent multicast routing.

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SECURITY IN AD HOC NETWORKS **9 Hours**

Security in ad hoc wireless networks – Network security requirements - Issues and challenges in security provisioning – Network security attacks – key management – secure routing in Ad hoc networks.

WIRELESS SENSOR NETWORKS **7 Hours**

Sensors and Actuators-Types of Sensors-Multimedia Sensors-Architecture - Data dissemination - Date gathering - MAC protocols - Location discovery - Quality of sensor networks - Case study

SENSOR NETWORK DATABASE **10 Hours**

Sensor database challenges – Querying the physical environment – Query interfaces - High level database organization – In-Network aggregation – Temporal data – Emerging Applications

Case Study of ad hoc and sensor network applications:
Proficiently analyze ad hoc and sensor network protocols using simulation tool (NS3/SUMO/OPNET..).

Theory: 45	**Tutorial: 0**	**Practical: 0**	**Project: 0**	**Total: 45 Hours**

REFERENCES

1. Siva Ram Murthy. C and Manoj B.S, “Ad hoc Wireless Networks: Architectures And Protocols”, Prentice Hall PTR, 2004
2. Toh C.K., “Ad hoc Mobile Wireless Networks: Protocols And Systems”, Prentice Hall PTR, First edition 2001.
3. Mohammad Ilyas, “The Handbook Of Ad hoc Wireless Networks”, CRC press, 2002
4. Charles E. Perkins, “Ad hoc Networking, Addison”, Wesley,2000
5. Stefano Basagni , et al, “Mobile Ad hoc Networking”, Wiley –IEEE press,2004
6. Zhao, Guibas “Wireless Sensor Networks”, ,Morgan Kaufmann Publications,2004

ONLINE COURSES AND VIDEO LECTURES

1. https://nptel.ac.in/courses/106105160/

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U17CSE0006 **SOFTWARE DEFINED NETWORKS**

L	T	P	J	C
3	0	0	0	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

- **CO1:** Categorize SDN Controllers and the evolution of SDN. [K4]
- **CO2:** Choose the relevant data center for SDN. [K3].
- **CO3:** Make use of SDN solutions in networking scenarios. [K3]
- **CO4:** Experiment with SDN Programming. [K3]
- **CO5:** Develop various applications of SDN. [K3]

Pre-requisite :NIL

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S									M		M			
CO2	S	M								M		M			
CO3		M	M							M		M			M
CO4		M								M		M			
CO5			M							M		M	M		M

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II 2. Open book test; Cooperative learning report, Assignment; Journal paper review, Group Presentation, Project report, Poster preparation, Prototype or Product Demonstration etc (as applicable) 3. End Semester Examination
INDIRECT
1. Course-end survey

THEORY COMPONENT CONTENTS

INTRODUCTION **9 Hours**

History of Software Defined Networking (SDN) – Modern Data Center – Traditional Switch Architecture – Why SDN – Evolution of SDN – How SDN Works – Centralized and Distributed Control and Date Planes

OPEN FLOW AND SDN CONTROLLERS **9 Hours**

Open Flow Specification – Drawbacks of Open SDN, SDN via APIs, SDN via Hypervisor-Based Overlays – SDN via Opening up the Device – SDN Controllers – General Concepts.

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DATA CENTRES **9 Hours**

Multitenant and Virtualized Multitenant Data Center – SDN Solutions for the Data Center Network – VLANs – EVPN – VxLAN – NVGRE

SDN PROGRAMMING **9 Hours**

Programming SDNs: Northbound Application Programming Interface, Current Languages and Tools, Composition of SDNs – Network Functions Virtualization (NFV) and Software Defined Networks: Concepts, Implementation and Applications

SDN **9 Hours**

Juniper SDN Framework - IETF SDN Framework - Open Daylight Controller - Floodlight Controller - Bandwidth Calendaring - Data Centre Orchestration.

