SYLLABUS

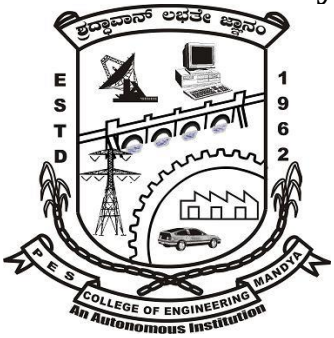
(With effect from 2018-19 Academic year)

ಪಠ್ಯಕ್ರಮ

(ಶೈಕ್ಷಣಿಕವರ್ಷ 2018–19)

V & VI Semester
Bachelor Degree
in
Information Science and Engineering

Out Come Based Education
with
Choice Based Credit System



P.E.S. College of Engineering,

Mandya - 571 401, Karnataka

(An Autonomous Institution Affiliated to VTU, Belagavi)
Grant -in- Aid Institution
(Government of Karnataka)
Accredited by NBA, New Delhi
Approved by AICTE, New Delhi.

ಪಿ.ಇ.ಎಸ್. ತಾಂತ್ರಿಕ ಮಹಾವಿದ್ಯಾಲಯ
ಮಂಡ್ಯ–571 401, ಕರ್ನಾಟಕ
(ವಿ.ಟಿ.ಯು, ಬೆಳಗಾವಿ ಅಡಿಯಲ್ಲಿನ ಸ್ವಾಯತ್ತ ಸಂಸ್ಥೆ)

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Preface

PES College of Engineering, Mandya, started in the year 1962, has become autonomous in the academic year 2008-09. Since, then it has been doing the academic and examination activities successfully. The college is running Eight undergraduate and Eight Postgraduate programs. It consists of Six M.Tech programs, which are affiliated to VTU. Other postgraduate programs are MBA and MCA.

India has recently become a Permanent Member by signing the Washington Accord. The accord was signed by the National Board of Accreditation (NBA) on behalf of India on 13th June 2014. It enables not only the mobility of our degree globally but also establishes equivalence to our degrees with that of the member nations such as Taiwan, Hong Kong, Ireland, Korea, Malaysia, New Zealand, Russia, Singapore, South Africa, Turkey, Australia, Canada and Japan. Among other signatories to the international agreement are the US and the UK. Implementation of Outcome Based Education (OBE) has been the core issue for enabling the equivalence and of Indian degrees and their mobility across the countries.

Our Higher Educational Institution has adopted the CBCS based semester structure with OBE scheme and grading system.

The credit based OBE semester system provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching.

The OBE, emphasize setting clear standards for observable, measurable outcomes of programs in stages. There lies a shift in thinking, teaching and learning processes moving towards Students Centric from Teacher Centric education. OBE standards focus on mathematics, language, science, attitudes, social skills & moral values.

The key features which may be used to judge, if a system has implemented an outcome based education system is mainly Standard based assessments that determines whether students have achieved the stated standard. Assessments may take any form, so long as the process actually measure whether the student knows the required information or can perform the required task. Outcome based education is a commitment that all students of all groups will ultimately reach the same minimum standards. Outcome Based Education is a method or means which begins with the end in mind and constantly emphasizes continuous improvement.

Choice Based Credit System (CBCS) provides choice for students to select from the prescribed courses (core, Foundation, Foundation Elective, elective, open elective and minor or soft skill courses). The CBCS provides a ‘cafeteria’ type approach in which the students can Choose electives from a wide range of courses of their choice, learn at their own pace, undergo additional courses and acquire more than the required credits, adopt an interdisciplinary approach to learning which enables integration of concepts, theories, techniques, and, perspectives from two or more disciplines to advance fundamental understanding or to solve problems whose solutions are beyond the scope of a single discipline. These greatly enhance the skill/employability of students.

In order to increase the Industry/Corporate readiness, many Soft Skills and Personality Development modules have been added to the existing curriculum of the academic year 2015-16. Industry Interactions have been made compulsory to enhance the field experience. In order to enhance creativity and innovation Mini Project and Industrial visit & Interaction are included in all undergraduate programs.

Dr. Umesh D R
Deputy Dean (Academic)
Associate Professor
Dept. of CS & Engg.

Dr. Nagarathna
Dean (Academic)
Professor
Dept. of CS & Engg

PES College of Engineering

Vision

*"*PESCE shall be a leading institution imparting quality engineering and management education developing creative and socially responsible professionals.*"*

Mission

1. Provide state of the art infrastructure, motivate the faculty to be proficient in their field of specialization and adopt best teaching-learning practices.
2. Impart engineering and managerial skills through competent and committed faculty using outcome based educational curriculum.
3. Inculcate professional ethics, leadership qualities and entrepreneurial skills to meet the societal needs.
4. Promote research, product development and industry-institution interaction.

DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING

About the Department

The Department of Information science and Engineering takes pride in producing quality engineers over the past 14 years. The credit for all the flowery results goes to the highly motivating staff, from whom all students draw inspiration. The Department was started in the year 2000. The present intake of the undergraduate program is 30. The department has well equipped classrooms, computer laboratories with high-end systems, department library and good collection of software's. Also a research centre is a major credential to our department. We are proud to produce the first PhD student in our college. Faculty members of the department are involved in research activities in different fields such as Medical Image Processing, Pattern Recognition, and Data Mining etc. The department is using Outcome-based education (OBE), which is a recurring education reform model, and it is affiliated to Visvesvaraya Technological University (VTU). The department has achieved good Placement, conducted International /national Conferences and other sponsored short-term courses, workshops, National seminars and symposia. The laboratory facilities and the Internet access are available round the clock to the staff and students of the Information Science and Engineering

Vision

"The department strives to equip our graduates with Knowledge and Skills to contribute significantly to Information Science & Engineering and enhance quality research for the benefit of society".

Mission

M1: To provide students with state of art facilities and tools of Information Science & Engineering to become productive, global citizens and life-long learners.
M2: To prepare students for careers in IT industry, Higher education and Research.
M3: To inculcate leadership qualities among students to make them competent Information Science & Engineering professionals or entrepreneurs.

1.2. State the Program Educational Objectives (PEOs)

Graduates of the program will be able to

PEO1: Establish a productive Information Science & Engineering career in industry, government or academia.
PEO2: Interact with their peers in other disciplines by exhibiting professionalism and team work to contribute to the economic growth of the country.
PEO3: Promote the development of innovative systems and solutions to the problems in Information Science using hardware and software integration.
PEO4: Pursue higher studies in Engineering, Management or Research.

A. List of Program Outcomes (POs)

Engineering Graduates will be able to:

PO1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

B. List of Program Specific Outcomes (PSOs)

Information Science & Engineering Graduates will be able to:

PSO1. Analyze, design, develop and test the principles of System software and Database concepts for computer-based systems.

PSO2. Develop computer communication systems and applications for Information security.

PSO3. Apply the knowledge of Information Science and Engineering to solve any software and hardware related problems and to organize, manage and monitor IT Infrastructure.

Bachelor of Engineering III Year

Scheme of Teaching and Examination [CBCS with OBE]

P.E.S. COLLEGE OF ENGINEERING, MANDYA
(An Autonomous Institution)
Scheme of Teaching and Examination
DEPARTMENT OF INFORMATION SCIENCE AND ENGINERING

V Semester B.E. (2017-18)

Sl. No.	Course Code	Course Title	Teaching Dept.	Hrs/Week L:T:P:H	Total Credit	Examination Marks		
						CIE	SEE	Total
1.	P17IS51	Database Management System	IS&E	4:0:0:4	4	50	50	100
2.	P17IS52	Data Communications	IS&E	3:2:0:5	4	50	50	100
3.	P17IS53	Software Testing	IS&E	4:0:0:4	4	50	50	100
4.	P17IS54	Python Programming	IS&E	4:0:0:4	4	50	50	100
5.	P17IS55	Foundation Elective	IS&E	2:0:2:4	3	50	50	100
6.	P17IS56X	Elective-I	IS&E	4:0:0:4	3	50	50	100
7.	P17ISL57	Python Programming Lab	IS&E	0:1:2:3	1.5	50	50	100
8.	P17ISL58	Data Base Management System Lab	IS&E	0:1:2:3	1.5	50	50	100
9.	P17IS59	Industry Visit & Interaction (Certification Course)	IS&E	0:0:2:2	1	50	--	50
10.	P17IS510	Aptitude and Reasoning Development –Advanced (ARDA)	HS&M	2:0:0:2	1	50	50	100
Total					27	500	450	950

List of Electives

Foundation Elective			**Elective – 1**		
Sl. No	Course Code	Course Title	Sl. No.	Course Code	Course title
1.	P17IS551	Unix System Programming	1.	P17IS561	J2EE and J2ME
2.	P17IS552	User Interface Design	2.	P17IS562	Principles of Programming Languages
3.	P17IS553	C# Programming & .Net	3.	P17IS563	Artificial Intelligence
4.	P17IS554	System Software	4.	P17IS564	Management & Entrepreneurship

P.E.S. COLLEGE OF ENGINEERING, MANDYA
(An Autonomous Institution)
Scheme of Teaching and Examination
DEPARTMENT OF INFORMATION SCIENCE AND ENGINERING

VI Semester B.E. (2017-18)

Sl. No	Course Code	Course Title	Teaching Dept.	Hrs/Week L:T:P:H	Total Credit	Examination Marks		
						CIE	SEE	Total
1.	P17IS61	Object Oriented System Development	IS&E	4:0:0:4	4	50	50	100
2.	P17IS62	Computer Networks	IS&E	4:0:0:4	4	50	50	100
3.	P17IS63	Internet of things	IS&E	4:0:0:4	4	50	50	100
4.	P17IS64	Data Science	IS&E	3:2:0:0	4	50	50	100
5.	P17IS65X	Elective-II	IS&E	4:0:0:4	3	50	50	100
6.	P17ISL66X	Elective-III	IS&E	4:0:0:4	3	50	50	100
7.	P17ISL67	Networks Lab	IS&E	0:0:3:3	1.5	50	50	100
8.	P17IS68	Internet of things Lab	IS&E	0:0:3:3	1.5	50	50	100
9.	P17IS69	Mini Project	IS&E	0:0:2:2	1	50	--	50
10.	P17IS610	Aptitude and Reasoning Development – Expert(ARDE)	HS&M	2:0:0:2	1	50	50	100
Total					27	500	450	950

List of Electives

Elective-II			**Elective – III**		
Sl. No	Course Code	Course title	Sl. No.	Course Code	Course title
1.	P17IS651	Web Technologies	1.	P17IS661	Modern Information Retrieval
2.	P17IS652	Wireless Technology	2.	P17IS662	Storage Area Network
3.	P17IS653	Multimedia Computing	3.	P17IS663	Data Mining
4.	P17IS654	Parallel computing	4.	P17IS664	Principles of Compiler Design

Course Title: DATABASE MANAGEMENT SYSTEM			
Course Code: P17IS51	**Semester: V**	**L-T-P-H : 4:0:0:4**	**Credit:4**
Contact Period: Lecture: 52 Hrs, Exam: 3 Hrs		**Weightage: CIE:50%, SEE: 50%**	

Course learning objectives (CLOs)

This course aims to

1. State the importance of DBMS and explain how DBMS is better than traditional File Processing Systems.
2. Analyze the basic structure of Database and recognize the different views of the database.
3. Draw and Investigate Data Flow and Entity Relationship Diagrams.
4. Analyze and use Relational Data Model, while comparing with other data models.
5. Formulate data retrieval queries in SQL and the Relational Algebra and Calculus.
6. Understand and explain the terms like Transaction Processing and Concurrency Control.
7. Understand types of database failure and recovery

UNIT – I

Introductory concepts of DBMS: Introduction and example of DBMS, Characteristics of the database, Actors on the scene and Workers behind the scene in DBMS, Database System-Concepts and Architecture: Data models, Schemas and Instances, Three Schema architecture and Data Independence, Database language and interfaces, The Database System Environment. Data modeling using the Entity Relationship Model: using high level conceptual data models for database design, Entity, Entity types, Entity sets, Attributes and keys, Relationship types, Relationship sets, Roles and structural constraints, an example Database Application, Refining the ER design for the company database.

Self Study: ER diagrams, naming conventions and design issues, Advantages of Using the DBMS Approach. **10 Hours**

UNIT -II

Relational Data Model and Relational Database Constraints: Relational Model concepts, Relational Model constraints and Relational Database schemas, Update operations, Transactions, dealing with constraint violations. Basic SQL: Data Definition and Data Types; Specifying basic constraints in SQL, Basic Retrieval Queries in SQL, INSERT, DELETE, and UPDATE Statements in SQL, More Complex SQL Retrieval Queries, Schema Change Statements in SQL,

Self study: Specifying Constraints as Assertions and Actions as Triggers, Views (Virtual Tables) in SQL.

11 Hours

UNIT – III

Relational Algebra and Relational Calculus: Unary relational operations, Relational Algebra operations from set theory, Binary relational operations, Additional relational operations, example of queries in relational algebra. Database Design-1: Functional Dependencies; Normal Forms Based on Primary Keys; General Definitions of Second and Third Normal Forms;

Self study: Informal Design Guidelines for Relation Schemas **10 Hours**

UNIT – IV

Database Design-2: Boyce-Codd Normal Form; Multi valued Dependencies and Fourth Normal Form; Join Dependencies and Fifth Normal Form. NoSQL Data Management: introduction to NoSQL, why NoSQL? Characteristics of NoSQL, History of NoSQL, Types of NoSQL data models, schema-less databases, Materialized Views, Distribution Models, CAP Theorem, Sharding
Self study: Difference between SQL and NoSQL. **10 Hours**

UNIT -V

Transaction processing concepts: Introduction to Transaction processing; Transactions and System concepts; Desirable properties of transactions; Characterizing Schedules based on Serializability. Concurrency control and recovery techniques: Two-phase locking techniques for concurrency control, concurrency control based on timestamp ordering; Database Recovery Techniques: NO-UNDO/REDO Recovery Based on Deferred Update, Recovery techniques based on immediate update.
Self study: Characterizing Schedules based on Recoverability, shadow paging, The ARIES Recovery Algorithm **11 Hours**

Text Books:

1. Fundamentals of Database Systems – Elmasri and Navathe, 6th Edition, Addison-Wesley, 2011
2. DT Editorial Services, "Black Book- Big Data (Covers Hadoop 2, MapReduce, Hive, Yarn, PIG, R, Data visualization)", Dream tech Press edition 2016. (Unit-4)

Reference Books:

1. Data Base System Concepts – Silberschatz, Korth and Sudharshan, 5th Edition, Mc-GrawHill, 2006
2. 2. An Introduction to Database Systems – C.J. Date, A. Kannan, S.Swamynatham, 8th Edition, Pearson Education, 2006.

Course Outcomes: After completing the course, the students will be able to

1. Understand and explore the needs and concepts of relational database management, non relational database, transaction processing and related relational database facilities.
2. Apply the knowledge of logical database design principles to real time issues.
3. Analyze and design relational and document-based data model concepts.
4. Develop applications using Relational database and NoSQL database.

Course Articulation Matrix (CAM)															
Course Outcomes	**Program Outcomes (PO's)**												**PSO's**		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	1	1							1	1		2	1		
CO 2		1	1	1	1		1		1	2		2	2		
CO 3	2	2	2	2	2		1		2	3	1	1	2		
CO 4	2	2	3	2	3			2	3	3	2	1	2		

Course Title: DATA COMMUNICATIONS			
Course Code: P17IS52	**Sem : V**	**L- T – P - H : 3 – 2– 0 -5**	**Credit : 4**
Contact period : Lecture: 52 Hr, Exam:3 hr		**Weightage: CIE: 50, SEE:50**	

Prerequisites: Operating System and Computer Organization

Course learning objectives(CLOs)

This course aims to

1. Understand the Data communication system, Networks and Internet.
2. Understand and recognize the OSI model and TCP/IP model, and also explain the layers in each model.
3. Identify the periodic analog signals and nonperiodic digital signals.
4. Discuss the digital-to-digital conversion, digital-to-analog conversion, analog-to-analog conversion and analog-to-digital conversion techniques.
5. Identify the different types of guided media and unguided media.
6. Identify the different error detection and correction techniques handled by Data link layer.
7. Discuss the taxonomy of protocols.
8. Compare High-level Data Link Control protocol and Point-to-Point protocol.
9. Identify the different multiple access techniques and also discuss the internet.
10. Discuss the wireless LANs, connecting LANs, backbone networks and virtual LANs.

Course Content

UNIT- I

Overview Of Networks And Physical Layer

Introduction: Data Communications; Networks; The Internet; Layered tasks; The OSI Model and the layers in the OSI model; TCP / IP Protocol Suite; Addressing; **Physical Layer:** Analog and digital signals; periodic analog signals - sine wave, phase, wavelength, time and frequency domain, bandwidth; Digital signals; Transmission impairment.

