Course Title: **Data Structure and Algorithms Lab**		Course Code: **19ECSP201**
L-T-P: **0-0-2**	Credits: **2**	Contact Hrs: **4 hrs/week**
ISA Marks: **80**	ESA Marks: **20**	Total Marks: **100**
Teaching Hrs:**56 hrs**	Exam Duration: **3 hrs**	

Tentative plan of lab Implementation

Week No	**Lab Assignments**
1	02 Programming Assignments on Basic Data structures
2	
3	02 Assignments on Algorithm Efficiency Analysis
4	
5	02 Assignments on Trees
6	
7	02 Assignments on Sorting and Searching
8	
9	04 Assignments on Graphs and Design Techniques
10	
11	
12	
13	Open Ended Experiment

Materials and Resources Required:

Text Books:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein. Introduction to Algorithms, Third Edition (3rd ed.). The MIT Press. 2009.
2. Anany V. Levitin. 2002. Introduction to the Design and Analysis of Algorithms. Addison-Wesley Longman Publishing Co., Inc., Boston, MA, USA.

Reference Books:

1. Hemant Jain, Problem Solving in Data structures and Algorithms Using C, TaranTechnologies Private Limited, 2016
2. Online Sites: HackerRank / CodeChef

Program: Bachelor of Engineering		
Course Title: Object Oriented Programming with C++		Course Code: 18ECSC207
L-T-P: **3-0-0**	Credits: **3**	Contact Hrs: **3 hrs/week**
ISA Marks: **50**	ESA Marks: **50**	Total Marks: **100**
Teaching Hrs: **40**	Exam Duration: **3hrs**	

Unit –I		
1	**Chapter No. 1: Introduction:** Introduction to object oriented programming. Characteristics of object oriented languages, Programming Basics, arrays, Functions in C++ (parameter passing techniques.)	**4 hrs**
2	**Chapter No. 2:Classes and Objects:** Introduction to Classes and Objects, encapsulation visibility modifiers, constructor and its types, nested classes, String class. UML diagrams to describe classes and relationships.	**6 hrs**
3	**Chapter No. 3:Inheritance:** Introduction, types of Inheritance, constructors, Abstract class,Aggregation: classes within classes	**6 hrs**
Unit –II		
4	**Chapter No. 4:Virtual Functions and Polymorphism:** Virtual functions, Friend functions, static functions, The 'this' pointer	**6 hrs**
5	**Chapter No. 5:Templates and Exception Handling:** Function and class templates.Introduction to exceptions, Throwing an Exception, Try Block, Exception Handler (Catching an Exception), Multiple exceptions. Exceptions with arguments	**6hrs**
6	**Chapter No. 6:Design Patterns:** Creational, Structural and Behavioural design patterns.	**4 hrs**
Unit –III		
7	**Chapter No. 7:Streams and Files:** Stream classes, File I/O with streams.	**4 hrs**
8	**Chapter No. 8:Standard Template Library:** container classes**:** Sequence and Associative Containers	**4 hrs**

Textbooks

1. Robert Lafore, "Object oriented programming in C++", 4th Edition, Pearson education,

Reference Books

1. Lippman S B, Lajorie J, Moo B E, C++ Primer, 5ed, Addison Wesley, 2013.

2. Herbert Schildt: The Complete Reference C++, 4th Edition, Tata McGraw Hill

Program: Bachelor of Engineering		
Course Title: **Object Oriented Programming with C++ Lab**		Course Code: **18ECSP203**
L-T-P: **0-0-1.5**	Credits: **1.5**	Contact Hrs: **3 hrs/week**
ISA Marks: **80**	ESA Marks: **20**	Total Marks: **100**
Teaching Hrs: **39**	Exam Duration: **3hrs**	

Experiments	**Lab assignments/experiment**
2-Demonstration	Introduction to Code Blocks IDE (Integrated Development Environment), C++ programming basics.
4–Exercise	Classes and objects, Inheritance, Polymorphism, Templates and Exceptions Handling
2-Structured Enquiry	Classes and objects, Inheritance, Polymorphism, Templates and Exceptions Handling
1-Open Ended	Data types, Classes and Objects, Inheritance polymorphism, Exception Handling. Design patterns

Text Book:

1. Robert Lafore, "Object oriented programming in C++", 4th Edition, Pearson education.

Reference Books:

1. Lippman S B, Lajorie J, Moo B E, C++ Primer, 5ed, Addison Wesley, 2013.
2. Herbert Schildt: The Complete Reference C++, 4th Edition, Tata McGraw Hill
1.