Theory: 45	Tutorial: 0	Practical: 0	Project: 0	Total: 45 Hours

REFERENCES

1. Paul Goransson and Chuck Black, ―Software Defined Networks: A Comprehensive Approach, First Edition, Morgan Kaufmann, 2014.
2. Thomas D. Nadeau, Ken Gray, ―SDN: Software Defined Networks, O'Reilly Media, 2013.
3. Siamak Azodolmolky, ―Software Defined Networking with Open Flow, Packet Publishing, 2013
4. Vivek Tiwari, ―SDN and Open Flow for Beginners‖, Amazon Digital Services, Inc., 2013
5. Fei Hu, Editor, ―Network Innovation through Open Flow and SDN: Principles and Design, CRC Press, 2014.

L	T	P	J	C

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U17CSE0007 CRYPTOGRAPHY AND NETWORK SECURITY

3	0	0	0	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1:	Analyze various security attacks and select appropriate security mechanisms for designing various security services	K4
CO2:	Construct cryptographic algorithms from hard problems in mathematics	K3
CO3:	Identify appropriate algorithms for assuring message integrity and authentication	K3
CO4:	Discover how cryptographic algorithms are used to build network security protocols	K4
CO5:	Identify appropriate mechanisms for providing system security	K3

Pre-requisite: U17CSI5201/Computer Networks

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S	M	S					M	M			M	M	S
CO2	S	M													
CO3	S													S	
CO4	S		M												
CO5	S	M							M	M				S	S

COURSE ASSESSMENT METHODS

DIRECT

1. Continuous Assessment Test I, II
2. Assignments / Mini Projects / Group Presentations/ Case Studies, involving analysis of security of any information system / domain, and using security mechanisms to deliver security services
3. End Semester Examination

INDIRECT

1. Course-end survey

THEORY COMPONENT CONTENTS

INTRODUCTION **10 Hours**

Security Attacks, Mechanisms and Services, Classical Encryption Techniques – Block Ciphers, DES, Finite Fields and AES, Block Cipher Operation, Stream Cipher – RC4.

PUBLIC KEY CRYPTOGRAPHY **9 Hours**

Introduction to Number Theory, Factorization problem and RSA, Discrete Log problem and Diffie Hellman Key Exchange, Elliptic curve cryptography

HASH FUNCTION AND MESSAGE AUTHENTICATION **9 Hours**

Requirements and Security of Cryptographic Hash Functions, SHA, Message Authentication Requirements – Message Authentication Functions – Requirements and Security of Message Authentication Codes–HMAC, Digital Signatures – NIST Digital Signature Algorithm, Key Management and Distribution

S. Meenakshi.

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NETWORK SECURITY **9 Hours**

Remote User Authentication Principles, Kerberos –Electronic Mail Security–PGP–S/MIME-IP Security–Transport Layer Security, 802.11 wireless security

SYSTEM LEVEL SECURITY **8 Hours**

Intruders, Intrusion Detection, Password Management, Malicious Software: Types, Viruses and Worms, Countermeasures for Viruses and Worms, DDoS Attacks, Firewalls: Needs, Characteristics, Types, Basing, Location and Configuration of Firewalls

Theory: 45	Tutorial: 0	Practical: 0	Project: 0	Total: 45 Hours

REFERENCES

1. William Stallings, "Network Security Essentials: Applications and Standards", Pearson Education India; 4 edition (2011)
2. William Stallings, "Cryptography and Network Security – Principles and Practices", Pearson Education; Seventh edition, 2017
3. AtulKahate, "Cryptography and Network Security", 2nd Edition, Tata McGraw Hill, 2008
4. Bruce Schneier, "Applied Cryptography", JohnWiley& Sons Inc, 2001.
5. Charles P fleeger and Shari Lawrence P fleeger, "Security in Computing", Fourth edition, PearsonEducation,2015.