11 Hours

Self Study: Data rate limits; Performance

UNIT- II

Physical Layer Continued

Digital Transmission and Analog Transmission: Digital-to-Digital conversion; Analog-to-Digital conversion; Transmission modes; Digital-to-Analog conversion; Analog-to-Analog conversion; **Transmission media:** Guided Media: Twisted pair cable, Coaxial cable, Fiber-Optic cable; Microwaves, Infrared waves**.**

11 Hours

Self Study: Unguided media: Radio waves,

UNIT- III

Data Link Layer – 1

Error Detection and Correction: Introduction; Block coding; Linear block codes; Cyclic codes - CRC, polynomials; **Data Link Control:** Framing; Flow and Error control; Protocols; Noiseless channels; Noisy channels.

10 Hours

Self Study: Checksum.

UNIT- IV

Data Link Layer – 2

Data Link Control: HDLC; Point-to-point Protocol - framing, transition phases, Multiplexing, Multilink PPP; **Multiple Access:** Controlled Access; Channelization. **Wired LANs:** Ethernet: IEEE standards; Standard Ethernet; Fast Ethernet, Gigabit Ethernet.

10 Hours

Self Study: Random Access.

UNIT- V

Data Link Layer – 3

Wireless LANs: IEE 802.11: Architecture, MAC Sub layer, Addressing Mechanism; Bluetooth: Architecture, Bluetooth layer, Radio layer, Base band layer;**:** Connecting devices, Backbone Networks, Virtual LANs.

10 Hours

Self Study: Connecting LANs

Text Book :

1. Behrouz A. Forouzan: Data Communications and Networking, 5th Edition, Tata McGraw-Hill, 2013.

Reference Books :

1.Alberto Leon-Garcia and IndraWidjaja: Communication Networks - Fundamental Concepts and Key architectures, 3rd Edition, Tata McGraw- Hill, 2006.
2. William Stallings: Data and Computer Communication, 8th Edition, Pearson Education, 2007.

Course outcomes

CO 1. Describe the OSI model and TCP/IP model, and also explain the layers in each model.
CO 2. Apply digital transmission techniques to transmit the data digitally.
CO3. Determine the better error detection and correction technique.
CO4. Analyze the data link control and media access control related to data link layer.
CO5. Identify the different wireless LANs and connecting devices.

Course Articulation Matrix (CAM)															
Course Outcomes	Program Outcomes (PO's)												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	2	2												2	2
CO 2	2	2	2											3	2
CO 3	2	2	2	2										3	2
CO 4	2	2	2											3	2
CO 5	2	2	2											3	2

Course title: SOFTWARE TESTING			
Course Code: P17IS53	**Semester: V**	**L-T-P-H:4-0-0-4**	**Credit:4**
Contact Period: Lecture: 52 Hrs, Exam: 3 Hrs		**Weightage: CIE:50%, SEE: 50%**	

Prerequisites: Software Engineering

Course Learning Objectives

This course aims to,

1. Define a software Testing, and understand its different methods of software testing and Ability to explains what a CFG is and how to construct one.-L1, L2
2. Understand the saturation effect, its impact on software reliability, and ways to overcome its shortcoming and Ability to apply equivalence partition technique for software testing. -L2,L3
3. Understand how boundary value analysis technique used for software testing and Recognize and distinguish basic terms Adequacy Coverage. -L2,L4
4. Understand practical uses and limitations of structural testing and Ability to analyses The data flow to build software testing models.-L2,L4
5. Understand the purpose of defining test adequacy criteria, and their limitation and Understand strategies for ordering construction and testing.-L2

Course Content

UNIT- I

BASICS OF SOFTWARE TESTING: Human Errors and Testing; Software Quality; Requirements, Behavior and Correctness; Correctness versus Reliability; Testing and Debugging; Test Metrics. Software and Hardware Testing; Testing and Verification; Defect Management; Execution History; Test generation Strategies, Static Testing. Model-Based Testing and Model Checking; Control-Flow Graph; Types of Testing; The Saturation Effect.

10 Hours

Self Study: The Saturation Effect.

UNIT- II

TEST GENERATION FROM REQUIREMENTS: Introduction; The Test-Selection Problem; Equivalence Partitioning; Boundary Value Analysis; Category-Partition Method. Cause-Effect Graphing, Test Generation from Predicates.

10 Hours

Self Stydy: Test Generation from Predicates

UNIT- III

STRUCTURAL TESTING: Overview; Statement testing; Branch testing; Condition testing, Path testing; Procedure call testing; Comparing structural testing criteria; The infeasibility problem. **DEPENDENCE, DATA FLOW MODELS, AND DATA FLOW TESTING**: Definition-Use pairs; Data flow analysis; Classic analyses; From execution to conservative flow analysis; Data flow analysis with arrays and pointers; Inter-procedural analysis; Overview of data flow testing; Definition Use associations; Data flow testing criteria; Data flow coverage with complex structures; The infeasibility problem.

12 Hours

Self Study: Data flow coverage with complex structures; The infeasibility problem.

UNIT- IV

TEST CASE SELECTION AND ADEQUACY, TEST EXECUTION: Overview; Test specification and cases; Adequacy criteria; Comparing criteria; Overview of test execution; From test case specification to test cases; Scaffolding; Generic versus specific scaffolding; Test oracles;

Self-checks as oracles; Capture and replay.

10 Hours

Self Study: Self-checks as oracles; Capture and replay.

UNIT- V

PROCESS: Test and analysis activities within a software process: The quality process; Planning and monitoring; Quality goals; Dependability properties; Analysis; Testing; Improving the process; Organizational factors. Integration and component-based software testing: Overview; Integration testing strategies; Testing components and assemblies. System, Acceptance and Regression Testing: Overview; System testing; Acceptance testing; Usability; Regression testing; Regression test selection techniques; Test case prioritization and selective execution.

10 Hours

Self Study: Test case prioritization and selective execution.

Text books:

1. Foundations of Software Testing - Aditya P Mathur, Pearson Education, 2008.
2. Software Testing and Analysis: Process, Principles and Techniques – Mauro Pezze, Michal Young, John Wiley & Sons, 2008.

Reference Books:

1. Software testing Principles and Practices – Gopalaswamy Ramesh, Srinivasan Desikan, 2ndEdition, Pearson,2007
2. Software Testing – Ron Patton, 2nd edition, Pearson Education, 2004.

Course Outcomes:

After learning all the units of the course, the student is able to

CO 1. Identify Test cases, Error and fault taxonomies, Levels of testing.

CO 2. Classify different types of testing (Boundary Value Testing, Equivalence Class Testing and Decision Table-Based Testing).

CO 3. Recognize Alternative life - cycle models, recognize Basic concepts for requirements specification, assess context of interaction.

CO 4. Recognize approaches for Test Execution: from test case specifications to test cases, Scaffolding, Generic versus specific scaffolding.

CO 5. Identify and plan strategies to test design specifications document.

Course Articulation Matrix

Course Outcomes	Program Outcomes (PO's)												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	2	3										2	3		
CO 2	3	3			1							2	3		
CO 3	2	2	3		1							2	3		
CO 4	2	2			1							2	3		
CO 5	2	2	3		1							2	3		

Course Title: PYTHON PROGRAMMING			
Course Code: P17IS54	**Semester : V**	**L- T – P - H - 4 : 0 : 0 : 4**	**Credit : 4**
Contact period : Lecture: 52 Hrs, Exam:3 hrs		**Weightage: CIE: 50 SEE:50**	

Prerequisites:

- Experience with a high level language (C/C++, Java) is suggested.
- Prior knowledge of a scripting language (Perl, UNIX/Linux shells).
- An object-oriented concept is helpful but not mandatory.

Course Learning Objectives (CLOs)

This course aims to:

1. To understand why Python is a useful scripting language for developers.
2. To learn how to design and program Python applications.
3. To learn how to use lists, tuples, and dictionaries in Python programs.
4. To learn how to identify Python object types.
5. To learn how to use indexing and slicing to access data in Python programs.
6. To define the structure and components of a Python program.
7. To learn how to write loops and decision statements and functions and pass arguments in Python.
8. To learn how to build and package Python modules for reusability.
9. To learn how to read and write files in Python.
10. To learn how to design object-oriented programs with Python classes.
11. To learn how to use class inheritance and exception handling in Python for reusability.

UNIT – I

Basics of Python Programming: Features of Python, History of Python, The future of Python, Writing and Executing First Python Program, literal Constants, Variables and Identifiers, Data Types, Input Operation, Comments, Reserved Words, Operators and Expressions, Expressions in Python, Operations on strings, Other Data types, and Type conversion. **Decision Control Statements:** introduction to Decision Control Statements, Selection/Conditional branching statements, Basic Loop Structure / Iterative statements, Nested Loops, The Break statement, The Continue statement, The Pass statement, The else statement used with loops. **Self Study:** Installing Python, Testing and Debugging, Simple Calculator, Generating a calendar. **10 Hours**

UNIT – II

Functions and Modules: Introduction, Function Definition, Function call, variable scope and lifetime, The return statement, More on defining functions, Lambda function, Documentation strings, Good Programming practices, Recursive functions, Modules, Packages in python, standard library modules, Globals(), locals(), and reload(). **Python strings revisited:** Introduction, Concatenating, appending and multiplying strings, strings are immutable, strings formatting operator, built-in string methods and functions, slice operation, ord() and chr() functions, in and not in operators, comparing strings, iterating strings, the string module. **Self Study:** Function redefinition, Function as Objects, Regular functions, Meta characters in regular expression Tower of Hanoi, **11 Hours**

UNIT – III

Data structure: sequence, Lists, Functional Programming, Tuples, Sets, Dictionaries.
Self Study: Iterator and Generator. **10 Hours**

UNIT – IV

Classes and Objects: introduction, Classes and objects, Class method and self argument, The_init_() method, Class variables and object variables, The_del_() method, order special methods, public and private data members, private methods, calling a class method from another class method, built in functions to check, get, set and delete class attributes. **Inheritance:** Introduction, Inheriting Classes in python, Types of inheritance.

Self Study: Built-in class attributes, Garbage collections, class methods, Static methods, overloading + and – Operator.

11 Hours

UNIT - V

File Handling: Introduction, File path, Types of files, opening and closing files, reading and writing files, file positions, renaming and deleting files and directory methods. **Error and Exception Handling:** Introduction to errors and exceptions, Handling exceptions, Multiple except blocks, multiple exceptions in a single block, except block without exception, the else clause, raising exceptions, predefined clean-up action.

Self Study: Re-raising exceptions, Assertions in python, instantiating exceptions, handling exceptions in invoked functions, the finally block

10 Hours

Text Books:

1. "Python Programming" using problem solving approach by Reema Thareja Oxford University, 2017.

Reference Books:

1. Practical Programming: An introduction to Computer Science Using Python, second edition, Paul Gries, Jennifer Campbell, Jason Montojo, The Pragmatic Bookshelf.
2. Learning Python, Fourth Edition, Mark Lutz, O'Reilly publication

Course Outcomes (COs)

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

CO1: Understand and comprehend the basics of python programming.

CO2: Understand and implement modular approach using python

CO3: Learn and implement various data structures provided by python library including string, list, dictionary and its operations etc

CO4: Understands about files and its applications.

CO5: Develop real-world applications using oops, files and exception handling provided by python.

Course Articulation Matrix (CAM)

Course Outcomes	Program Outcomes (PO's)												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	2	2	2	2								2			
CO 2	2	1	3									1			
CO 3	2	2	1	2					2						
CO 4	1	1	2						2						
CO 5	2	1	2	3	2					2		2			

Course title: PYTHON PROGRAMMING LAB			
Course Code: P17ISL57	**Semester: V**	**L-T-P-H:0 - 0 – 0 -3**	**Credit:1.5**
Contact Period: Lecture: 36 Hr, Exam: 3 Hr		**Weightage: CIE:50%, SEE: 50%**	

Course Objective:

1. Learn Syntax and Semantics and create Functions in Python.
2. Handle Strings and Files in Python.
3. Understand Lists, Dictionaries and Regular expressions in Python.
4. Implement Object Oriented Programming concepts in Python
5. Build Web Services and introduction to Network and Database Programming in Python.

Another Way to specify Programs

1. Programs on Basics.
2. Programs on Operators
3. Programs on control flows
4. Programs on Data structures
5. Programs on Files.
6. Programs on Functions.
7. Programs on Multi-Dimensional Lists.

Course Outcomes:

1. Understand the benefits of python programming over other languages and program using python language.
2. Understand and implement classes and objects in python.
3. Implement various data structures in Python language.

Course Articulation Matrix (CAM)															
Course Outcomes	**Program Outcomes (PO's)**												**PSO's**		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	3	3	3	2			2			2					
CO 2	3	2	3	2			2			2					
CO 3	3	2	3	2			2			2					

Course Title: DATA BASE MANAGEMENT SYSTEM LAB			
Course Code: P17ISL58	**Semester: V**	**L-T-P-H : 4:0:0:4**	**Credit:1.5**
Contact Period: Lecture: 52 Hrs, Exam: 3 Hrs		**Weightage: CIE:50%, SEE: 50%**	

Course Learning Objectives:

1. Foundation knowledge in database concepts, technology and practice to prepare students into well-informed database application developers.
2. Strong practice in SQL programming through a variety of database problems.
3. Develop database applications using front-end tools and back-end DBMS

PART – A: Database Queries (Max. exam Marks – 30):

- Design, develop and implement the specified queries for the following problems using oracle, MySQL, MS SQL server or any other DBMS under Linux/Windows environment.
- Create schema and insert at least five records for each table. Add appropriate database constraints.

PART – B: Mini Project (Max. Exam Marks: 20):

- Use C#, Java, PHP, Python, Visual Basic or any other similar front end tool. All applications as a standalone or web based applications (optional).

PART – A

1. Consider the following schema for a Library Database:

BOOK (Book_id, Title, Publisher_Name, Pub_Year)

BOOK_AUTHORS (Book_id, Author_Name)

PUBLISHER (Name, Address, Phone)

BOOK_COPIES (Book_id, Branch_id, No-of_Copies)

BOOK_LENDING (Book_id, Branch_id, Card_No, Date_Out, Due_Date)

LIBRARY_BRANCH (Branch_id, Branch_Name, Address)

Write SQL queries to

a) Retrieve details of all books in the library – id, title, name of publisher, authors, number of copies in each branch, etc.

b) Get the particulars of borrowers who have borrowed more than 3 books, but from Jan 2017 to Jun 2017

c) Delete a book in BOOK table. Update the contents of other tables to reflect this data manipulation operation.

d) Partition the BOOK table based on year of publication. Demonstrate its working with a simple query.

e) Create a view of all books and its number of copies that are currently available in the Library.

2. Consider the following schema for Order Database:

SALESMAN (Salesman_id, Name, City, Commission)

CUSTOMER (Customer_id, Cust_Name, City, Grade, Salesman_id)

ORDERS (Ord_No, Purchase_Amt, Ord_Date, Customer_id, Salesman_id)

Write SQL queries to:

a) Count the customers with grades above Bangalore's average.

b) Find the name and numbers of all salesmen who had more than one customer.

c) List all salesmen and indicate those who have and don't have customers in their cities (Use UNION operation.)

d) Create a view that finds the salesman who has the customer with the highest order of a day.

e) Demonstrate the DELETE operation by removing salesman with id 1000. All his orders must also be deleted.

3. Consider the schema for Movie Database:

ACTOR *(*Act_id, Act_Name, Act_Gender*)*

DIRECTOR *(*Dir_id, Dir_Name, Dir_Phone*)*

MOVIES *(*Mov_id, Mov_Title, Mov_Year, Mov_Lang, Dir_id*)*

MOVIE_CAST *(*Act_id, Mov_id, Role*)*

RATING *(*Mov_id, Rev_Stars*)*

Write SQL queries to:

a) List the titles of all movies directed by 'Hitchcock'.

b) Find the movie names where one or more actors acted in two or more movies.

c) List all actors who acted in a movie before 2000 and also in a movie after 2015 (use JOIN operation).

d) Find the title of movies and number of stars for each movie that has at least one rating and find the highest number of stars that movie received. Sort the result by movie title.

e) Update rating of all movies directed by 'Steven Spielberg' to 5

4. Consider the schema for College Database:

   STUDENT (USN, Sname, Address, Phone, Gender)

   SEMSEC (SSID, Sem, Sec)

   CLASS (USN, SSID)

   SUBJECT (Subcode, Title, Sem, Credits)

   IAMARKS (USN, Subcode, SSID, Test1, Test2, Test3, FinalIA)

   Write SQL queries to:

   a) List all the student details studying in fourth semester 'C' section.

   b) Compute the total number of male and female students in each semester and in each section.

   c) Create a view of Test1 marks of student USN '1BI15CS101' in all subjects.

   d) Calculate the FinalIA (average of best two test marks) and update the corresponding table for all students.

   e) Categorize students based on the following criterion:

      If FinalIA = 17 to 20 then CAT = 'Outstanding'

      If FinalIA = 12 to 16 then CAT = 'Average'

      If FinalIA< 12 then CAT = 'Weak'

      Give these details only for 8th semester A, B, and C section students.