Evaluation :

Students Assessment Through CIE (80%) + SEE (20%)

Continuous Internal	**Assessment**	**Weightage in Marks**

Evaluation (80%)	Exercises	40
	Structured Enquiry	20
	Open Ended Experiment	20
Semester End Examination (20%)	Structured Enquiry	**20**
	Total	**100**

Program: **Bachelor of Engineering**		
Course Title **Scripting Languages Lab**		Course Code: **18ECSP201**
L-T-P: **0-0-2**	Credits: **2**	Contact Hrs: **4hrs/week**
ISA Marks: **80**	ESA Marks: **20**	Total Marks: **100**
Teaching Hrs: **30**	Exam Duration: **3 hrs**	

1	**Introduction to UNIX Utilities** Architecture, Commands, File Attributes, vi Editor, Process, Simple Filter, File System, Handling Files and Basic File Attributes.	**06hrs**
2	**UNIX shell Scripting** Shell Basics, Shell Environment, Shell Script Programming Concepts, Decision Structures, Looping Structures, and Command line arguments, Functions and Arrays, Regular Expression & Filters, Processes.	**06hrs**
3	**Python Scripting** Python: Types, Variables, and Simple I/O, Branching and Looping, String Manipulation,Numbers, Lists and Dictionaries, Regular Expressions, Functions, Files and Exceptions, Programming using numpy and scipy libraries.	**12hrs**
4	**System Administration** Common administrative tasks, creating and mounting file system, File system management, managing users and group accounts, monitoring system performance, accessing system information, backup and restore files, reconfiguration hardware with kudzu, installing and removing packages.	**06 hrs**

Tentative plan of lab implementation

Expt./ Job No.	Lab assignments/experiment	No. of Lab. Slots per batch (estimate)
1-2	Introduction to UNIX Utilities	02
3-4	Shell Script	03
5-10	Python programming	05
11-12	System Administration	02

Text Books

1. Sumitabha Das, UNIX Concepts and Applications", 4th Edition, McGraw-Hill, 2017.
2. Mark Lutz, "Programming Python", 4th Edition, O'Reilly, 2010.

Reference Books

1. Noah Gift, Jeremy Jones, Python for Unix and Linux System Administration, 2008.
2. RytisSileikam, Pro Python System Administration, 2nd Edition, 2014
3. Michael Dawson, Python Programing for the Absolute Beginner, Premier Press, 3rd Edition 2010.

Program: Bachelor of Engineering		
Course Title: **Operating System Principles and Programming**		Course Code: **18ECSC202**
L-T-P: **4-0-1**	Credits: **5**	Contact Hrs: 4+2**hrs/week**
ISA Marks: **50**	ESA Marks: **50**	Total Marks: **100**
Teaching Hrs: **74**	Exam Duration: **3 hrs**	

Unit –I		
1	**Chapter No. 1. Introduction and Systems structures** Operating system definition; Operating System operations; Modules of OS **,**Overview of UNIX Operating System,UNIX APIs	04 hrs + 02 hrs (lab)
2	**Chapter No. 2. Process Management** Process concept; Process scheduling; Operations on processes; Inter-process communication (Pipes and FIFOs). Threads, Process Scheduling: Basic concepts; Scheduling criteria; Scheduling algorithms. Process management using UNIX APIs**:** Process Management Functions, User IDs and Group IDs, Creating process, parent child relationship.	10 hrs + 08 hrs (lab)
3	**Chapter No. 3. Process Synchronization**	06 hrs +