ONLINE COURSES

1. Cryptography I – Stanford University Course by Dan Boneh available at Coursera Link: https://www.coursera.org/learn/crypto or at Stanford Online: https://online.stanford.edu/courses/soe-y0001-cryptography-i
2. Applied Cryptography – Udacity Course by Dave Evans available at: https://in.udacity.com/course/applied-cryptography--cs387
3. Cryptography and Network Security – NPTEL Course by Prof. S. Mukhopadhyay available at https://onlinecourses.nptel.ac.in/noc18_cs07/preview

S. Sheela.

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U17CSE0014

BLOCKCHAIN TECHNOLOGY AND APPLICATIONS

L	T	P	J	C
3	0	0	0	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1:	Understand emerging abstract models for Blockchain Technology (K2)
CO2:	Discover the secure and efficient transactions with crypto-currencies (K4)
CO3:	Experiment with cryptocurrency trading and crypto exchanges (K3)
CO4:	Develop private blockchain environment and develop a smart contract on ethereum (K3,S2)
CO5:	Build the hyperledger architecture and the consensus mechanism applied in the hyperledger (K5,S2)

Pre-requisites : Nil

CO/PO MAPPING

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	PROGRAMME OUTCOMES (POs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M		M						M		M			
CO2	S					M				M		M	M		
CO3	S	M	M		M	M				M		M	M		M
CO4	M	S	S		M							M			
CO5	M	S	S		M							M			

COURSE ASSESSMENT METHODS

DIRECT
4. Continuous Assessment Test I, II 5. Assignment, Project 6. End Semester Examination
INDIRECT
2. Course-end survey

THEORY COMPONENT CONTENTS

BLOCKCHAIN REVOLUTION AND DESIGN PRINCIPLES (10 hours)

Blockchain- An Introduction, Distinction between databases and blockchain, Centralized Registries vs. Distributed Ledgers, Public vs. Private Ledgers, Bitcoin & Blockchain, Blockchain Structure and operations, Consensus Algorithms & Types- Proof of work, proof of stake, Byzantine Fault Tolerance.

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Distributed networks- Distributed Applications (DApps) – Web 3.0 - DApps Ecosystems. Working - Permissioned and permission-less Blockchain – Cross Chain Technologies. – IOT & Blockchain - Digital Disruption in Industries – Banking, Insurance, Supply Chain, Governments, IP rights, Creation of trustless Ecosystems – Block chain as a Service – Open Source Block chains

CRYPTO AND CRYPTOCURRENCIES (8 HOURS)

Crypto Currencies - Anonymity and Pseudonymity in Cryptocurrencies , Cryptographic Hash Functions, Hash Pointers and Data Structures, Digital Signatures, Public Keys as Identities, Centralization vs. Decentralization, Distributed Consensus, Consensus without Identity, Incentives and Proof of work, Regulations on Crypto Currencies & exchanges – Downside of non-regulated currencies – crypto Scams – Exchange hacks

BITCOIN (9 HOURS)

Bitcoin blockchain, the challenges, and solutions, Bitcoin Scripts, Applications of Bitcoin Scripts, Bitcoin Blocks, The Bitcoin Network, Limitations & Improvements, How to Store and Use Bitcoins, Hot and Cold Storage, Splitting and Sharing Keys, Online Wallets and Exchanges, Payment Services, Transaction Fees, Currency Exchange Markets

ETHEREUM (9 hours)

The Ethereum ecosystem, Smart Contract Basics, Processing and deploying smart contracts in Remix IDE, Solidity: contract classes, Data Types & Statements , operators, Data structures, functions, Inheritance, functions, abstract contracts, libraries, Types & optimization of Ether- Global variables- Debugging, Viewing Information about blocks in Blockchain- Developing smart contract on private Blockchain.

HYPERLEDGER (9 HOURS)

Hyperledger fabric, components of Hyperledger Fabric Technology, Develop Hyperledger Blockchain Applications using Composer Framework, Model the Blockchain Applications using Composer modeling language, Intro: Alternative Decentralized Solutions, Interplanetary File System, Hashgraph.

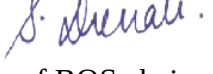
Theory: 45	Tutorial: 0	Practical: 0	Project: 0	Total: 45 Hours

REFERENCES

1. Mastering Bitcoin: Unlocking Digital Cryptocurrencies, by Andreas M Antonopoulos 2018
2. Ethereum: Blockchains, Digital Assets, Smart Contracts, Decentralized Autonomous Organizations-2016
3. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press, 2016.