5. Consider the schema for Company Database:

   EMPLOYEE (SSN, Name, Address, Sex, Salary, SuperSSN,Dno)

   DEPARTMENT (Dno, Dname, MgrSSN, MgrStartDate)

   DLOCATION (Dno,Dloc)

   PROJECT (Pno, Pname, Plocation,

   Dno) WORKS_ON (SSN, Pno, Hours)

   Write SQL queries to:

   a) Make a list of all project numbers for projects that involve an employee whose last name is 'Scott', either as a worker or as a manager of the department that controls the project.

   b) Show the resulting salaries if every employee working on the 'IoT' project is given a 10 percent raise.

   c) Find the sum of the salaries of all employees of the 'Accounts' department, as well as the maximum salary, the minimum salary, and the average salary in this department

   d) Retrieve the name of each employee who works on all the projects controlled by department number 5 (use NOT EXISTS operator).

e) For each department that has more than five employees, retrieve the department number and the number of its employees who are making more than Rs. 6,00,000

PART – B

Develop a menu driven project for management of database system:

1. Student Feedback system
2. Library management system
3. Placement management System
4. Student Registration system
5. Attendance Management System
6. Student Result Analysis System

Course Outcomes:

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

1. **Design** and implement a database schema for a given problem.
2. **Generate** queries on a database using SQL commands.
3. **Declare** and enforce integrity constraints on a database using a state-of-the-art RDBMS.

Course Articulation Matrix (CAM)															
Course Outcomes	**Program Outcomes (PO's)**												**PSO's**		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	3	3	3			2				3		2	2		
CO 2	2	1	2			3				3		3	2		
CO 3	2	3	3			2				3		2	2		

Foundation Electives

Course Title: UNIX SYSTEM PROGRAMMING			
Course Code:P17IS551	**Semester: V**	**L-T-P-H : 4:0:0:4**	**Credit:3**
Contact Period: Lecture: 52 Hrs, Exam: 3 Hrs		**Weightage: CIE:50 SEE: 50**	

Course Learning Objectives (CLOs)

This course aims to:

1. Interpret the features of UNIX and basic commands.
2. Demonstrate different UNIX files and permissions
3. Implement shell programs.
4. Explain UNIX process, IPC and signals.

UNIT - I

Introduction: Unix Components/Architecture. Features of UNIX. The UNIX Environment and UNIX Structure, Posix and Single Unix specification. General features of Unix commands/ command structure. Command arguments and options. Basic Unix commands such as echo, printf, ls, who, date, passwd, cal, Combining commands. Meaning of Internal and external commands. The type command: knowing the type of a command and locating it. The root login. Becoming the super user: su command.**Unix files:** Naming files. Basic file types/categories. Organization of files. Hidden files. Standard directories, Parent child relationship. The home directory and the HOME variable. Reaching required files- the PATH variable, manipulating the PATH, Relative and absolute Pathnames, Directory commands – pwd, cd, mkdir, rmdir commands. The dot (.) and double dots (..) notations to represent present and parent directories and their usage in relative path names. **Self study:** File related commands – cat, mv, rm, cp, wc and od commands **12 Hours**

UNIT - II

File attributes and permissions: The ls command with options. Changing file permissions: the relative and absolute permissions changing methods. Recursively changing file permissions. Directory permissions. **The shells interpretive cycle:** Wild cards. Removing the special meanings of wild cards. Three standard files and redirection. Connecting commands: Pipe. Basic and Extended regular expressions. The grep, egrep. Typical examples involving different regular expressions. **Shell programming:** Ordinary and environment variables. The .profile. Read and readonly commands. Command line arguments. exit and exit status of a command. Logical operators for conditional execution. The test command and its shortcut. The if, while, for and case control statements. The set and shift commands and handling positional parameters. The here (<<) document and trap command. **Self study:** Simple shell program examples. **10 Hours**

UNIT - III

UNIX File APIs: General File APIs, File and Record Locking, Directory File APIs, Device File APIs, FIFO File APIs, Symbolic Link File APIs. **UNIX Processes and Process Control:** The Environment of a UNIX Process: Introduction, main function, Process Termination, Command-Line Arguments, Environment List, Memory Layout of a C Program, Shared Libraries, Memory Allocation, Environment Variables, setjmp and longjmp Functions, getrlimit, setrlimit Functions. **Process Control:** Introduction, Process Identifiers, fork, vfork, exit, wait, waitpid, wait3, wait4 Functions, Race Conditions, exec Functions **Self study:** UNIX Kernel Support for Processes **10 Hours**

UNIT - IV

Changing User IDs and Group IDs, Interpreter Files, system Function, Process Accounting, User Identification, Process Times, I/O Redirection. Overview of IPC Methods, Pipes, popen, pclose Functions, Co processes, FIFOs, System V IPC, Message Queues, Semaphores. Shared Memory, Client-Server Properties. **Self study:** Stream Pipes **10 Hours**

UNIT -V

Signals and Daemon Processes: Signals: The UNIX Kernel Support for Signals, signal, Signal Mask, sigaction, The SIGCHLD Signal and the waitpid Function, The sigsetjmp and siglongjmp Functions, Kill, Alarm, Interval Timers, POSIX.lb Timers. Daemon Processes: Introduction, Daemon Characteristics, Coding Rules, Error Logging. **Self-study:** Client-Server Model. **10 Hours**

Text Books:

1. Sumitabha Das., Unix Concepts and Applications., 4thEdition., Tata McGraw Hill (Chapter 1,2 ,3, 4, 5, 6, 8, 13, 14)
2. W. Richard Stevens: Advanced Programming in the UNIX Environment, 2nd Edition, Pearson Education, 2005 (Chapter 3,7,8,10,13,15)
3. UNIX System Programming Using C++ - Terrence Chan, PHI, 1999. (Chapter 7,8,9,10)

Reference Books:

1. M.G. Venkatesh Murthy: UNIX & Shell Programming, Pearson Education.
2. Richard Blum , Christine Bresnahan : Linux Command Line and Shell Scripting Bible, 2nd Edition, Wiley,2014.

Course Outcomes (COs)

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

1. Explain Unix Architecture, File system and use of Basic Commands
2. Illustrate Shell Programming and to write Shell Scripts
3. Categorize, compare and make use of Unix System Calls
4. Build an application/service over a Unix system.

Course Articulation Matrix (CAM)															
Course Outcomes	**Program Outcomes (PO's)**												**PSO's**		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	1	2	2										1		
CO 2	1	2	2										1		
CO 3	1	1	2										1		
CO 4	1	1	2										1		

Course Title: USER INTERFACE DESIGN			
Course Code:P17IS552	**Semester: V**	**L-T-P-H : 4:0:0:4**	**Credit:3**
Contact Period: Lecture: 52 Hrs, Exam: 3 Hrs		**Weightage: CIE:50%, SEE: 50%**	

Prerequisites: Programming Principles, Software Engineering

Course Learning Objectives (CLOs)

This course aims to

1. Describe basic user interface engineering definitions, concepts, and principles.
2. Discuss, analyze and evaluate a variety of approaches to user interface design.
3. Acquire an understanding of needs analysis of user interactions/interfaces, legal, ethical, and social issues.
4. Design, develop, implement, and present a new user interface for an application.
5. Explain Information Search and data visualization methods.

Course Content

UNIT- I

Introduction Usability of Interactive Systems – Introduction, Usability Goals and Measures, Usability Motivations, Goals for Our Profession Universal Usability – Introduction, Variations in Physical Abilities and Physical Workspaces, Diverse Cognitive and Perceptual Ability, Personality Differences, Cultural and International Diversity, Users with Disabilities, Older Adult Users, Children, Guidelines, Principles, and Theories – Introduction, Guidelines, Principles, Theories.

12 Hour

Self Study: Accommodating Hardware and Software Diversity

UNIT- II

Design Processes Design – Introduction, Organizational Support for Design, The Design Process and Design Frameworks, Design Methods, Design Tools, practices and Patterns, Social Impact Analysis, Legal Issues Evaluation and the User Experience– Introduction, Expert Reviews and Heuristics, Usability Testing and Laboratories, Survey Instruments, Acceptance Tests, Evaluation during Active Use and Beyond **10Hours**

Self Study: Controlled Physiologically Orientated Experiments.

UNIT- III

Interaction Styles – I Direct Manipulation and Immersive Environments – Introduction, What is Direct Manipulation?, Some Examples of Direct Manipulation, 2-D and 3-D Interfaces, Tele-operation and Presence, Fluid Navigation– Introduction, Navigation by Selection, Small Displays, Content Organization, Audio Menus, Form Fill-in and Dialog Boxes

10Hours

Self Study: Augmented and Virtual Reality

UNIT- IV

Interaction Styles-II Expressive Human and Command Languages – Introduction, Speech Recognition, Speech Production, Human Language Technology, Devices – Introduction, Keyboards and Keypads, Pointing Devices, Displays **10 Hours**

Self Study: Traditional Command Language

UNIT- V

Design Issues Information Search – Introduction, Five-Stage Search Framework, Dynamic Queries and Faceted Search, Command Languages and "Natural" Language Queries, Multimedia

Document Search and Other Specialized Search, The Social Aspect of Search Data Visualization– Introduction, Tasks in Data Visualization, Visualization of Data Type.
Self Study: Challenges of Data Visualization **10 Hours**

Text Book:

1. **Designing the User Interface:** Strategies for Effective Human-Computer Interaction, 6th Edition by Ben Shneiderman, Catherine Plaisant, and Steven Jacobs. (2018, Pearson Education Company).

Reference Books:

1. User Interface Design And Evaluation by Debbie Stone, Mark Woodroffe, Caroline Jarrett, ShaileyMinocha, Morgan Kaufmann Publishers, ISBN: 0120884364
2. The Design of Everyday Things: Revised and Expanded Edition by Don Norman, November 5, 2013

Course Outcomes

After learning all the units of the course, the student is able to

1. Apply basic user interface engineering definitions, concepts, and principles.
2. Analyze and evaluate a variety of approaches to user interface design.
3. Analysis of user interactions/interfaces, legal, ethical, and social issues.
4. Design, develop, implement, and present a new user interface for an application.
5. Apply powerful search and visualization methods.

Course Articulation Matrix (CAM)															
Course Outcomes	**Program Outcomes (PO's)**												**PSO's**		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	2		2		1								1	1	1
CO 2	2		2		1								1	1	1
CO 3	2		2		1	1	1	1					1	1	1
CO 4	2		2		1								1	1	1
CO 5	2		2		1								1	1	1

Course Title: C# PROGRAMMING & .NET			
Course Code:P17IS553	**Semester: V**	**L-T-P-H : 4:0:0:4**	**Credit:3**
Contact Period: Lecture: 52 Hrs, Exam: 3 Hrs		**Weightage: CIE:50%, SEE: 50%**	

Prerequisites : Object Oriented Programming with Java

Course Learning Objectives (CLOs)

This course aims to

1. Identify the basic building blocks of .NET.
2. Provide the fundamental concepts of object oriented programming.
3. Implement C# programming and .NET features.
4. Build C# Applications with and without using VS .NET IDE.
5. Analyze& solve real world problems using object-oriented approach.
6. Understand structured exception handling.
7. Understand Interfaces and Collections in C#.
8. Understand Generics in C#.
9. Understand life time of the objects in C#.
10. Implement the advanced concepts of C# programming.

Course Contents

UNIT- I

The Philosophy of .NET: An Initial Look at the .NET Platform, Introducing the Building Blocks of the .NET Platform (the CLR, CTS,and CLS), Additional .NET-Aware Programming Languages, An Overview of .NET Binaries (aka Assemblies), The Role of the Common Intermediate Language , The Role of .NET Type Metadata, The Role of the Assembly Manifest, Understanding the Common Type System, Intrinsic CTS Data Types, Understanding the Common Languages Specification, Understanding the Common Language Runtime, The Assembly/Namespace/Type Distinction, The Role of the Microsoft Root Namespace, Accessing a Namespace Programmatically. **Building C# Applications:** The Role of the .NET Framework 4.5 SDK, Building C # Application using csc.exe, Working with C# Response Files, Building .NET Applications Using Notepad++,Building .NET Applications Using Sharp Develop, Building .NET Applications Using Visual C# Express, Building .NET Applications Using Visual Studio. **Self-study component**: Referencing External Assemblies, Exploring an Assembly Using ildasm.exe, The Visual Class Designer, The Integrated .NET Framework 4.5 SDK Documentation System. **11Hours**

UNIT- II

Core C# Programming: The Anatomy of a Simple C# Program, An Interesting Aside: Some Additional Members of the System. Environment Class, The System. Console Class, Basic Input and Output with the Console Class, System Data Types and Corresponding C# Keywords, Working with String Data, Narrowing and Widening Data Type Conversions, Understanding Implicitly Typed Local Variables, C# Iteration Constructs, Decision Constructs and the Relational/Equality Operators, Methods and Parameter Modifies, Understanding C# Arrays, Understanding the enum Type, Understanding the Structure Type, Understanding Value Types and Reference Types.

Understanding Encapsulation: Introducing the C# Class Type, Understanding Constructors, The Role of the this Keyword, Understanding the static Keyword, Defining the Pillars of OOP, C# Access Modifiers, The First Pillar: C#'s Encapsulation Services, Understanding Automatic Properties, Understanding Object Initialization Syntax. **Self-study component:** Understanding C# Nullable Types, The?? Operator, Working with Constant Field Data, Understanding Partial Types.

11 Hours

UNIT- III

Understanding Inheritance and Polymorphism: The Basic Mechanics of Inheritance, The Second Pillar of OOP: The Details of Inheritance, Programming for Containment/Delegation, The Third Pillar of OOP: C#'s Polymorphic Support, Understanding Base Class/Derived Class Casting Rules, The Master Parent Class: System. Object. **Understanding Structured Exception Handling:** Ode to Errors, Bugs, and Exceptions, The Role of .NET Exception Handing, The Simplest Possible Example, Configuring the State of an Exception, System-Level Exceptions (System.System Exception), Application-Level Exceptions (System. Application Exception), Building Custom Exceptions, Processing Multiple Exceptions. **Self-study component**: Who Is Throwing What? The Result of Unhandled Exceptions, Debugging Unhandled Exceptions Using Visual Studio. **10 Hours**

UNIT- IV

Working with Interfaces: Understanding Interface Types, Defining Custom Interfaces, Implementing an Interface, Invoking Interface Members at the Object Level, Interfaces As Parameters, Interfaces As Return Values, Arrays of Interface Types, Implementing Interfaces Using Visual Studio, Explicit Interface Implementation, Designing Interface Hierarchies, The IEnumerable and IEnumerator Interfaces, The ICloneable Interface. **Collections and Generics:** The Motivation for Collection Classes,the System.Collections Namespace, An Illustrative Example: Working with the Array List, The Problems of Nongeneric Collections, The Role of Generic Type Parameters, The System.Collections.Generic Namespace. **Self-study component:** The IComparable Interface, Understanding Collection Initialization Syntax. **10 Hours**

UNIT- V

Delegates, Events, andAdvanced C# Language Features: Understanding the .NET Delegate Type, The Simplest Possible Delegate Example, Sending Object State Notifications Using Delegates, Understanding Generic Delegates, Understanding C# Events, Understanding C# Anonymous Methods, Understanding Indexer Methods, Understanding Operator Overloading, Understanding Custom Type Conversions. **Understanding Object Lifetime:** Classes, Objects, and References, The Basics of Object Lifetime, The Role of Application Roots, Understanding Object Generations, The System. GC Type, Building Finalizable Objects, Building Disposable Objects, Building Finalizable and Disposable Types. **Self-study component:** Understanding Extension Methods,A Formalized Disposal Pattern. **10 Hours**

Text Books:

1. Andrew Troelsen: Pro C# 5.0 and the .NET 4.5 Framework, Sixth Edition, Apress, 2012. Chapters: 1 to 11.

2. E Balaguruswamy: Programming in C#, 3rd edition, Tata McGraw Hill, Reprint 2014.

References:

1. Tom Archer: Inside C#, WP Publishers, 2007.

2. Herbert Schildt: C# The Complete Reference, Tata McGraw Hill.

Course Outcomes

After learning all the units of the course, the student is able to

1. Solve simple problems using C# Language either by using Visual Studio .NET development tool or by using Microsoft .NET SDK.
2. Develop C# programs with well understanding of C# language constructs.
3. Implement Inheritance and / or Polymorphism and apply exception handling concepts to improve application performance.
4. Work with interfaces, collections and Generics

5. Design and implement additional features like interfaces, delegates, events, and advanced techniques in C# by applying garbage collection concepts to avoid memory leaks.