	Synchronization: The Critical section problem; Peterson's solution; Semaphores, Classical problems of synchronization, Process synchronization UNIX APIs.	02 hrs (lab)
Unit –II		
4	**Chapter No. 4. Deadlocks** Deadlocks: System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock.	06 hrs + 02 hrs (lab)
5	**Chapter 5 : File management** File concepts, Directory structure, File Types , File systems , File Attributes, Inodes in UNIX , UNIX Kernel Support for Files, Directory Files, Hard and symbolic names. General File APIs: File and record lock API, Symbolic file API	07 hrs + 04 hrs (lab)
6	**Chapter No. 6. Memory Management** Memory Management Strategies: Background; Swapping; Contiguous memory allocation; Paging; Segmentation. Virtual Memory Management: Background; Demand paging; Page replacement.	07 hrs + 02 hrs (lab)
Unit –III		
7	**Chapter No. 7. Secondary Storage Management** Mass storage structures; Disk structure; Disk attachment; Disk scheduling; Disk management.	5hrs
8	**Chapter No. 8. Case study** Architecture of Mobile OS - Introduction. .Overall Architecture, Linux Kernel, various components, Network OS, Applications.	5hrs

Text Books

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne: Operating

System Principles, 9th edition, Wiley-India, 2006.

2. W. Richard Stevens, Stephen A. Rago, "Advanced Programming in the UNIX Environment", 3rd Edition, Addison Wesley Professional, 2013

References

1. William Stallings,"Operating System Internals and Design Principles", 5th edition, Pearson Education, Asia, 2005
2. Gary Nutt," Operating System"3rd edition, Pearson Education,2004
3. Terrence Chan, "Unix System Programming Using C++", 1 ed., Prentice Hall India, 2007
4. Marc J. Rochkind, "Advanced Unix Programming", 2nd Edition, Pearson Education, 2005.

Program: **Bachelor of Engineering**		
Course Title: **Product Realization**		Course Code: **17ECSP203**
L-T-P: **0-0-2**	Credits: **02**	Contact Hrs: **03 Hrs**
ISA Marks: **80**	ESA Marks: **20**	Total Marks: **100**
Teaching Hrs:	Exam Duration:	

Experiments	Lab assignments/experiment
Week 1 And Week 2	IOT workshop: Introduction to Android studio, Introduction to Arduino programming, PHP
Week 3	Selection of UI and Core Component of Android
Week 4	UI implementation using XML
Week 5	UI implementation and validation
Week 6	Android core component implementation and Unit Testing
Week 7	Android core component implementation and Unit Testing
Week 8	Android core components integration and testing
Week 9	Configuration of IoT Server
Week 10	Integratesubsystems for prototype testing, Analyze the test results, System modification, and System integration.
Week 11	System Testing

Reference:

1. Beginning Android Programming with Android Studio by J.F. DiMarzio

Program: Bachelor of Engineering		
Course Title: **Engineering Design Practice [Part B]** **[Part A – Central Level]**		Course Code: **17ECSP202**
L-T-P: **0-0-1.5**	Credits: **1.5**	Contact Hrs: **3 hrs/week**
ISA Marks: **40**	ESA Marks: **0**	Total Marks: **40**
Teaching Hrs: **39 hrs**	Exam Duration: **3 hrs**	

Experiments	Lab assignments/experiment
Phase 1 (Plannig)	Introduction to Eclipse –IDE Requirement modeling : • Identifying use cases and actors • Apply UML notations to draw use case diagram
Phase 2 (Conceptual Design)	Behaviour Modeling using DFD • List behavior of system/sub-system • List states, tasks and their dependencies Illustrate DFD : • Identify data flow and processes of a system • Draw data flow diagrams for system/sub-system • Draw system diagram to show interaction of all domain components (Draw state and sequence diagram for identified tasks)
Phase 3(System Design)	Software Architectures: • List components of architecture • List type of architectures Choose appropriate architecture for given system
Phase 4 (Detail Design)	UI Design using GUI wireframe: • Design function prototyping for event diagrams(DFD) • Identify user interface components • Choose appropriate property of component • Use wireframe to design a user interface
Text books: 1. Ian Somerville, Software Engineering, 9th, Pearson Ed, 2015 2. Clive L Dym and Patrick Little, "Engineering Design: A Project Based Introduction", John Wiley & Sons	
Reference books: 1. Roger S. Pressman, Software Engineering: A Practitioners Approach, 7th, McGraw, 2007 2. Shari Lawrence Pfleeger and Joanne M. Atlee, Software Engineering Theory and Practice,	