E BOOKS AND ONLINE LEARNING MATERIALS

1. https://www.coursera.org/learn/blockchain-basics#syllabus
2. https://www.coursera.org/learn/cryptocurrency#syllabus
3. https://www.coursera.org/learn/smarter-contracts#syllabus
4. https://www.udemy.com/course/hyperledger
5. https://www.coursera.org/learn/blockchain-platforms
6. https://bitcoinbook.cs.princeton.edu/



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GENERAL ELECTIVES

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U17CSE0008 PRINCIPLES OF COMPILER DESIGN

L	T	P	J	C
3	0	0	0	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Interpret the different phases of the compiler and experiment the scanner using Lex tool (K3).

CO2: Construct various parser and execute the same using tools. (K5).

CO3: Break down the given expression into intermediate code (K4).

CO4: Translate given intermediate code to target code.(K3)

CO5: Identify various types of optimizations that can be applied to an intermediate code (K3)

Pre-requisite:U17CST4003/Theory of Computation

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S		S		S							M	M		
CO2	M	M										M	M		
CO3	S	S										M	M		
CO4												M	M		
CO5	S	S										M	M		

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II 2. Assignment; Group Presentation 3. End Semester Examination
INDIRECT
1. Course-end survey

THEORY COMPONENT CONTENTS

INTRODUCTION **9 Hours**

Introduction: Language Processors- The Structure of a Compiler

Lexical Analysis: The Role of the Lexical Analyzer- Input Buffering- Specification of Tokens- Recognition of Tokens- The Lexical-Analyzer Generator: LEX

SYNTAX ANALYZER **9 Hours**

The Role of the Parser- Error-Recovery Strategies- Top Down Parsing- Bottom-Up Parsing: SLR, CLR, LALR- The Parser Generator YACC

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INTERMEDIATE CODE GENERATION **9 Hours**

Variants of syntax trees- Three address codes – Types and Declarations – Translation of expression- Type checking - Control flow-Back patching-Switch statements-Intermediate code for procedures

CODE GENERATION **9 Hours**

Issues in the design of code generation – Target language-Addresses in target code- Basic Blocks and Flow Graphs- Optimization of Basic Blocks – A simple Code generator – Peephole optimization

CODE OPTIMIZATION AND RUN-TIME ENVIRONMENTS **9 Hours**

Machine-Independent Optimizations: The Principal Sources of Optimization - Loops in Flow Graphs

Run-Time Environments: Storage organization- Stack allocation space- Access to non-local data on the stack-Heap management

Optimizing for Parallelism-Basic Concepts

Simple exercises using LEX and YACC tools

Theory: 45	**Tutorial: 0**	**Practical: 0**	**Project: 0**	**Total: 45 Hours**

REFERENCES

1. Alfred V. Aho et al “Compilers Principles, Techniques and Tools”, Second Edition, Pearson Education, 2007.
2. Allen I. Holub, “Compiler Design in C”, Prentice Hall of India, 2003.
3. Fischer C.N. and LeBlanc R.J. “Crafting a Compiler with C”, Benjamin Cummings, 2003.
4. Bennet J.P. “Introduction to Compiler Techniques”, Second Edition, Tata McGraw-Hill, 2003.
5. HenkAlblas and Albert Nymeyer, “Practice and Principles of Compiler Building with C”, PHI, 2001.
6. Kenneth C. Louden, “Compiler Construction: Principles and Practice”, Thompson Learning, 2003.

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U17CSE0009 GRAPHICS AND MULTIMEDIA

L	T	P	J	C
3	0	0	0	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Illustrate graphics input and output primitives.[K3]
CO2: Construct 2D and 3D geometric transformations on objects.[K5]
CO3: Summarize the graphics modeling process.[K3]
CO4: Apply the techniques of multimedia, compression, communication and authoring.[K3]
CO5: Design a simple application with animation.[K5]

Pre-requisite: NIL

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S									M		M			
CO2	S	S								M		M			
CO3	S									M		M			
CO4	S									M		M			
CO5	S	S			S	S			M	M	S	M	M		

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II 2. Assignment 3. Mini Project 4. End Semester Examination
INDIRECT
1. Course-end survey