Course Articulation Matrix (CAM)															
Course Outcomes	**Program Outcomes (PO's)**												**PSO's**		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	2	2	2		1								1	1	1
CO 2	2	2	2		1								1	1	1
CO 3	2	2	2		1								1	1	1
CO 4	2	2	2		1								1	1	1
CO 5	2	2	2		1								1	1	1

Course Title : SYSTEM SOFTWARE			
Course Code : P17IS554	**Semester : V**	**L - T – P-H : 3 - 0 - 2-5**	**Credit : 3**
Contact Period: Lecture: 52 Hrs, Exam: 3 Hrs		**Weightage: CIE:50; SEE:50**	

Prerequisites:

- Assembly language programming
- Data Structure and algorithms
- Basics of computer organization

Course Learning Objectives (CLOs)

This course aims to

1. Understand the basic machine architecture
2. Design various system software's
3. Know the working principle of assemblers, linkers and loaders.
4. Analyze the working principle of macro processor
5. Understand the application of lex and yacc tools for developing lexical analyzers and parsers

Course Content

UNIT- I

Machine Architecture:

Introduction to System Software and Machine Architecture, Simplified Instructional Computer (SIC) - SIC Machine Architecture, SIC/XE Machine Architecture, SIC Programming Examples. CISC machines, RISC machines. **9 Hours**

Self Study: comparison of CISC and RISC

UNIT- II

Assemblers:

Basic Assembler Function - A Simple SIC Assembler, Assembler Algorithm and Data Structures, Machine Dependent Assembler Features - Instruction Formats & Addressing Modes, Program Relocation.Machine Independent Assembler Features - Literals, Symbol-Definition Statements, Expression, Program Blocks, Control Sections and Programming Linking, Assembler Design Options - One- Pass assembler. **12 Hours**

Self Study: Multi-Pass Assembler.

UNIT- III

Loaders and Linkers:

Basic Loader Functions - Design of an Absolute - Relocation, Program Linking, Algorithm and Data Structures for a Linking Loader , Machine-Independent Loader Features - Automatic Library Search, Loader Options, Loader Design Options - Linkage Editor,.

Self Study: Dynamic Linking **10 Hours**

UNIT- IV

Microprocessor

Basic Macro Processor Functions - Macro Definitions and Expansion, Macro Processor Algorithm and Data Structures, Machine- Independent Macro Processor Features - Concatenation of Macro Parameters, Generation of Unique Labels, Conditional Macro Expansion, Keyword Macro Parameters Macro processor Design Options – Recursive Macro Expansion, General-Purpose Macro Processors, Macro Processing Within Language Translators. **11Hours**

Self Study: Implementation Examples - MASM Macro Processor, ANSI C Macro Processor.

UNIT- V

LEX:

Recognizing Words With LEX, Symbol Tables, Grammars, Parser-Lexer Communication, The Parts of Speech Lexer, A YACC Parser, The Rules Section, Running LEX and YACC, LEX and Hand- Written Lexers.

YACC : Using YACC - Grammars, Recursive Rules, Shift/Reduce Parsing, What YACC Cannot Parse; A YACC Parser - The Definition Section, The Rules Section, Symbol Values and Actions, The LEXER, Compiling and Running a Simple Parser, Arithmetic Expressions and Ambiguity.

Self Study: Examples of Regular Expressions. **10 Hours**

Text Books :

1. System Software - an introduction to system programming Leland. L. Beck,D.Manjula 3rd Edition, reprinted in 2013.
2. John. R. Levine, Mason and Doug Brown:Lex and Yacc, O'Reilly, SPD, Reprint March 2005. chapters 1,2(page 27-42),3(page 51-65)

Reference Book:

1. System Programming and Operating Systems,D M Dhamdhere, TATA McGraw Hill, 2nd Edition.

Course Outcomes

On successful completion of the course the students will be able to

CO 1. Develop assembly level programs for the given machine architecture.
CO 2. Analyze the output of different passes of an assembler.
CO 3. Identify the data structures used in loaders & linkers.
CO 4. Analyze the output of macro processor.
CO 5. Apply LEX and YACC tools to identify tokens and check the syntax of given program.

Course Articulation Matrix															
Course Outcomes	**Program Outcomes (PO's)**												**PSO's**		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	2	2	3										3	1	
CO 2	2	3											3		
CO 3	2	1	2										2		
CO 4	2	3											2		
CO 5	3												2	1	

Elective -1

Course Title:J2EE & J2ME			
Course Code: P17IS561	**Semester: V**	**L-T-P-H : 4:0:0:4**	**Credit:3**
Contact Period: Lecture: 52 Hrs, Exam: 3 Hrs		**Weightage: CIE:50%, SEE: 50%**	

Prerequisites: Object Oriented Programming with Java

Course learning objectives (CLOs)

This course aims to

1. Understand object-oriented approach.
2. Develop Java applications to solve real world problems.
3. Create & execute applets to solve real world problems.
4. Implement Multi-Threading and Event Handing concepts.
5. Design GUIs using Swings.
6. Implement JDBC Concept.
7. Develop client server applications using Servlets and JSPs.
8. Implement RMI Concept.
9. Implement Enterprise Java Beans Concept.
10. Develop Mobile applications using J2ME.

Course Content

UNIT- I

APPLETS, MULTI THREADED PROGRAMMING, EVENT HANDLING: The Applet Class: Two types of Applets; Applet basics; Applet Architecture; An Applet skeleton; Simple Applet display methods; Requesting repainting; Using the Status Window; The HTML APPLET tag; Passing parameters to Applets; getDocumentbase() and getCodebase(); Multi Threaded Programming: What are threads? How to make the classes threadable; Extending threads; Implementing runnable; Synchronization; Changing state of the thread; Bounded buffer problems, read-write problem. Event Handling: Two event handling mechanisms; The delegation event model; Event classes; Sources of events; Event listener interfaces; Using the delegation event model; **Self-study component**: Adapter classes; Inner classes.

11 Hours

UNIT- II

SWINGS, JAVA 2 ENTERPRISE EDITION OVERVIEW, DATABASE ACCESS: Swings: The origins of Swing; Two key Swing features; Components and Containers; The Swing Packages; A simple Swing Application; Create a Swing Applet; Jlabel and ImageIcon; JTextField;The Swing Buttons; JTabbedpane; JScrollPane; JList; JComboBox; JTable. Overview of J2EE and J2SE, The Concept of JDBC; JDBC Driver Types; JDBC Packages; A Brief Overview of the JDBC process; Database Connection; Associating the JDBC/ODBC Bridge with the Database; Statement Objects; ResultSet; Transaction Processing; Metadata, Data types; **Self-study component**: Exceptions. **11 Hours**

UNIT- III

SERVLETS, JSP: Background; The Life Cycle of a Servlet; Using Tomcat for Servlet Development; A simple Servlet; The Servlet API; The Javax.servlet Package; Reading Servlet Parameter; The Javax.servlet.http package; Handling HTTP Requests and Responses; Using Cookies. Java Server Pages (JSP): JSP, JSP Tags, Tomcat, Request String, User Sessions, Cookies, Session Objects. **Self-study component**: Session Tracking. **10 Hours**

UNIT- IV

RMI, ENTERPRISE JAVA BEANS: Java Remote Method Invocation: Remote Method Invocation concept; Server side, Client side. Enterprise Java Beans; Deployment Descriptors; Session Java Bean, Entity Java Bean; Message-Driven Bean. **Self-study component**: The JAR File. **10 Hours**

UNIT- V

J2ME: Introduction, CDC, CLDC, MIDP; Programming for CLDC, MIDlet model, Provisioning, MIDletlife-cycle, Creating new application, MIDlet event handling, GUI in MIDP, Low level GUI Components, Multimedia APIs; Communication in MIDP. **Self-study component**: Security Considerations in MIDP **10 Hours**

Text Books:

1. Java - The Complete Reference – Herbert Schildt, 7th Edition, Tata McGraw Hill, 2007.
2. J2EE - The Complete Reference – James Keogh, Tata McGraw Hill, 2007.
3. Mobile Computing, Technology, Applications and Service Creation - Dr. Ashok Talukder, Ms RoopaYavagal, Mr. Hasan Ahmed, 2nd Edition, Tata McGraw Hill, 2010

References:

1. Introduction to JAVA Programming – Y. Daniel Liang, 6th Edition, Pearson Education, 2007.
2. The J2EE Tutorial – Stephanie Bodoff et al, 2nd Edition, Pearson Education.
3. Mobile and Wireless Design Essentials - Martyn Mallik, Wiley.

Course Outcomes

After learning all the units of the course, the student is able to

1. Recognize the object oriented concepts & apply them to create java applications.
2. Demonstrate java applications with applets, threads and event handling concepts.
3. Develop GUI applications with the help of swings.
4. Develop client server applications with JDBC, Servelts, JSP, RMI and EJB concepts.
5. Develop program for CLDC, MIDP let model and security concerns

Course Articulation Matrix

Course Outcomes	Program Outcomes (PO's)												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	2	1	2		2	1					2		2		1
CO 2		2	2		2						3		2		1
CO 3		2			1	2					2		2		1
CO 4	2	2	2		2	2					3		2		2
CO 5	2	2	2		2	2					2		2		1

Course Title: Principles of Programming languages			
Course Code: P17IS562	**Semester: V**	**L-T-P-H : 4-0-0-4**	**Credit:3**
Contact Period: Lecture: 52 Hrs, Exam: 3 Hrs		**Weightage: CIE:50%, SEE: 50%**	

Prerequisites: Computer Programming, Formal Languages and Automata Theory

Course learning objectives(CLOs)

This course aims to:

1. Be familiar with the structure and design principles of programming languages.
2. Discuss the skills in analyzing and using the features of programming languages.
3. Recall the preliminary concepts like context-free grammar, Backus-Naur form, Parse trees.
4. Understand the data types of different programming languages.
5. Discuss various logic programming and functional programming languages features.
6. Understand the variable declarations in programming languages, in particular to binding, scope, and substitution of variables.
7. Introduce the power of Python scripting language

Course Content

UNIT- I

Preliminary Concepts: Reasons for studying, concepts of programming languages, Programming domains, Language Evaluation Criteria, influences on Language design, Language categories, Programming Paradigms– Imperative, Object Oriented, functional Programming, Logic Programming. **Syntax and Semantics:** general Problem of describing Syntax and Semantics, formal methods of describing syntax - BNF, EBNF for common programming languages features, parse trees, ambiguous grammars, attribute grammars, denotational semantics and axiomatic semantics for common programming language features.

Self Study: Programming Language Implementation – Compilation and Virtual Machines, programming environments. **11 Hours**

UNIT- II

Data types: Introduction, primitive, character, user defined, array, associative, record, union, pointer and reference types, design and implementation uses related to these types. Names, Variable, concept of binding, type checking, strong typing, type compatibility, **Expressions and Statements:** Arithmetic relational and Boolean expressions, Short circuit evaluationmixed mode assignment, Assignment Statements, Control Structures – Statement Level, Compound Statements, Selection, Iteration, Unconditional Statements, and guarded commands.

Self Study: named constants, variable initialization. **11 Hours**

UNIT- III

Subprograms and Blocks: Fundamentals of sub-programs, Scope and lifetime of variable, static and dynamic scope, Design issues of subprograms and operations, local referencing environments, parameter passing methods, overloaded sub-programs, generic sub-programs, parameters that are sub-program names.

Self Study: Design issues for functions user defined overloaded operators, co routine

10 Hours

UNIT- IV

Abstract Data types: Abstractions and encapsulation, introductions to data abstraction, design issues, language examples, C++ parameterized ADT, object oriented programming in small talk, C++, Java, C#, Ada 95. **Concurrency:** Subprogram level concurrency, semaphores, monitors, massage passing, Java threads. **Exception handling:** Exceptions, exception Propagation, Exception handler in Ada, C++ and Java. **Logic Programming Language:** Introduction and overview of logic programming, basic elements of prolog, application of logic programming

Self Study: C# threads **10 Hours**

UNIT – V

Functional Programming Languages: Introduction, fundamentals of FPL, LISP, ML, Haskell, application of Functional Programming Languages. **Scripting Language**: Pragmatics, key concepts, case study: Python- values and types, variables, storage and control, bindings and scope, procedural abstraction, data abstraction, separate compilation, module library.

Self Study:comparison of functional and imperative Languages. **10 Hours**

Text books:

1. Robert .W. Sebesta, "Concepts of Programming Languages", 10/e, Pearson Education. - 2012

References:

1. B. Tucker, R. E. Noonan, "Programming languages", 2e, TMH.
2. K. C. Louden," Programming Languages", 2e, 2003.
3. Patric Henry Winston and Paul Horn," LISP", Pearson Education.
4. W. F. Clocksin, C. S. Melish, "Programming in Prolog", 5e, Springer.

Course outcomes

After learning all the units of the course, the student is able to

1. Elaborate the features of attribute grammars and draw parse trees.
2. Listout various data types in different programming languages.
3. Tabulate different parameter passing techniques of different programming languages.
4. Apply logic programming concepts by using PROLOG.
5. Apply scripting languages in web design and real-time applications.

Course Articulation Matrix (CAM)															
Course Outcomes	**Program Outcomes (PO's)**												**PSO's**		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	3	1													
CO 2	3	3													
CO 3		2	1												
CO 4		1	1	1		1							2	2	
CO 5	1		1	1		2							2		

Course Title : ARTIFICIAL INTELLIGENCE			
Course Code : P17IS563	**Semester : V**	**L :T:P:H : 4:0:0:4**	**Credits: 3**
Contact Period: Lecture: 52 Hr, Exam: 3 Hr	**Weightage: CIE:50; SEE:50**		

Prerequisites

The basic knowledge of Computer Science is mandatory. Familiarity with basic concepts of algorithms, data structures, complexity and linear algebra is needed.

Course Learning Objectives

This course aims to

1. Describe fundamental concepts in Artificial Intelligence and problem solving strategies.
2. Discuss techniques for representation of knowledge and reasoning in AI.
3. Explain techniques for devising a plan of action to achieve one's goals.
4. Discuss how uncertainty is handled in AI
5. Explain various forms of inductive learning.

Course Content

UNIT- I

Artificial Intelligence and Problem Solving

Introduction: What is AI; Foundations of Artificial Intelligence; The state of the art **Intelligent Agents:** Agent and Environments; Good Behavior; The Nature of Environments; The Structure of Agents **Problem-solving by Searching:** Problem-solving agent; searching for solution; Uninformed search strategies, Informed searchstrategies; Heuristic functions**Constraint Satisfaction problems:** Defining constraint satisfaction problems; Backtracking search for CSPs.

12 Hours

Self Study: Adversarial search: Games; optimal decisions in Games; Alpha-Beta pruning;

UNIT- II

Knowledge, Reasoning and Planning

Logical Agents: Knowledge-based agents**;** The wumpus world; Logic; Propositional logic; Propositional theorem proving; **First-Order Logic**: Representation revisited; Syntax and semantics of first order logic; **Interference in First-Order Logic**: Propositional verses first-order interference; Unification and lifting; Forward and backward chaining.

10 Hours

Self Study: Knowledge engineering in first order logic

UNIT- III

Knowledge, Reasoning and Planning

Knowledge Representation: Ontological engineering; Categories and object; Events; Mental events and mental objects; Reasoning system for categories; Reasoning with default information; Truth maintenance system. **Planning:** Classical Planning; Algorithms Planning with state-space search; Planning graphs **10 Hours**

Self Study: The internet shopping world

UNIT- IV

Uncertain Knowledge and Reasoning

Quantifying Uncertainty: Acting under uncertainty; Interference using full joint distributions; Independence; Bayes's rule and its use;**Probabilistic Reasoning:** Representing knowledge in an

uncertain domain; The semantics of Bayesian networks; Efficient representation of conditional distribution. **10 Hours**

Self Study: Exact interference in Bayesian network

UNIT- V

Learning

Learning: Forms of learning**;** Supervisedlearning; Learning decision trees; The theory of learning; Regression and Classification with Linear models; Artificial neural networks.

10 Hours

Self Study: Support vector machines.

Text Book:

1. Stuart Russel, Peter Norvig: Artificial Intelligence A Modern Approach, Pearson 3rd edition 2013.

References Books:

1. Elaine Rich, Kevin Knight, Shivashankar.B.Nair, "Artificial Intelligence", Tata Mc Graw Hill Publishing Company Limited. Third Edition, 2009.
2. Nils J. Nilsson, "Artificial Intelligence: A new Synthesis", Harcourt Asia Pvt. Ltd., 2000.
3. George F. Luger, "Artificial Intelligence-Structures and Strategies for Complex Problem Solving", Pearson Education / PHI, 2002.