THEORY COMPONENT CONTENTS

2D PRIMITIVES **9 Hours**

Elements of pictures created in Computer Graphics – Graphics input primitives and devices – Output Primitives – Line, Circle and Ellipse drawing Algorithms – Attributes of output primitives

2D GEOMETRIC TRANSFORMATIONS **9 Hours**

Two Dimensional Geometric Transformations – 2D Viewing – Window-Viewport Transformations – Line, Polygon, Curve and Text Clipping algorithms – 2D Geometric Transformations-Case study

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3D CONCEPTS **9 Hours**

Three Dimensional Object Representation – Polygons, Curved Lines, Splines, Quadric Surfaces - 3D affine transformations - Parallel and perspective projections – Visualization of data sets – Viewing – Visible Surface Identification - Color Models- Case study

MULTIMEDIA BASICS AND 3D MODELLING **9 Hours**

Introduction and Definitions – Applications – Elements – Animations –Definition of Modelling -Surface Modelling- Object cloning-Object Editing-3D Procedural Modelling- Modelling with Polygons-Building Simple scenes-Building complex scenes- Modelling with NURBS

MULTIMEDIA APPLICATION DESIGN **9 Hours**

Types of Multimedia systems - Virtual Reality Design - Components of Multimedia system - Distributed Application Design Issues - Multimedia Authoring and User Interface - Hypermedia Messaging - Distributed Multimedia Systems

Theory: 45	**Tutorial: 0**	**Practical: 0**	**Project: 0**	**Total: 45 Hours**

REFERENCES

1. Donald Hearn, M. Pauline Baker, “Computer Graphics”, Prentice Hall, 1998
2. Donald Hearn, M. Pauline Baker, “Computer Graphics(C version)” Second edition , Prentice Hall ,2002
3. Donald Hearn, M. Pauline Baker and Warren Caritthers, “Computer Graphics with OpenGL”, Fourth edition, Prentice Hall, 2010.
4. Ze-Nian Li and Mark S. Drew, “Fundamentals of Multimedia”, First Edition, Pearson Education, 2004.
5. PrabhatK.Andleigh, KiranThakrar ,”Multimedia Systems Design”, PHI, 2013.
6. Ralf Steinmetz and Klara, “Multimedia Computing, Communications and Applications”, Pearson Education, 2012.
7. F.S. Hill, “Computer Graphics using OpenGL”, Third Edition, Pearson Education, 2006.

TOOLS

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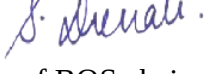
https://docs.gimp.org/2.8/en/gimp-tools.html
https://www-uxsup.csx.cam.ac.uk/pub/doc/suse/suse9.0/userguide-9.0/ch23s02.html
https://en.wikipedia.org/wiki/Hypermedia#Development_tools

OTHER REFERENCES

1. http://ocw.mit.edu/courses/electrical-engineering-and-computerscience/6-837-computer-graphics-fall-2003/
2. https://nptel.ac.in/courses/106106090/



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U17CSE0010 **INFORMATION SECURITY**

L	T	P	J	C
3	0	0	0	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Select the appropriate security techniques to prevent and detect security breaches (K3)
CO2: Analyze the threats, attacks and understand legal professional and ethical issues (K4)
CO3: Utilize the Big data security analytics tools to detect security breaches (K3,S2)
CO4: Select the appropriate security technology for risk control (K5)
CO5: Choose the appropriate operational security technologies to prevent security breach (K5)

Pre-requisite: NIL

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M		M								M	M		
CO2	S		M			M				M		M			
CO3	S	M								M		M		M	M
CO4	M	S										M			
CO5	M	S	S		S	M						M	M		

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II 2. Assignment, Project 3. End Semester Examination
INDIRECT
1. Course-end survey

THEORY COMPONENT CONTENTS

SECURITY REQUIREMENTS AND SECURE SDLC **9 Hours**

History - What is Information Security? - CIA requirements- security model - Components of an information system - Securing the components - Balancing security and access - The SDLC - Security in SDLC.

THREATS, ATTACKS AND ISSUES **9 Hours**

Need for security - Business needs - Threats – Attacks – Legal - Ethical and professional issues.

RISK MANAGEMENT BASED SECURITY **9 Hours**

Planning for Security, Risk management: Identifying and assessing risk - Assessing and controlling risk.

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SECURITY TECHNOLOGIES **9 Hours**

Security Technology: Access Control, Firewalls, and VPNs, Intrusion Detection and Prevention Systems, Honeypots, Honeynets and Padded Cell Systems, Scanning and Analysis Tools, Introduction to Big Data Security Analytics and Security Breaches

PHYSICAL, PERSONNEL AND OPERATIONAL SECURITY **9 Hours**

Physical Security: Physical Access Controls, Fire Security and Safety, Failure of Supporting Utilities and and Structural Collapse, Interception of Data, Securing Mobile and Portable Systems, Special Considerations, - Security and personnel – Information Security Maintenance- Real time case studies.

Theory: 45	**Tutorial: 0**	**Practical: 0**	**Project: 0**	**Total: 45 Hours**

REFERENCES

1. Michael E Whitman and Herbert J Mattord, “Principles of Information Security”, Sixth Edition, Cengage Learning, 2017.
2. Micki Krause, Harold F. Tipton, “Handbook of Information Security Management”, Vol 1-3 CRC Press LLC, 2004.
3. Stuart McClure, et al., “Hacking Exposed”, Tata McGraw- Hill, Sixth edition2009. 4. Matt Bishop, “Computer Security Art and Science”, Pearson/PHI, 2002.

E BOOKS AND ONLINE LEARNING MATERIALS

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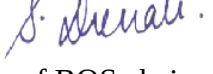
2. https://www.nisc.go.jp/security-site/campaign/files/aj-sec/handbook-all_eng.pdf



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U17CSE0011 DECLARATIVE DEVELOPMENT OF CUSTOMIZED APPLICATIONS

L	T	P	J	C
2	0	0	2	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1:	Design and manage the correct data model based on business requirements.
CO2:	Define business logic and configure application security.
CO3:	Visualize the process automation declaratively.
CO4:	Define and Design an appropriate deployment plan.
CO5:	Develop customized applications using Lightning Components.

Pre-requisites : U17CSI3204/Database Management System

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO MAPPING		
COs	**PROGRAMME OUTCOMES (POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	M		M											M	
CO2		M	M												
CO3					S										
CO4			M		S									M	
CO5			M		M								M		

COURSE ASSESSMENT METHODS

DIRECT
1.Online Assessment 2.Quiz
INDIRECT
1.Course-end survey

THEORY COMPONENT CONTENTS

INTRODUCTION TO DATA MODEL

6+3 Hours

Introduction to Salesforce- Salesforce Architecture-Declarative vs. Programmatic Customizations - Salesforce CRM-Data Modeling-Custom and Standard Objects- Object Relationships- Data Management- Determining an Appropriate Data Model - Building Data Model

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BUSINESS LOGIC AND APPLICATION SECURITY **6+3 Hours**

Constructing business logic – Salesforce Social Features-Lightning Vs Classic UI- - UI Design Best Practices.-Customization Options- Custom Buttons, Links, and Actions- List Views- Record Types- - Constructing business logic - Formula Fields - Roll-up Summary Fields - Validation Rules - Restricting and Extending Object, Record, and Field Access

AUTOMATING BUSINESS PROCESSES **6+3Hours**

Business Value of Process Builder-Workflow Vs Process Builder-Converting Workflow into Process Best Practices-Lightning Process Builder- Workflows and Approvals- Automating Business Processes- Custom Lightning Components

DEPLOYING YOUR APP **6+3Hours**

Application Lifecycle Management-Change Management Process- Sandboxes-Application Lifecycle Models- Change Sets - Unmanaged and Managed Packages - Determining an Appropriate Deployment Plan

DESIGNING ADVANCED USER INTERFACE COMPONENTS **6+3 Hours**

Declarative Customizations- Limits of Declarative tools - Creating Reports – Report Types – Dashboards – Declarative Options for Incorporating Lightning Components – AppExchange Apps

Theory: 30	**Tutorial: 0**	**Practical: 0**	**Project: 15**	**Total: 60 Hours**
Completion of Project : 15 Hours				