Course Outcomes

After learning all the units of the course, the student is able to

CO 1. Applyproblem solving strategies for various problems in AI
CO 2. Use propositional logic and first order logic techniques for representation and reasoning
CO 3. Discuss approaches for knowledge representation and planning
CO 4. Apply probabilistic techniques in AI for problems involving uncertainty
CO 5. Analyse various learning systems used in practice

Course Articulation Matrix

Course Outcomes	Program Outcomes (PO's)												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	1	2	1										1		1
CO 2	2	2	1										1		
CO 3	2	2	1										1		
CO 4	2	2	1										1		1
CO 5	2	2	1										1		1

Course Title: Management and Entrepreneurship			
Course Code: P17IS564	**Semester : V**	**L- T – P-H : 4 – 0 – 0-4**	**Credit :3**
Contact period : 52 Hrs, Exam:3 hrs		**Weightage: CIE: 50, SEE:50**	

Course learning objectives (CLOs)

This course aims to

1. Understand the roles and functions of management.
2. Analyze the evolution of management from classical approach to modern approach.
3. Differentiate between strategic planning and tactical planning.
4. Explain the recruitment and selection process.
5. Compare formal and informal communication.
6. Identify the new control techniques.
7. Explain the role of entrepreneurs in the economic development of the nation.
8. Identify the contents of the project report.
9. Understand the different Industry Policy Resolutions.
10. Understand the rules, policies and working criteria by visiting small scale industry.

Course Content

Unit-I

Management

Nature and Functions of Management : Importance and definition of management, management functions, roles of a manager, levels of management, managerial skills, management and administration , management – a science or art or profession, professional management versus family management. **Development of Management Thought:** Early classical approaches.

Self Study: Neo classical approaches, modern approaches. **10 Hours**

Unit-II

Planning: Importance of planning, forms and types of plans, steps in planning, limitations of planning, making planning effective, planning skills. Decision making: Types of decisions, steps in Rational decision making, rationality in decision making, environment of decision making. **Organisation:** Process of organizing, span of management, principles of organising, Departmentalisation, committees, teams.

Self Study: Staffing: Manpower planning, recruitment and selection process. **11 Hours**

Unit-III

Direction: Requirements of effective direction, giving orders, motivation. Communication: Purposes of communication, formal communication, forms of communication, informal communication, barriers to communication. Leadership: characteristics of leadership, functions of leader.

Control: Steps in control process, need for control, types of control methods, essentials of effective control system.

Self Study: new control techniques. **10 Hours**

Unit-IV

Entrepreneurship: Introduction, Entrepreneur, Functions of an Entrepreneur, Types of Entrepreneur, Intrapreneur, Entrepreneurship, Evolution of Entrepreneurship, Development of Entrepreneurship, Stages in entrepreneurial process, Role of entrepreneurs in Economic Development, Entrepreneurship in India, Entrepreneurship – its Barriers, women entrepreneurs, Entrepreneurship Development Programme. Preparation of project: meaning of project, project identification, project selection, project report need and significance.

Self Study: contents of project report, project formulation**.** **10 Hours**

Unit-V

Small Scale Industry: Definition, Characteristics, Need and rationale, Objectives, Scope, role and advantages of SSI, steps to start an SSI, Different Industry Policy Resolutions (IPRs) of S.S.I, Government Support for S.S.I. during 5 year plans, Impact of Liberalization, Privatization, Globalization on S.S.I., WTO/GATT, supporting Agencies of Government for S.S.I, Ancillary Industry and Tiny Industry.

Self Study: Institutional Support: State level institutions, Central Government institutions.

11 Hours

Text Book :

1 Principles of Management, P C Tripathi, P N Reddy, 5th edition, TataMcGraw Hill, 2012.
2 Management and Entrepreneurship,N V R Naidu, T Krishna Rao, I K International Publishing House Pvt. Ltd., 2010.

Reference Books :

1. Dynamics of Entrepreneurial Development & Management - Vasant Desai, Himalaya Publishing House, 2007.
2. Management Fundamental Concepts, Application, Skill Development - Robert Lusier - Thomson, 2007.

Course outcomes

After learning all the units, the student is able to

CO 1. Understand the evolution of management from classical approach to modern approach.
CO 2. Explain the steps in planning and steps in selection process.
CO 3. Identify the direction and control techniques.
CO 4. Compare Entrepreneur and Intrapreneur.
CO 5. Analyze the government support for small scale industry.

Couse Articulation Matrix

Course Outcomes	Program Outcomes (PO's)												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1			3	2		3	3	2	1						
CO 2			3	3		3	3	3	2						
CO 3		1	2	3	2	3		3	1	1					
CO 4		1	3	2	2	2		3	2	3	2				
CO 5			3			3	1	3	3						

Course Title : Aptitude and Reasoning Development - Advanced (ARDA)			
Course Code : P17HU510	Semester : 5	L:T:P:H :0:0:2:2	Credits: 1
Contact Period: Lecture: 32 Hr, Exam: 3 Hr		Weightage: CIE:50;% SEE:50%	
Prerequisites: Vocabulary builder, Concept of Percentage.			

Course Learning Objectives (CLOS)

This course aims to,

1. Describe the importance of reading with comprehension.
2. Explain seven dimensions approach to better reading skills.
3. Explain the purpose, plan and the ways to identify specific details in a paragraph for better comprehension.
4. Formulate easier ways to solve problems of averages.
5. Explain the Application of the technique of alligation while solving weighted average and mixture problems.
6. Describe the concepts of profit, loss, discount, marked price.
7. Explain the application of percentage in our daily life.
8. Discover different ways to identify the progressions and to compare between AP< GP and HP.
9. Explain the basic concepts in calculating simple interest and compound interest.
10. Differentiate between simple interest and compound interest and describes the importance of compound interest and its behavior.

Course Content

UNIT – I

Reading Comprehension:

Introduction: Read more and more, the process of writing and its relevance to the process of writing, how reading skills are important for aspects other than the reading comprehension questions, the daily reading scheme.

Seven dimension approach to better reading skills:

Developing the ability of understanding vocabulary in context, Ability to identify and understand main ideas, Ability to predict and identify supporting details, Understanding the use of transition and idea organization patterns, Inferences, Identifying purpose and tone, Recognizing and evaluating arguments and their common structures.

Theory of reading comprehension:

Solving RC passages is an exact science, tackling RC on the basis of evaluation of support, All passages have a topic, purpose and a plan, Other things to pick up while reading the passage– The tonality and other software related the author's viewpoint in the passage, specific details and their use in the passage, Types of questions asked in reading comprehension passage.

10 Hours

UNIT – II

Averages and Alligations mixtures:

Average: relevance of average, meaning of average, properties of average, deviation method, concept of weighted average. **Alligation method:** situation where allegation technique, general representation of alligations, the straight line approach, application of weighted average and alligation method in problems involving mixtures. Application of alligation on situation other than mixtures problems.

6 Hours

UNIT – III

Profit and Loss: percentage change, original 100 concept effect of percentage increase or decrease in number, effect of successive percentage change, amount of change, comparison of two

numbers through percentage and ratio, return to original concept, net percentage change to keep product fixed. Definition of basic terms— cost price, selling price, profit percentage, discount and marked price, solving problems using n/d method, techniques to tackle from standard set of problems, the concept of mark up. Concept of partnership and problems involving partnership

6 Hours

UNIT IV

Progression:

Arithmetic Progression: sum of given number of terms in an A.P., arithmetic mean, to insert a given number of arithmetic means between two given quantities, nth term of an A.P., finding common difference of an A.P. given 2 terms of an A.P., types of A.P.s– increasing A.P.s and decreasing A.P. s

Geometric: to find, the geometric mean between two given quantities, to insert a given number of geometric means between two given quantities, sum of a number of terms in a G.P. Types of G.P.s— increasing G. P. s type one and two , decreasing G. P. s type one and two.

Harmonic Progression: to find the harmonic mean between two given quantities, theorems related with progressions, solved examples sample company questions

6 Hours

UNIT- V

Simple Interest and Compound Interest

Concept of time value of money, Terminology pertaining to interest, Relation among Principal, Time, Rate percent per annum and total interest. Compound interest, Depreciation of value, Population, Application of interest in D.I.– The difference between simple annual growth rate and compound annual growth rate.

4 Hours

Reference books:

1. **Trachtenberg speed system ofbasic mathematics**, published by Rupa publications.
2. AbhijithGuha **"CAT Mathematics"**published by PHI learning private limited.
3. Dr. R. S Agarwal "**Quantitative aptitude**" published by S.Chand private limited.
4. Dr. R. S Agarwal , " **Verbal reasoning**"published by S. Chand private limited.
5. Arun Sharma"**Quantitative aptitude**" for CAT by, published by McGraw Hill publication.

Course Outcomes (CO)

After learning all the units of the course, the student is able to:

1. Apply the approach of seven dimensions to better reading skills.
2. Solve the questions under reading comprehension confidently with higher accuracy than random reading.
3. Apply the technique of alligation for effective problem solving.
4. Interpret the requirement of different methods of calculating average and apply the right method at right scenario.
5. Effectively solve problems of profit and loss and problems related to discount, simple interest and compound interest.
6. Formulate the equations for summation and other functions for all the kinds of progressions– AP, GP and HP.

Course Articulation Matrix (CAM)															
Course Outcome (CO)	Program Outcome (ABET/NBA-(3a-k))														
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
Apply the approach of seven dimensions to better reading skills.	L2	-	-	-	-	-	-	-	-	2	-	-	-	-	-
Solve the questions under reading comprehension confidently with higher accuracy than random reading.	L4	-	-	-	-	-	-	2	-	2	-	-	-	-	-
Apply the technique of alligation for effective problem solving.	L2	3	-	-	-	-	-	-	-	-	-	-	-	-	-
Interpret the requirement of different methods of calculating average and apply the right method at right scenario.	L4	2	-	-	-	-	-	-	-	2	-	-	-	-	-
Effectively solve problems of profit and loss and problems related to discount, simple interest and compound interest.	L5	3	-	-	-	-	-	-	-	2	-	-	-	-	-
1 – Low, 2 – Moderate and 3 – High															

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VI Semester

Course Title: Object Oriented System Development			
Course Code:P17IS61	**Semester: VI**	**L-T-P-H : 4:0:0:4**	**Credit:4**
Contact Period: Lecture: 52 Hrs, Exam: 3 Hrs		**Weightage: CIE:50%, SEE: 50%**	

Prerequisites:
A good understanding of object oriented technologies and a basic understanding of analysis and design.

Course learning objectives (CLOs)

This course aims to
1. Describe Unified Modeling Language (UML) notations, the concepts and notations involved in OO modeling.
2. Explain the models for Object Oriented System Development.
3. Analyze and Design a solution to the real world problem.
4. Understand the basics of how to prepare OO models.
5. Apply the design patterns to solve problems.
6. Apply software metrics to the improve software design.

Course Content

Unit - I

Introduction, Modeling Concepts, Class Modeling And Advanced Class Modeling: What is Object Orientation? What is OO development? OO themes; ***Modeling as Design Technique****:* Modeling; Abstraction; The three models. **Class Modeling:** Object and class concepts; Link and associations concepts; Generalization and inheritance; A sample class model; Navigation of class models. **Advanced Class Modeling:** Advanced object and class concepts; Association ends; N-ary associations; Aggregation; Abstract classes; Multiple inheritance. **11 Hours**
Self Study: Reification; Constraints; Derived data; Packages.

Unit - II

State Modeling, Advanced State Modeling, And Interaction Modeling: **State Modeling**: Events, States, Transitions and Conditions; State diagrams; State diagram behavior. **Advanced State Modeling:** Nested state diagrams; Nested states; Signal generalization; Concurrency; A sample state model; **Interaction Modeling**: Use case models; Sequence models; Activity models. **Advanced Interaction Modeling**: Use case relationships; Procedural sequence models; Special constructs for activity models**.** **10 Hours**
Self Study: Relation of class and state models

Unit - III

System conception, domain analysis, application analysis: System Conception: Devising a system concept; Elaborating a concept; Preparing a problem statement. **Domain Analysis:** Overview of analysis; Domain class model; Domain state model; Domain Interaction model; Iterating the analysis **Application Analysis**: Application interaction model; Application class model; Application state model. **10 Hours**
Self Study: Adding operations.

Unit - IV

System Design, Class Design: System design: Overview of system design; Estimating performance; Making a reuse plan; Breaking a system in to sub-systems; Identifying concurrency; Allocation of sub-systems; Management of data storage; Handling global resources; Choosing a

software control strategy; Handling boundary conditions; Setting the trade-off priorities; Common architectural styles; Architecture of the ATM system as the example. **Class Design**: Overview of class design; Bridging the gap; Realizing use cases; Designing algorithms; Recursing downwards, Refactoring; Design optimization; Reification of behavior; Adjustment of inheritance. **11 Hours**
Self Study: ; Organizing a class design; ATM example.

Unit - V

Design Patterns: What is a pattern and what makes a pattern? Pattern categories; Relationships between patterns; Pattern description Communication Patterns: Forwarder-Receiver; Client-Dispatcher-Server; Publisher-Subscriber, Management Patterns: Command processor; View handler. **Metrics:** Product quality metrics; In-process quality metrics; Metrics for software maintenance; Design and complexity metrics; Productivity metrics; Quality and quality management metrics. **10 Hours**
Self Study: Lessons learned for OO projects.

Text Books

1.Object-Oriented Modeling and Design with UML - Michael Blaha, James Rumbaugh , 2nd Edition, Pearson Education.
2.Pattern-Oriented Software Architecture, A System of Patterns: Frank Buschmann, ReginеMeunier, Hans Rohnert, Peter Sommerlad, Michael Stal:, Volume 1, John Wiley and Sons.
3.Metrics and Models in Software Quality Engineering, Stephan H. Kan:, 2nd Edition, Pearson.

Reference Books

1. Object-Oriented Analysis and Design with Applications – Grady Booch et al, 3rd edition, Pearson education.
2. Object-Oriented Analysis, Design, and Implementation, Brahma Dathan, SarnathRamnath, Universities Press.
3. Software Metrics: A Rigorous Approach, Fenton N. E., S. L. Pfleeger, 2nd Edition, Cengage Learning.

Course Outcomes

After learning all the units of the course, the student is able to

CO 1. Describe the object oriented modeling concepts and class model.
CO 2. Apply state model and interaction model with UML notations to solve problems.
CO 3. Analyze to build domain and application model.
CO 4. Design the solutions for real world problems.
CO 5. Apply design patterns to solve real world problems and also use metrics to evaluate the designed software.

Course Articulation Matrix

Course Outcomes	Program Outcomes (PO's)												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	3	2	3	1											2
CO 2	3	2	3	2											2
CO 3	2	3	3	2						1			2		2
CO 4	2	2	2	2						2	1		1		2
CO 5	2	2	3	3						1			1		2

Course Title: COMPUTER NETWORKS			
Course Code:P17IS62	**Semester: VI**	**L-T-P-H : 4:0:0:4**	**Credit:4**
Contact Period: Lecture: 52 Hrs, Exam: 3 Hrs		**Weightage: CIE:50%, SEE: 50%**	

Course learning objectives (CLOs)

This course aims to

1. Demonstration of application layer protocols
2. Discuss transport layer services and understand UDP and TCP protocols
3. Explain routers, IP and Routing Algorithms in network layer
4. Disseminate the Wireless and Mobile Networks covering IEEE 802.11 Standard
5. Illustrate concepts of Multimedia Networking, Security and Network Management

Course Content

Unit – 1 Network layer -1

Introduction to Network layer: introduction, switching, packet switching at network layer, Network layer services. **IPv4 Address**: introduction, Classful Addressing, Classless Addressing, special Addresses, NAT. **IPv4**: introduction, Datagrams, fragmentation, options, checksum, IP package. **ARP**: Address mapping, the ARP protocol, ATM ARP, ARP package.
Self study: Delivery and forwarding IP packets: delivery, forwarding based on destination address, forwarding based on Label. **12 Hours**

Unit – 2 Network layer -2

ICMPv4: introduction, messages, debugging tools, ICMP package. **Mobile IP**: Addressing, Agents, Three phases, inefficiency in mobile IP. **Unicast Routing Protocols**: Introduction, intra and Inter domain routing, Distance Vector Routing, RIP, Link state routing, OSPF, Path vector routing, BGP. **Multicast and Multicast routing protocols**: introduction, Multicast address, IGMP.
Self Study: Multicast and Multicast routing protocols: Multicast Routing, Routing Protocols. **10 Hours**

Unit - 3 Application Layer:

Principles of Network Applications, The Web and HTTP, File Transfer: FTP, Electronic Mail in the Internet, DNS—The Internet's Directory Service.
Self-Study: Peer-to-Peer Applications **10 Hours**

Unit -4: Transport Layer

Introduction and Transport-Layer Services, Multiplexing and Demultiplexing, Connectionless Transport: UDP, Principles of Reliable Data Transfer, Connection-Oriented Transport: TCP, Principles of Congestion Control.
Self study:TCP Congestion Control**.** **10 Hours**

Unit – 5: Security in Computer Networks

What Is Network Security? Principles ofCryptography, Message Integrity and Digital Signatures, End-Point Authentication, SecuringE-Mail, Securing TCP Connections: SSL, Network-Layer Security: IPSec.
Self study: Network-Layer Security:Virtual Private Networks. **10 Hours**

Text Books:

1. Behrouz A. Forouzan: "TCP/IP Protocol Suite" Fourth Edition Tata McGraw-Hill, 2010 (unit - 1 and unit - 2)
2. James F Kurose and Keith W Ross, Computer Networking, A Top-Down Approach, Sixth edition, Pearson,2017 .(unit -3, unit -4 and unit-5)

Reference Books:

1. Larry L Peterson and Bruce S Davie, Computer Networks, fifth edition, ELSEVIER
2. Andrew S Tanenbaum, Computer Networks, fifth edition, Pearson.