REFERENCES

1. https://www.edureka.co/blog/what-is-salesforce/
2. https://www.j2interactive.com/blog/brief-history-salesforce/
3. https://www.salesforce.com/blog/2017/08/salesforce-forbes-most-innovative-2017.html
4. https://trailhead.salesforce.com/en/academy/classes/dex402-build-platform-apps-using-declarative-development-in-lightning-experience/
5. https://trailhead.salesforce.com/en/users/strailhead/trailmixes/prepare-for-your-salesforce-platform-app-builder-credential
6. https://trailhead.salesforce.com/en/users/dnadimi/trailmixes/dex-402-kick-off
7. https://trailhead.salesforce.com/content/learn/trails/platform-app-builder-certification-prep
8. https://trailhead.salesforce.com/modules/data_security
9. https://trailhead.salesforce.com/modules/reports_dashboards
10. https://trailhead.salesforce.com/modules/lex_customization

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U17CSE0013 ADX 201 SALESFORCE ADMINISTRATOR

L	T	P	J	C
2	0	0	2	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1	Understand admin essentials in Lightning Experience.
CO2	Differentiate the building blocks of Salesforce and visualize the CRM in Salesforce lighting platform
CO3	Find out how maintain and import clean data in Lightning platform
CO4	Use Lightning features to create high-value reports and dashboards
CO5	Implement security and Understand how workflow automation complies with Lightning.

Pre-requisites :Nil

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													**CO/PSO MAPPING**		
COs	**PROGRAMME OUTCOMES (POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1		M			M								M		
CO2					M					M					M
CO3			M								M			M	
CO4			M							M					
CO5	M							M							

COURSE ASSESSMENT METHODS

DIRECT
1.Online Assessment 2. Quiz
INDIRECT
1.Course-end survey

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THEORY COMPONENT CONTENTS

CUSTOMIZE AN ORG TO SUPPORT A NEW BUSINESS UNIT **9 Hours**

Wh Manage User Access-Manage Chatter-Modify Your Data Model-Configure an Email Letterhead and Template-Automate Your Business Process

DATA SECURITY **9 Hours**

Overview of Data Security-Control Access to the Org-Control Access to Objects-Control Access to Fields-Control Access to Records-Create a Role Hierarchy-Define Sharing Rules

REPORTS AND DASHBOARDS FOR LIGHTNING EXPERIENCE **9 Hours**

Introduction to Reports and Dashboards in Lightning Experience-Create Reports with the Report Builder-Format Reports-Visualize Your Data with the Lightning Dashboard Builder- Extend Your Reporting Strategy with AppExchange

CREATE REPORT AND DASHBOARDS FOR SALES AND MARKETING MANAGERS 9 **Hours**

Create Report and Dashboard Folders-Create a Simple Custom Report-Filter Your Reports-Group and Categorize Your Data-Use Summary Formulas in Your Reports-Manage Reported Data-Visualize Your Data

LIGHTNING APP BUILDER **9 Hours**

Clean and import account data-Create users and manage access-Create email templates for new marketing needs-Configure UI tools for a new product type-Create reports and dashboards-Manage and apply Chatter tools - Create Your First Page-Add More Components-Add Quick Actions and Activate the App-Test in the Salesforce Mobile App- Get to Know Salesforce Identity- Get To Know Your Salesforce Identity Users-Learn the Language of Identity- Secure Your Users' Identity-Customize Your Login Process with My Domain-Set Up Single Sign-On for Your Internal Users

Theory:	**Tutorial: 0**	**Practical: 0**	**Project: 0**	**Total: 45 Hours**

REFERENCES

E BOOKS AND ONLINE LEARNING MATERIALS

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2. https://trailhead.salesforce.com/en/content/learn/modules/lex_implementation_reports_dashboards/lex_implementation_reports_dashboards_overview
3. https://trailhead.salesforce.com/en/content/learn/modules/identity_login
4. https://trailhead.salesforce.com/en/content/learn/superbadges/superbadge-lex-rd
5. https://trailhead.salesforce.com/en/content/learn/superbadges/superbadge_business_specialist

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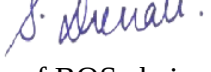

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