Course Outcomes:

1. Explain principles of application layer protocols
2. Recognize transport layer services and infer UDP and TCP protocols
3. Classify routers, IP and Routing Algorithms in network layer
4. Understand the Wireless and Mobile Networks covering IEEE 802.11 Standard
5. Describe Multimedia Networking and Network Management

Course Articulation Matrix															
Course Outcomes	**Program Outcomes (PO's)**												**PSO's**		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	2	1	1											2	2
CO 2	2	1	1											2	2
CO 3	2	1	2	1										2	2
CO 4	2	1	1											2	1
CO 5	2	1	1											1	1

Course Title: INTERNET OF THINGS			
Course Code: P17IS63	**Semester : VI**	**L- T – P - H - 4 : 0 : 0 : 4**	**Credit : 4**
Contact period : Lecture: 52 Hrs, Exam:3 hrs		**Weightage: CIE: 50; SEE:50**	

Course Learning Objectives: The students will be able to

1. To assess the vision and introduction of IoT.
2. Understand what Internet of Things and its applications of IOT in the different environment
3. Understand the Need of IoT System Management with NETCONG
4. Understand the Radio Frequency Identification Technology.
5. Apply IoT on different areas.
6. Explain resources in the IoT and deploy of resources into business.
7. Demonstrate data analytics for IoT

Course Content

UNIT-I

Introduction & Concept: Introduction to Internet of Things, Introduction, physical Design of IoT, Logical Design of IoT, IoT Enabling Technologies, IoT Levels & Deployment Templates, IoT and M2M: Introduction,M2M, difference between IoT and M2M, SDN and NFV for IoT.

Self Study: Identify the levels of various real time IoT applications **10 Hours**

UNIT-II

Domain Specific IoTs: Introduction, Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health & Lifestyle, IoT System Management with NETCONF-YANG: Need for IoT Systems Management, Simple Network Management Protocol (SNMP), Network Operator Requirements, NETCONF,YANG, IoT System Management with NETCONF-YANG.

Self Study: Study of Various Applications of IoT **10 Hours**

UNIT-III

Radio Frequency Identification Technology Overview Introduction, Principals of RFID, Components of RFID system, Reader, RFID tag, RFID Middleware, RFID Applications, and Related Research Issues: introduction, Concepts and Terminology, Radio Frequency Identification, Transpoder classes, standards, RFID system architecture, other related technologies, RFID applications, logistic and supply chain, production, monitoring and maintenance, product safety, quality and information, access control and tracking and tracing of individuals, ongoing research projects, hardware issues, protocols, product safety, quality and information, access control and tracking and tracing of individuals, ongoing research projects, hardware issues, protocols, Wireless Sensor Networks Technology and Overview: the node, communication, computation, sensing, energy, networking nodes, MAC, multi-hop routing, securing communication, computation, sensing, energy, networking nodes, MAC, multi-hop routing, securing communication.

Self Study: Study of various RFID applications. **12 Hours**

UNIT-IV

IoT Platforms Design Methodology: Introduction, IoT Design Methodology, IoT Physical Servers & Cloud Offerings, Introduction to Cloud Storage Models & Communication APIs, WAMP -

AutoBahn for IoT, Xively Cloud for IoT, Designing a RESTful Web API, Amazon Web Services for IoT.

Self Study: Case Study on IoT System for Weather Monitoring **10 Hours**

UNIT-V

Data Analytics for IoT – Introduction, Apache Hadoop, Using Hadoop MapReduce for Batch Data Analysis, Apache Oozie, Apache Spark, Apache Storm, Using Apache Storm for Real-time Data Analysis.

Self Study: Structural Health Monitoring Case Study **10 Hours**

Text Books:

1. Arshdeep Bahga, Vijay Madisetti, "Internet of Things: A Hands on Approach" Universities Press., 2015
2. Hakima Chaouchi, " The Internet of Things Connecting Objects to the Web" ISBN : 978 – 1 – 84821 - 140 - 7, Willy Publications

Reference Books:

1. NPTEL MOOC materials for Introduction to Internet of Thing: http://nptel.ac.in/courses/106105166
2. NPTEL MOOC Certification Course: https://onlineCourses.nptel.ac.in/noc18_cs46/
3. Daniel Minoli , " Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications " , ISBN: 978–81–265–5823–0 , Wiley Publications, 2016.
4. Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things: Key Applications and Protocols", ISBN: 978–81–265–5765–3,Wiley Publications, 2015.

Course Outcomes: After completing the course, the students will be able to

1. Able to identify the basic concepts, the different levels of IOT applications from a present and a futuristic view point
2. Understand the practical knowledge through different case studies and develop multiple node IOT system with YANG network Configuration
3. Understand the working knowledge related to enabling technologies like RFID,WSN

1. Design a methodology for various IOT applications and Model the Internet of things to business
2. Understand data sets received through IoT devices and tools used for analysis

Course Articulation Matrix (CAM)															
Course Outcomes	Program Outcomes (PO's)												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	3		1		2	2	2	2	2	2	2	2		2	
CO 2	3	1	2		2	2	2	2	2	2	2	2			2
CO 3	3	1	2		2	2	2	2	2	2	2	2		2	
CO 4	3		3		3	2	2	2	2	2	2	2		2	

Course Title: DATA SCIENCE			
Course Code: P17IS64	**Semester: VI**	**L-T-P-H : 4:0:0:4**	**Credit:4**
Contact Period: Lecture: 52 Hrs, Exam: 3 Hrs		**Weightage: CIE:50%, SEE: 50%**	

Course learning objectives (CLOs)

This course aims to

1. Describe what Data Science is and the skill sets needed to be a data scientist.
2. Identify probability distributions commonly used as foundations for statistical modeling.
3. Use R to carry out basic statistical modeling and analysis.
4. Explain the significance of exploratory data analysis (EDA) in data science.
5. Describe the Data Science Process and how its components interact.
6. Use APIs and other tools to scrap the Web and collect data.
7. Explain basic machine learning algorithms (Linear Regression, k-Nearest Neighbors (k-NN), k-means, Naive Bayes) for predictive modeling.
8. Describe common approaches used for Feature Generation and for Feature Selection.
9. Explain fundamental mathematical and algorithmic ingredients that constitute a Recommendation Engine.
10. Create effective visualization of given data.

Course contents

Unit-I

Introduction: What is Data Science? Big Data and Data Science hype - and getting past the hype, Why now? – Datafication, Current landscape of perspectives, Skill sets needed.Statistical Inference - Populations and samples, Statistical modeling, probability distributions, fitting a model.

Self-study component: Intro to R **10 Hours**

Unit-II

Exploratory Data Analysis and the Data Science Process - Basic tools (plots, graphs and summary statistics) of EDA, Philosophy of EDA, The Data Science Process, Case Study: RealDirect (online real estate firm).Three Basic Machine Learning Algorithms - Linear Regression, k-Nearest Neighbors (k-NN),k-means.

Self-study component: Exercise: Basic Machine Learning Algorithms

10 Hours

Unit-III

One More Machine Learning Algorithm and Usage in Applications - Motivating application: Filtering Spam, Why Linear Regression and k-NN are poor choices for Filtering Spam, Naive Bayes and why it works for Filtering Spam, Data Wrangling: APIs and other tools for scrapping the Web. Feature Generation and Feature Selection (Extracting Meaning From Data) - Motivating application: user (customer) retention, Feature Generation (brainstorming, role of domain expertise, and place for imagination), Feature Selection algorithms, Filters; Wrappers; Decision Trees .

Self-study component: Random Forests. **11 Hours**

Unit-IV

Recommendation Systems: Building a User-Facing Data Product - Algorithmic ingredients of a Recommendation Engine, Dimensionality Reduction, Singular Value Decomposition, Principal

Component Analysis, Exercise: build your own recommendation system. Mining Social-Network Graphs - Social networks as graphs, Clustering of graphs, Direct discovery of communities in graphs, Partitioning of graphs. **Self-study component**: Neighborhood properties in graphs. `

11 Hours

Unit-V

Data Visualization - Basic principles, ideas and tools for data visualization, Examples of inspiring (industry) projects, Exercise: create your own visualization of a complex dataset. Data Science and Ethical Issues - Discussions on privacy, security, ethics, A look back at Data Science. **Self-study component:** Next-generation data scientists. **10 Hours**

Text Book:

1. Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk From The Frontline.O'Reilly. 2014.

Reference Books:

1. Jure Leskovek, Anand Rajaraman and Jeffrey Ullman. Mining of Massive Datasets. v2.1,Cambridge University Press. 2014.
2. Kevin P. Murphy. Machine Learning: A Probabilistic Perspective. ISBN 0262018020. 2013.
3. Foster Provost and Tom Fawcett. Data Science for Business: What You Need to Know about Data Mining and Data-analytic Thinking. ISBN 1449361323. 2013.

Course Outcomes::

1. Fit a model to data.
2. Apply basic tools (plots, graphs, summary statistics) to carry out EDA. Identify Machine Learning Algorithms and to use in applications.
3. Use APIs and other tools to scrap the Web and collect data. Identify basic Feature Generation and Feature Selection algorithms and to use in applications.
4. Build own recommendation system.
5. Create effective visualization of given data (to communicate or persuade

Course Articulation Matrix (CAM)															
Course Outcomes	**Program Outcomes (PO's)**												**PSO's**		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	2	2	2		2									1	1
CO 2	2	2	2		2									1	1
CO 3	2	2	2	1	2									1	1
CO 4	2	2	2	1	2									1	1
CO 5	2	2	2	1	2									1	1

Course title: NETWORKS LAB			
Course Code: P17ISL67	**Semester: VI**	**L-T-P-H:0 - 0 – 0 -3**	**Credit:1.5**
Contact Period: Lecture: 36 Hr, Exam: 3 Hr		**Weightage: CIE:50%, SEE: 50%**	

Prerequisites: Computer Networks and C/Java

Course Learning Objectives

This course aims to,

1. Write C/C++ code to implement network related concepts.
2. Design/Develop network scenarios and analyze its performance by specifying parameters using QualNet simulator.

Course Contents

PART - A

The following experiments shall be conducted using C/Java

1. Write a program for error detection using CRC-CCITT (16-bits).
2. Write a program for frame sorting technique used in buffers.
3. Write a program to generate Hamming Code for error detection and correction.
4. Write a program for congestion control using Leaky bucket algorithm.
5. Write a program for simple RSA algorithm to encrypt and decrypt the data.
6. Using TCP/IP sockets, write a client-server program to make client sending the file name and the server to send back the contents of the requested file, if present.
7. Implement the above program using FIFOs as IPC channels.

PART - B

The following experiments shall be conducted using QualNet simulator:

1. Design a star topology for LAN using hub or switch or both by taking at least five nodes and analyze the statistics.
2. Design a mesh topology for five nodes and analyze the TCP, UDP statistics and FIFO queuing mechanism.
3. Develop a scenario for wired network and implement VOIP and analyze the statistics.
4. Design a scenario to integrate wired network and wireless network using Wi-Fi infrastructure mode and analyze the statistics.
5. Develop a scenario for WIMAX using standard 802.16. Analyze the statistics.
6. Design a scenario for wireless sensor networks (total 9 devices). Analyze the Zigbee battery model along with the statistics.
7. Develop a scenario for MANET in wireless networks. Consider 7 devices and show the mobility for all the devices and analyze the statistics.

Note: Student is required to solve one problem from **PART-A** and one problem from **PART-B**.

Course Outcomes

After learning all the programs of the course, the student is able to,

CO 1. Write C/C++ code to implement network related concepts.

CO 2. Design/Develop network scenarios and analyze its performance by specifying parameters using QualNet simulator.

Course Articulation Matrix (CAM)															
Course Outcomes	**Program Outcomes (PO's)**												**PSO's**		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	1				1				1					2	1
CO 2	2				2				1					2	1

Course title: INTERNET OF THINGS LAB			
Course Code: P17ISL68	**Semester: VI**	**L-T-P-H:0-0-0-3**	**Credit:1.5**
Contact Period: Lecture: 36 Hr, Exam: 3 Hr		**Weightage: CIE:50%, SEE: 50%**	

Course Learning Objectives (CLOs)

This course aims to

1. To develop simple Internet of Things Applications
2. To Implement Data and Knowledge Management and use of Devices in IoT Technology.
3. Usage of cloud infrastructure and services in Internet of Things

PART-A

Course Content

1. Design a Smart Traffic Light System using Arduino UNO which includes a crosswalk button
2. Develop an application using Arduino UNO to modulate an LED using an LDR and PIR sensor
3. Design a Smart dustbin system using Arduino UNO and ultrasonic sensor
4. Develop an application using RasberyPi to detect an object using IR sensor and send the message using SMTP protocol
5. a) Write a Program to interface temperature sensor to Arduino UNO and read the values of temperature and humidity in the given environment and turn On the LED if temperature value met the threshold value
   b) Using XCTU software, connect two different motes wirelessly and establish a duplex communication.
6. Write a Program to interface LPG sensor to Arduino UNO and read the values of a sensor in the given environment and turn On the buzzer if petroleum gas is detected value.
7. Write a program to interface soil sensor to RasberyPi and transmit received data to cloud using Ethernet/WiFi

PART-B

Develop any Internet of Things Applications as a simple project using different sensors and devices.

Course Outcomes:

1. Ability to Design and Develop simple Internet of Things Applications
2. Compare and Contrast the use of Devices, Gateways and Data Management in Internet of Things
3. Able to Development, deployment and a management of cloud applications

Course Articulation Matrix (CAM)															
Course Outcomes	**Program Outcomes (PO's)**												**PSO's**		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	3	2	2		2	1	1	2	2	1	1	1		2	2
CO 2	3	2	2		2	1	1	2	2	1	1	1		2	1
CO3	3	2	2		2	1	1	2	2	2	1	1		2	2

ELECTIVE-II

Course Title: WEB TECHNOLOGIES			
Course Code:P17IS651	**Semester: VI**	**L-T-P-H : 4:0:0:4**	**Credit:3**
Contact Period: Lecture: 52 Hrs, Exam: 3 Hrs		**Weightage: CIE:50%, SEE: 50%**	

Course Learning Objectives

1.This course is intended to provide an exposure to fundamental concepts of WWW, Internet, Browsers, Servers, URL, MIME, HTTP

2.To present competent technologies for the design of Web using XHTML and CSS.

3.To provide knowledge of scripting languages such as JavaScript and design dynamic XHTML documents using DOM and JavaScript

4.To create XML documents using DTD/ XML schema and XSLT style sheets and create cookies using PHP, Implement session tracking using PHP

5.To develop a Rails application using Ajax.

Course content

UNIT - I

Fundamentals of Web: Internet, WWW, Web Browsers and Web Servers, URLs, MIME, HTTP, Security, **Introduction to XHTML:** Origins and evolution of HTML and XHTML, Basic syntax, Standard XHTML document structure, Basic text markup, Images, Hypertext Links, Lists, Tables, Forms, Frames, Syntactic differences between HTML and XHTML.

10 Hours

Self Study: The Web Programmers Toolbox.

UNIT - II

CSS: Introduction, Levels of style sheets, Style specification formats, Selector forms, Property value forms, Font properties, List properties, Color, Alignment of text, The Box model, Background images, The and tags. **JAVASCRIPT:**Overview of JavaScript, Object orientation and JavaScript, General syntactic characteristics, Primitives, operations, and expressions, Screen output and keyboard input, Control statements, Object creation and modification, Arrays, Functions, Constructor, Pattern matching using regular expressions

10 Hours

Self Study: . Errors in scripts, Examples.

UNIT - III

JAVASCRIPT AND HTML DOCUMENTS: The JavaScript execution environment; The Document Object Model; Element access in JavaScript; Events and event handling; Handling events from the Body elements, Button elements, Text box and Password elements **DYNAMIC DOCUMENTS WITH JAVASCRIPT:**Introduction to dynamic documents; Positioning elements; Moving elements; Element visibility; Changing colors and fonts; Dynamic content; Stacking elements; Locating the mouse cursor; Reacting to a mouse click; Slow movement of elements..

11 Hours

Self Study: Dragging and dropping elements

UNIT-IV

XML: Introduction; Syntax; Document structure; Document Type definitions; Namespaces; XML schemas; Displaying raw XML documents; Displaying XML documents with CSS; XSLT style sheets;. **PHP:** Origins and uses of PHP, Overview of PHP, General syntactic characteristics, Primitives, Operations and expressions, Output, Control statements, Arrays, Functions, Pattern matching, Form handling, Files, Cookies, Session tracking. **11 Hours**

Self Study: XML processors; Web services

UNIT-V

Introduction to Rails: Overview of Rails, Document requests, processing forms, **Introduction to Ajax :**Overview of Ajax, Basics of Ajax, Rails with Ajax. **10 Hours**

Self Study:Rails applications with databases,

TEXT BOOK:

1. **Programming the World Wide Web** – Robert W. Sebesta, 8th Edition, Pearson Education, 2015.

REFERENCE BOOKS:

1. **Internet & World Wide Web How to program** – M. Deitel, P.J Deitel, A. B. Goldberg, 3rd Edition, Pearson Education / PHI, 2004.
2. **Web Programming Building Internet Applications** – Chris Bates, 3rd Edition, Wiley India, 2006.
3. **The Web Warrior Guide to Web Programming** – Xue Bai et al,

Course Outcomes

1. **Develop** web pages using various XHTML tags.
2. **Design** interactive web pages using java script.
3. **Create** dynamic documents using DOM object model.
4. **Develop** web pages using PHP scripts.
5. **Implement** a simple Rails application using Ajax.

Course Articulation Matrix (CAM)															
Course Outcomes	**Program Outcomes (PO's)**												**PSO's**		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	3	2	2		2	1	1	2	2	1	1	1		2	2
CO 2	3	2	2		2	1	1	2	2	1	1	1		2	1
CO 3	3	2	2		2	1	1	2	2	2	1	1		2	2

Course Title: WIRELESS TECHNOLOGY			
Course Code:P17IS652	**Semester : VI**	**L- T – P -H: 4 – 0 – 0-4**	**Credit : 3**
Contact period : Lecture: 52 Hrs, Exam: 3 Hrs		**Weightage: CIE: 50, SEE:50**	

Prerequisites: Computer Networks

Course learning objectives (CLOs)

This course aims to

1. Understand the properties of wireless channel. -L2
2. Analyze the different generations of cellular system. -L4
3. Understand the different variations of TCP in wireless domain and analyze the issues in Ad Hoc Wireless Networks. -L2
4. Compare different routing protocols for Ad Hoc wireless networks. -L2
5. Distinguish between Ad Hoc wireless networks and wireless sensor networks. -L4

Relevance of the Course: The course introduces the student to the classical techniques and Paradigms used in the wireless networks. This course is an extension of computer networks. Student will be familiar with different protocols of wireless networks. Only theoretical techniques of analysis are covered. Topics include introduction to wireless networks, Wireless LANS and PANS, Wireless WANS and MANS, Wireless Internet, AD HOC Wireless Networks, Routing Protocols for Ad Hoc Wireless Networks and Wireless Sensor Networks. Students will be able to practice their skills on different protocols in order to solve real-life problems. Course Content

Course content

Unit – I

Introduction: Fundamentals of wireless communication technology, The Electromagnetic Spectrum, Radio propagation mechanisms, characteristics of the wireless channel, Modulation techniques, multiple access techniques, voice coding, error control, computer Network software, computer network architecture. **10 Hours**

Self Study: IEEE 802 networking standard, wireless Networks

Unit – II

Wireless LANS and PANS: Introduction, Fundamentals of WLANs, IEEE 802.11 Standard–physical layer, basic MAC layer mechanisms, CSMA/CA mechanism, HIPERLAN standard, Bluetooth. Wireless WANS and MANS: Introduction, Cellular concept, cellular architecture, First-Generation Cellular Systems, Second-Generation Cellular Systems, Third Generation Cellular Systems. **10 Hours**

Self Study: Wireless in local loop, Wireless ATM, IEEE 802.16 standard

Unit – 3

Wireless Internet: Introduction, Wireless internet, Mobile IP, TCP in wireless domain,WAP, Optimizing web over wireless. AD HOC Wireless Networks: Introduction, issues in Ad Hoc wireless networks. **10 Hours**

Self Study: Ad Hoc wireless internet.

Unit – 4

MAC Protocols for Ad Hoc Wireless Networks: Issues in designing a MAC protocol for Ad Hoc wireless networks, Design goals of a MAC protocol for Ad Hoc wireless networks, classifications of MAC protocols. Routing Protocols for Ad Hoc Wireless Networks: Issues in designing a routing

protocol for Ad Hoc wireless networks, Classifications of routing protocols, Table-Driven routing protocols, On-Demand routing protocols, Hybrid routing protocols, Routing protocols with efficient flooding mechanisms..

12 Hours

Self Study: Hierarchical routing protocols, Power-Aware routing protocols

Unit – 5

Wireless Sensor Networks: Introduction, Sensor network architecture, Data dissemination, Data gathering, MAC protocols for sensor networks, Location discovery, Quality of a sensor network.

10 Hours

Self Study: Evolving standards, other issues.

Text Books:

1. AD HOC Wireless Networks: Architectures and Protocols – C. Siva Ram Murthy and B. S. Manoj, Pearson Education, 2013.

REFERENCE BOOKS:

1. Wireless Networks – P. Nicopolitidis, M.S. Obaidat, G.I. Papadimitriou and A.S. Pomportsis, Publisher: Wiley India Pvt. Ltd., 2009.
2. Fundamentals of Wireless Sensor Networks: Theory and Practice – Waltenegus W. Dargie and Christian Poellabauer, Publisher: Wiley; 1 edition, 2011.
3. Ad Hoc Mobile Wireless Networks: Protocols and Systems - C.K. Toh, Publisher: Pearson Education, First edition, 2007.

Course outcomes

After learning all the units, the student is able to

1. Understand the various concepts and principles involved in wireless communication. -L2
2. Analyze and apply the concept related to wireless LAN, PAN, WAN and MAN. -L3, L4
3. Identify the different aspects of Ad Hoc Wireless Networks. - L3
4. Compare the routing protocols in Ad hoc wireless networks. -L2
5. Understand the sensor network architecture. -L2

Course Articulation Matrix (CAM)															
Course Outcomes	**Program Outcomes (PO's)**												**PSO's**		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2		2						2			2		2	2
CO2	1		2		3				2			2		2	2
CO3	1		2		2				2			2		2	2
CO4	1		2		2				2			2		2	2
CO5	1		2						2			2		2	2

Course Title: MULTIMEDIA COMPUTING			
Course Code: P17IS653	**Semester : VI**	**L- T – P -H: 4 – 0 – 0-4**	**Credit : 3**
Contact period : Lecture: 52 Hrs, Exam: 3 Hrs		**Weightage: CIE: 50, SEE:50**	

Course Learning Objectives (CLOs)

This course aims to

1. Describe the components of multimedia systems, the technologies used for multimedia system, and storage management of multimedia system.
2. Identify applications of multimedia systems.
3. Describe the computerized graphic and images and their respective properties.
4. Explain different compression methods used for audio and video signals.
5. Describe the basic optical technology.
6. Explain different type of currently available content analysis techniques and large number of file and data formats.

Course Content

Unit I

Introduction, Media and Data Streams, Audio Technology. Introduction: Multimedia Element, Multimedia Applications, Multimedia Systems Architecture, Evolving Technologies for Multimedia Systems, Defining objects for Multimedia systems, Multimedia data Interface standards, the need for data compression, Multimedia Databases. Media: Perception media, Represent media, Presentation media, Storage media. Sound: Frequency, Amplitude, Sound Perception and Psychoacoustics, Audio representation on Computers, Three dimensional sound projection, Music and MIDI standards, Speech signals, Speech Output, Speech Input, Speech Transmission. **10 Hours**

Self Study: Characterizing Continuous media data streams.

Unit II

Graphics and Images, Video Technology, Computer-Based Animation. Graphics and Images**:** Capturing Graphics and Images, Computer Assisted Graphics and Image Processing, Reconstructing Images, Graphics and Image Output Options. Basics, Television System, Digitalization of video Signals, Digital Television. Computer-Based Animation: Basic Concepts, Specification of Animations, Methods of Controlling Animation.

11 Hours

Self Study: Virtual Reality Modeling Language.

Unit III

Data Compression Storage Space, Coding Requirements, Source, Entropy and Hybrid Coding, Basic Compression Techniques, JPEG: Image Preparation, Lossy Sequential DCT-based Mode, Expanded Lossy DCT-base Mode, Lossless Mode, Hierarchical Mode. H.261(Px64) and H.263: Image Preparation, Coding Algorithm, Data Stream, H.263+ and H.263L, MPEG: Video Encoding, Audio Encoding, Data Stream, MPEG-2,MPEG-4, MPEG-7.

Self Study: Fractal Compression **10 Hours**

Unit IV

Optical Storage Media History of Optical Storage, Basic Technology, Video Discs and Other WORMs, Compact Disc Digital Audio, Compact Disc Read Only Memory, CD-ROM Extended Architecture, Further CD-ROM Based Developments, Compact Disc Recordable, Compact Disc Magneto-Optical, Compact Disc Read/Write. **10 Hours**

Self Study: Digital Versatile Disc.

Unit V

Content Analysis, Data and File Format standards Content Analysis: Simple Vs. Complex Features, Analysis of Individual Images, Analysis of Image Sequences, Audio Analysis,

Applications. Data and File Format standards:Rich Text Format, TIFF File Format, Resource Interchange File Format [RIFF]. **11 Hours**

Self Study: MIDI File Format. TWAIN

Text Books:

1. Multimedia Fundamentals: Vol 1- Media Coding and Content Processing – Ralf Steinmetz, Klara Narstedt, 2nd Edition, Pearson Education / PHI, 2011.
2. Multimedia Systems Design - Prabhat K. Andleigh, Kiran Thakrar, PHI, 2013.

Reference Books:

1. Multimedia Communication: Applications, Networks, Protocols and Standards-Fred Halsal, Pearson, 2013
2. Introduction to Data Compression- Khalid Sayood, Fourth Edition, Elsevier Inc, 2013

Course Outcome

After learning all the units of the course, the student is able to

CO 1**.** Identify the basic requirements of multimedia system.

CO 2. Identify properties, formats and standards to represent graphics and images, video and animations.

CO 3. Apply different compression techniques for audio and video data.

CO 4. Identify the efficient optical storage media for a given scenario.

CO 5. Demonstrate content analysis techniques and various data and file formats standards to represent data.

Course Articulation Matrix

Course Outcomes	Program Outcomes (PO's)												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	2	1											1		
CO 2	2	2	2										1	2	
CO 3	2	3	2										2		2
CO 4	2	2	2										1	1	1
CO 5	2	2	2										2	2	1

Course Title : PARALLEL COMPUTING			
Course Code : P17IS654	**Semester : VI**	**L :T:P:H : 4:0:0:4**	**Credits: 3**
Contact Period: Lecture: 52 Hr, Exam: 3 Hr		**Weightage: CIE:50; SEE:50**	

Prerequisites: Programming Language.

Course Description: This course introduces you to the foundations of parallel computing including the principles of parallel algorithm design, analytical modelling of parallel programs, and programming models for shared- and distributed-memory systems, parallel computer architectures, along with numerical and non-numerical algorithms for parallel systems.

Course Learning Objectives (CLOs)

This course aims to:

1. To study the scalability and clustering issues and the technology necessary for them.
2. To understand the technologies enabling parallel computing.
3. To study the different types of interconnection networks.
4. To study the different parallel programming models.
5. To study the software support needed for shared memory programming.

Course Content

Unit 1

Introduction to Parallel Computing: Thinking in Parallel, Parallelism Vs. Concurrency, Types and levels of parallelism, Different grains of parallelism, Introduction to parallelization and vectorization: Data dependencies, SIMD technology, Definition of thread and process, Parallel programming models, Decomposition methodologies for parallel program development, The message passing paradigm,load balancing issues for parallel programs,PRAM computational model, Flynn's Taxonomy,current issues in parallel processing.

Self Study: Parallel Processing speedup issues: including Amdahl's and Gustafason's Laws.

10 Hours

Unit 2

Heterogeneous Architectures: Motivation for Heterogeneous Computing, Introduction to heterogeneous architectures- GPU in particular Modern GPU architecture. Introduction to GPU computing (general purpose computation on GPU), GPU architecture case studies: NVIDIA Fermi Tesla C2050/Kepler K20.

Self Study: languages for parallel computing, including:MPI and OpenMP Parallel Programming.

10 Hours

Unit 3

Introduction to CUDA programming Compute Unified Device Architecture (CUDA): CUDA Architecture, CUDA programming model, execution model, thread organization: Concept of grid, block and thread, thread index generation, warp; memory model: Introduction to global, shared, local memories, usage of cache, texture cache, constant memory, memory banks and bank conflicts. CUDA structure, API and library (CUDPP, CUBALS, FFT etc.) details.

Self Study:CUDA example programs (Vector dot product, Matrix multiplication (with the usage of tiling and shared memory). **10 Hours**

Unit 4

Multicore Programming with OpenMP: Fundamentals of Shared Memory Programming, Basic OpenMP concepts, PARALLEL directive, data scoping rules, basic OpenMP constructs/directives/calls, examples, parallelizing an existing code using OpenMP, More advanced OpenMP directives and functions

Self Study: OpenMP performance issues. **10 Hours**

Unit 5

Problem solving using GPUs: Single vs double precision, solving a problem that involves Vectors, Matrices, Binomial coefficients, Bernstein coefficients and etc. Instructor will choose the problems from several domains with which students are already aware. **Optimizations and Tools:** Memory coalescing, Reduction operation using prefix sum example. Usage of shared memory optimally, Performance issues in algorithmsdeciding parallelization of a part of algorithm and selecting the highest parallelism, Need of profilers and analyzers.
Self Study: Introduction to CUDA Tools: MemCheck, Command line & Visual Profilers.

12 Hours

TEXT BOOKS:

1. AnanthGrama, Anshal Gupta, GreogeKarypis, Vipin Kumar, "Introduction to Parallel Computing",Second Edition,(Pearson Publication)
2. David B. Kirk and Wen-mei W. Hwu, "Programming Massively Parallel Processors: A Hands-On Approach", Second Edition(MK-Morgan Kaufmann Publication)
3. Parallel Programming in C with MPI and OpenMP by Michael J. Quinn, Tata McGrawHill Edition
4. Advanced computer architecture by Kai Hwong, Tata McGraw-Hill Edition, 2001

REFERENCE BOOKS

1. Jason Sanders and Edward Kandrot,"CUDA by Example: An Introduction to General-Purpose GPU Programming",2010.

Course Outcomes

After completing this course, students will able to:

CO 1. Awareness of the GPU architecture and its programming.
CO 2. Design parallel programs for GPU.
CO 3. Design & develop OpenMP and CUDA programs.
CO 4. Analyze and apply various parallel algorithms
CO 5. Capable to optimize algorithms for better performance.

Course Articulation Matrix

Course Outcomes	Program Outcomes (PO's)												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	2	2							3			3			
CO 2	2	2													
CO 3	2	2													
CO 4	2	2													
CO 5	2	2							3			3			

ELECTIVE-III

Course Title: Modern Information Retrieval			
Course Code: P17IS661	**Semester : VI**	**L- T – P -H: 4 – 0 – 0-4**	**Credit: 3**
Contact period : Lecture: 52 Hr, Exam:3 hr		**Weightage: CIE: 50, SEE:50**	

Prerequisites: The student should have undergone the course on programming language, database.

Course learning objectives

This course aims to

1. Understand the difficulty of representing and retrieving documents.
2. Understand the latest technologies for linking, describing and searching the Web.
3. Understand the relationship between IR, hypermedia, and semantic models.
4. Be familiar with classical techniques of Information Retrieval, and the additional techniques employed by Web search engines sufficient to understand how Web search engines work and how they could be improved.
5. Be familiar with techniques for conveying the meaning of documents or hypermedia content, for example, metadata, thesauri, and classification taxonomies – sufficient to understand their application to the "semantic Web".
6. Be familiar with the fundamentals of hypermedia systems sufficient to know how to develop a good Web hypermedia and why a Web site is good or bad.
7. Implement techniques for the preprocessing needed for information retrieval systems.
8. Develop a simple information retrieval system.

Course contents

Unit-I

Information Retrieval and Modeling Introduction: Information versus data retrieval, information retrieval at the center of stage; basic concepts: user task, logical view of the documents; past present and future: early development, information retrieval in the library, the web and digital libraries; the retrieval process. **Modeling:** A taxonomy of IR models; classic IR: Basic Concepts, Boolean model, vector model, probabilistic model, fuzzy set model, extended Boolean model.

Self Study: neural network model. **10 Hours**

Unit-II

Retrieval Evaluation, Query Language and Operation Introduction; retrieval performance evaluation, reference collection, keyword-based querying pattern matching, structural queries, query protocol, user relevance feedback, automatic local analysis, automatic global analysis, metadata, text.

Self Study: Markup language, multimedia. **10 Hours**

Unit-III

Text Operation, Indexing and Searching Introduction, document preprocessing, document clustering, text compression, inverted files, other indices for text, Boolean queries, sequential searching, pattern matching, structural queries

Self Study: compression **12 Hours**

Unit-IV

Parallel and Distributed IR and Multimedia IR Introduction, parallel IR, distributed IR, data modeling, query language, spatial access methods, a generic multimedia indexing approach, one dimensional time series.

Self Study: Two dimensional color images. **10 Hours**

Unit-V

Searching the Web Introduction, challenges, characterizing the web, search engines browsing, metasearchers, finding the needle in the haystack, searching using hyperlinks. **10 Hours**

Text Books:

1. Ricardo Baeza-Yates, Berthier Ribeiro-Neto: Modern Information Retrieval, First edition, Pearson Education, 2011.

Reference Book:

1. William B Frakes, Ricardo Baeza Yates: Information Retrieval Data Structures and Algorithms, First edition, Pearson Education, 2009.
2. C.J. van Rijsbergen: Information Retrieval, Second Edition, Butterworth-Heinemann.

Course outcomes

After learning all the units of the course, the student is able to

CO 1. Compare data & information retrieval systems and apply appropriate information retrieval model for given problem.
CO 2. Evaluate retrieval performance of given model.
CO 3. Develop techniques for the preprocessing/clustering needed for information retrieve systems
CO 4. Differentiate between parallel IR and distributed IR.
CO 5. Develop a simple information retrieval system.

Course Articulation Matrix

Course Articulation Matrix															
Course Outcomes	**Program Outcomes (PO's)**												**PSO's**		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2		2												1
CO2	2			1											
CO3	2		2												1
CO4	1		1												
CO5	2		1												1

Course Title: Storage Area Network			
Course Code: P17IS662	**Sem: VI**	**L-T-P-H: 4:0:0:4**	**Credits - 3**
Contact Period: Lecture: 52 Hrs., Exam: 3 Hrs		**Weightage: CIE:50; SEE:50**	

Prerequisites : Operating system and Communication Network.

Course Learning Objectives

The course aims to:

1. Identify the need for performance evaluation and the metrics used for it.
2. Realize strong virtualization concepts.
3. Develop techniques for evaluating policies for LUN masking, file systems.
4. Explain how data centre's maintain using remote mirroring concepts.
5. Design storage configurations that effectively meet scalability, security, resilience, and availability requirements.

Unit I

Introduction: Server Centric IT Architecture and its Limitations; Storage – Centric IT Architecture and its advantages. Case study: Replacing a server with Storage Networks The Data Storage and DataIntelligent Disk Subsystems: Architecture of Intelligent Disk Subsystems; Hard disks and Internal I/O Channels; JBOD, Storage virtualization using RAID and different RAID levels; Caching: Acceleration of Hard Disk Access.

Self Study: Intelligent disk subsystems,Availability of disk subsystems. **10 Hours**

Unit II

I/O Techniques: The Physical I/O path from the CPU to the Storage System; SCSI; Fibre Channel Protocol Stack; Fibre Channel SAN; IP Storage. Network Attached Storage: The NAS Architecture, The NAS hardware Architecture, The NAS Software Architecture, Network connectivity, NAS as a storage system. File System and NAS: Local File Systems; Network file Systems and file servers; Shared Disk file systems; Comparison of fibre Channel and NAS.

10 Hours

Unit III

Storage Virtualization: Definition of Storage virtualization; Implementation Considerations; Storage virtualization on Block or file level; Storage virtualization on various levels of the storage Network Symmetric.

Self Study: Asymmetric storage virtualization in the Network. **10 Hours**

Unit IV

SAN Architecture and Hardware devices: Overview, Creating a Network for storage; SAN Hardware devices The fibre channel switch; Host Bus Adaptors; Putting the storage in SAN; Fabric operation from a Hardware perspective. Software Components of SAN: The switch's Operating system; Device Drivers; Supporting the switch's components.

Self Study: Configuration options for SANs. 1**0 Hours**

Unit V

Management of Storage Network: System Management, Requirement of management System, Support by Management System, Management Interface, Standardized Mechanisms, Property Mechanisms, In-band Management, Use of SNMP, CIM and WBEM, Storage Management Initiative Specification (SMI-S), CMIP and DMI.

Self Study: Optional Aspects of the Management of Storage Networks, Summary. **10 Hours**

Prerequisites: Data Structures, DBMS and Graph Theory.

Text Book:

1. Ulf Troppens, Rainer Erkens and Wolfgang Muller: Storage Networks Explained, Wiley India,2015.
2. 1. Robert Spalding: "Storage Networks The Complete Reference", Tata McGraw-Hill, 2011.

Reference Books:

1. Marc Farley: Storage Networking Fundamentals – An Introduction to Storage Devices, Subsystems, Applications, Management, and File Systems, Cisco Press, 2005.
2. Richard Barker and Paul Massiglia: "Storage Area Network Essentials A Complete Guideto understanding and Implementing SANs", Wiley India, 2006.

Course Outcomes

The students shall able to:

CO 1. Describe the fundamentals of storage centric and server centric systems
CO 2. Analyze the metrics used for Designing storage area networks
CO 3. Explain the RAID concepts
CO 4. Explain strong virtualization concepts.
CO 5. Apply the techniques used for data maintenance.

Course Articulation Matrix															
Course Outcomes	**Program Outcomes (PO's)**												**PSO's**		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2												2	2	1
CO2	2												2	1	2
CO3	2	3											1	1	1
CO4	2	2	2										1	1	1
CO5	2	2	2										2	2	2

Course title: DATA MINING			
Course Code: P17IS663	**Semester: VI**	**L-T-P-H : 4-0-0-4**	**Credit:3**
Contact Period: Lecture: 52 Hrs, Exam: 3 Hrs		**Weightage: CIE:50%, SEE: 50%**	

Course Learning Objectives(CLOs)

This course aims to

1. Explain fundamental concepts of ODS, Data warehouses, OLAP and data cube
2. Outline fundamental concepts of data mining and data pre-processing techniques
3. Analyze algorithms used in association analysis .
4. Compare and Contrast algorithms used in classification and clustering .
5. Summarize the concepts of Web Data Mining.

Course Content

Unit - I

Data Warehousing: Introduction, Operational Data Stores (ODS), Data Warehouses, Design issues, Guidelines for Data Warehouse Implementation, Data Warehouse metadata. Online Analytical Processing(OLAP): Introduction, Characteristics of OLAP systems, motivations for using OLAP, Multidimensional view and Data cube, Data cube implementations, Data cube operations..

10 Hours

Self Study: Guidelines for Implementation of OLAP

Unit - II

Data Mining: Introduction, Motivating challenges. Data mining tasks, Types of data, Data quality, Data preprocessing, Measures of similarity and dissimilarity.

10 Hours

Self Study: Origins of data mining

Unit - III

Association Analysis: Problem definition, frequent item set generation, Rule generation, Compact representation of frequent item sets, Alternative method for generating frequent item set, FP-growth algorithm.

11 Hours

Self Study: Evaluation of Association Patterns

Unit - IV

Classification: Basics, General approach to solving a classification problem, Decision tree induction, Rule based classifier, Nearest Neighbor classifiers, Bayesian classifier, ANN classifier, SVM classifier.

11 Hours

Self Study: Evaluating the performance of a classifier

Unit - V

Cluster analysis: Overview, K-means, Agglomerative Hierarchical clustering, DBSCAN, Web data Mining: Introduction, web mining, web terminology and characteristics, locality and hierarchy in the web, Web content mining.

10 Hours

Self Study: web usage mining, and web structure mining

Text Books:

1. Introduction to Data Mining – Pang-Ning Tan, Vipin Kumar, Michael Steinbach, Pearson education 2012.

2. Introduction to Data Mining with case studies – G K Guptha, PHI, 3rd edition 2014.

Reference Books:

1. Data Mining Techniques - Arun K Pujari, Universities press 2009.
2. Data mining concepts and techniques – Jiawei and MichelineKamber, Morgan Kauffmann publisher. 3rd Edition 2011.
3. Discovering Knowledge in Data: An introduction to Data Mining, Daniel T. Larose, John Wiley, 2nd Edition, 2014

Course Outcomes

After learning all the units of the course, the student is able to,

1. Analyze different data models used in data warehouse.
2. Apply different pre processing techniques for given data attributes.
3. Analyze different association rules to determine frequent item set.
4. Apply the different classification techniques.
5. Identify different clustering techniques.

Course Articulation Matrix (CAM)															
Course Outcomes	Program Outcomes (PO's)												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	2	3											2		
CO 2	3												3		1
CO 3		3											2		1
CO 4	2	2	3										2		1
CO 5	1	1											2		

Course Title: PRINCIPLES OF COMPILER DESIGN			
Course Code: P17IS664	**Semester : VI**	**L- T – P -H: 4 – 0 – 0 -4**	**Credit :3**
Contact period : Lecture: 52 Hr, Exam:3 hr		**Weightage: CIE: 50, SEE:50**	

Prerequisites: The student should have undergone the course on System Software, have knowledge about finite automata and any one programming language**.**

Course learning objectives

This course aims to

1. Describe the various phases of a compiler, software tools to build compiler and know the technique used to implement lexical analyzer.
2. Apply an algorithm for top down parsing.
3. Apply an algorithm for bottom-up parsing.
4. Create a syntax-directed definition and explain the role of a semantic analyzer and type checking.
5. Apply the transformation of abstract syntax tree to intermediate code.
6. Analyze various issues in allocation strategies and design of code generator.
7. Implement the phases for set of instructions.
8. Apply the knowledge of LEX tool & YACC tool to develop a scanner & parser.
9. Design & conduct experiments for Intermediate Code Generation in compiler.
10. Acquire the knowledge of modern compiler & its features.
11. Learn & Use the new tools and technologies used for designing a compiler

Course contents

Unit– I

Language processors; The structure of a Compiler; Language processors; The evolution of programming languages. Applications of compiler technology; Programming language basics. Lexical analysis: The Role of Lexical Analyzer;
Input Buffering; Specifications of Tokens; Recognition of Tokens. **10 Hours**
Self Study: The science of building a Compiler

Unit – II

Syntax Analysis – 1: Introduction; Context-free Grammars; Writing a Grammar. Recursive decent parsing, FIRST set, FOLLOW set, LL(1) Grammar, Non-recursive predictive parsing,
Self Study: Error recovery in predictive parsing. **10 Hours**

Unit – III

Syntax Analysis – 2: Reduction, Handle pruning, Shift reduce parsing, Conflicts during shift reduce parsing, Introduction to LR Parsing: Simple LR; LR parsing algorithm, Constructing SLR parsing tables, Constructing SLR parsing tables, Using ambiguous grammars.
Self Study: Parser Generators. **10 Hours**

Unit – IV

Syntax-Directed Translation and Intermediate Code Generation Syntax-directed definitions; Evaluation orders for SDDs; Applications of syntax-directed translation. **Intermediate Code Generation:** Variants of syntax trees; Three-address code; Translation of expressions; Control flow; Back patching; Switch statements; Procedure calls.
Self Study: Syntax-directed translation schemes. **11 Hours**

Unit - V

Run-Time Environments and Code Generation Storage Organization; Stack allocation of space; Access to non-local data on the stack; Heap management **Code Generation:** Issues in the design of Code Generator; The Target Language; Addresses in the target code; Basic blocks and Flow graphs; Optimization of basic blocks; A Simple Code Generator.

Self Study: Introduction to garbage collection. **11 Hours**

Text Books:

1. Alfred V Aho, Monica S.Lam, Ravi Sethi, Jeffrey D Ullman: Compilers- Principles, Techniques and Tools, 2nd Edition, Pearson Education, 2011.

Reference Books:

1. Charles N. Fischer, Richard J. leBlanc, Jr.: Crafting a Compiler with C, Pearson Education, 2009.
2. Andrew W Apple: Modern Compiler Implementation in C, Cambridge University Press, 2009.
3. Kenneth C Louden: Compiler Construction Principles & Practice, Cengage Learning, 2011.

Course outcomes

After learning all the units of the course, the student is able to

CO 1. Identify the tools used in various phases of compiler.

CO 2. Apply different top down parsing techniques for context free grammar.

CO 3. Apply different bottom up parsing techniques for context free grammar.

CO 4. Develop syntax directed definition and convert the abstract syntax tree to intermediate code.

CO 5. Analyze different code generation techniques for code optimization

Course Articulation Matrix

Course Outcomes	Program Outcomes (PO's)												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	1	1										1		
CO2	3												2		
CO3	3												2		
CO4	2	2	3										2		
CO5	2	2	3										2		

Course Title : Aptitude and Reasoning Development - EXPERT (ARDE)			
Course Code : P17HU610	Semester : VI	L:T:P:H -0:0:2:2	Credits: 1
Contact Period: Lecture: 32 Hr, Exam: 3 Hr	Weightage: CIE:50%; SEE:50%		
Prerequisites : Number system, Concept of percentage, Analytical reasoning-2.			

Course Learning Objectives (CLOS)

This course aims to

1. Explain different types of functions, representation of different functions on the graphs.
2. Describe the properties of quadratic equations and application of quadratic equations.
3. Demonstrates the principle of counting.
4. Differentiates between permutation and combination and solve problems conceptually.
5. Predict the probabilities in different scenarios and its application in our day-to-day life.
6. Evaluate the cause and effect of the statements logically.
7. Recognize different ways in which a statement can be strengthened or weakened.
8. Explain the criticality of data sufficiency chapter., universal methodology to solve any problem.
9. Analyse the data in a bar graph , pie chart and tabular column and line graph and the combination of these graphs.
10. Compare the data in different format and understand the difference between them

Course Content

UNIT – I

Functions and Quadratic equations:

Functions: Basic methods of representing functions– Analytical representation, tabular representation, graphical representation of functions. Even and odd functions, Inverse of a function, Shifting of graph. Representation of standard set of equations. Methodology to tackle inverse functions. Graphical process for solving inequalities, graphical view of logarithmic function.

Quadratic equations: Theory, properties of quadratic equations and their roots, the sign of quadratic equation, Equations in more than one variable. Simultaneous equations, number of solutions of the simultaneous equations. **6 Hours**

UNIT – II

Permutation and Combination: Understanding the difference between the permutation and combination, Rules of Counting-rule of addition, rule of multiplication, factorial function, Concept of step arrangement, Permutation of things when some of them are identical, Concept of 2^n, Arrangement in a circle.

Probability: Single event probability, multi event probability, independent events and dependent events, mutually exclusive events, non-mutually exclusive events, combination method for finding the outcomes. **8 Hours**

UNIT – III

Analytical reasoning 3: Punchline: Introduction, format of the problem, An analysis, Does a suggested statement qualify as a punchline?. If a given statement fits as a punchline, what is its idea or wavelength?, The complete method of solving a punchline problem, Solved examples, conclusion, Sample company questions.

Strengthening and Weakening arguments: Format of the problem, An analysis, Suggested methods, solved examples, conclusion, sample company questions.

Cause and Effect : Cause and Effect—A theoretical discussion, Immediate cause, Principal cause, A quick check– Cause always antecedent. The strategy for solution. **6 Hours**

UNIT- IV

Data Sufficiency: Introduction, answer choices in data sufficiency, tips to solve data sufficiency problems, directions of questions, classification of sections in data sufficiency– Number system, Algebra, series and sequence, logical, geometry and mensuration, arithmetic. **6 Hours**

UNIT- V

Data Interpretation: Approach to interpretation - simple arithmetic, rules for comparing fractions, Calculating (approximation) fractions, short cut ways to find the percentages, Classification of data– Tables, Bar graph, line graph, Cumulative bar graph, Pie graph, Combination of graphs. Combination of table and graphs **6 Hours**

Reference Books:

1. **"The Trachtenberg speed system of basic mathematics**, published by Rupa publications.
2. **CAT Mathematics** by Abhijith Guha. published by PHI learning private limited.
3. **Quantitative aptitude** by Dr. R. S Agarwal, published by S.Chand private limited.
4. **Verbal reasoning** by Dr. R. S Agarwal , published by S. Chand private limited.
5. **Quantitative aptitude** for CAT by Arun Sharma, published by McGraw Hill publication.
6. **Analytical reasoning** by M.K Pandey BSC PUBLISHING.CO.PVT.LTD

Course Outcomes (CO)

After learning all the units of the course, the student is able to:

1. Graphically represent the functions and analyze it.
2. Infer the conclusions based on the roots obtained by solving quadratic equations and establish relationship between them.
3. Effective solve the problems of permutation and combination.
4. Predict different possibilities by the principle of probability.
5. Interpret the data given in the graphical format and infer the results.

Analyze the statement critically and solve the questions from verbal logic.

A. Course Articulation Matrix (CAM)															
Course Outcome (CO)	**Program Outcome (ABET/NBA-(3a-k))**														
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
Graphically represent the functions and analyze it.	L5	2	-	-	-	2	-	-	-	-	-	-	-	-	-
Infer the conclusions based on the roots obtained by solving quadratic equations and establish relationship between them.	L6	2	-	-	-	-	-	-	-	-	-	-	-	-	-
Effective solve the problems of permutation and combination.	L4	3	-	-	-	2	-	-	-	2	-	-	-	-	-
Predict different possibilities by the principle of probability.	L3	3	-	-	-	-	-	-	-	2	-	-	-	-	-
Interpret the data given in the graphical format and infer the results.	L5	2	-	-	-	-	-	-	-	-	-	-	-	-	-
L- Low, M- Moderate, H-High															