3rd, Pearson Ed, 2006

3. Jalote, P, An Integrated Approach to Software Engineering, 3rd, Narosa Pub, 2005

Program: Bachelor of Engineering		
Course Title: **Database Management System**		Course Code:**15ECSC208**
L-T-P: **4-0-0**	Credits: **4**	Contact Hrs: **4 hrs/week**
CIE Marks: **50**	SEE Marks: **50**	Total Marks: **100**
Teaching Hrs: **50**	Exam Duration: **3** hrs	

Unit –I		
1	**Introduction and ER Model:** Introduction to DBMS and an example ; Data models, schemas and instances; Three-schema architecture; Database languages; Using High-Level Conceptual Data Models for Database Design; An Example Database Application; Entity Types, Entity Sets, Attributes and Keys, Relationship types, Relationship Sets. Roles and Structural Constraints; Weak Entity Types; Refining the ER Design; ER Diagrams, Naming Conventions and Design Issues.	**07hrs**
2	**Relational Data Model and Relational Algebra** Relational Model Concepts; Relational Model Constraints and Relational Database Schemas; Update Operations and dealing with constraint violations; Unary Relational Operations: SELECT and PROJECT; Binary Relational Operations: CARTESIAN PRODUCT, JOIN: Additional Relational Operations; Relational Database Design Using ER- to-Relational Mapping.	**08hrs**
3	**SQL** SQL Data Definition and Data Types; Specifying basic constraints in SQL; Schema change statements in SQL; Insert, Delete and Update statements in SQL; Basic queries in SQL,JOIN operations, Complex SQL Queries.	**06hrs**
Unit –II		
4	**Database Design** Informal Design Guidelines for Relation Schemas; Functional Dependencies; Normal Forms Based on Primary Keys; Boyce-Codd Normal Form.	**06 hrs**
5	**PL/SQL** Features of PL/SQL; Advantages of PL/SQL; PL/SQL Basic syntax; PL/SQL Data types; PL/SQL variables; PL/SQL Constraints and Literals; PL/SQL Operators; PL/SQL Conditions; PL/SQL Loops; PL/SQL Strings; PL/SQL Arrays; PL/SQL Procedures; PL/SQL Functions; PL/SQL Cursors; PL/SQL Records; PL/SQL Triggers.	**07 hrs**
6	**Introduction to Transaction Processing** Introduction to Transaction Processing; Transactions and System concepts; Desirable Properties of Transactions; Characterizing schedules based on-recoverability, Serializibilty.	**06 hrs**
Unit –III		
7	**Concurrency control techniques**	

	Introduction, Two-phase locking techniques for concurrency control, dealing with dead-lock and starvation, Concurrency control based on Time stamp ordering.	**05 hrs**
8	**Database Security** Introduction to DB security issues, Discretionary access control based on granting and revoking privileges, Mandatory access control and role-based access control, Mandatory Access Control.	**05 hrs**

Text Books:

1. Elmasri R. and Navathe S., Fundamentals Database Systems, 6th edition, Pearson Education, 2011.
2. Steven Feuerstein, Bill Pribyl Oracle PL/SQL Programming, 6th Edition , O'Reilly Media,2014.

References:

1. Ramakrishnan S. and Gehrke J., Database Management Systems, 3rd edition, McGraw Hill, 2007.
2. Silberschatz A., Korth H.F. and Sudharshan S., Data base System Concepts, 5th Edition, Mc- GrawHill, 2006.
3. PL/SQL User's Guide and Reference 10g Release 1 (10.1) December 2003.

Scheme for Semester End Examination (SEE)

UNIT	8 Questions to be set of 20 Marks Each	Chapter Numbers	Instructions
I	Q.No.-1, Q.No.-2, Q.No.-3	1, 2,3	Solve Any **2** out of **3**
II	Q.No.-4, Q.No.-5, Q.No.-6	4,5,6	Solve Any **2** out of **3**
III	Q.No.-7	7	Solve Any **1** out of **2**
	Q.No.-8	8	

Program: Bachelor of Engineering		
Course Title: **Database application Lab**		Course Code: **15ECSP204**
L-T-P: **0-0-1.5**	Credits: **1.5**	Contact Hrs: **3 hrs/week**
CIE Marks: **80**	SEE Marks:**20**	Total Marks: **100**
Teaching Hrs: **36**	Exam Duration: **3 hrs**	

Experiments	Lab assignments/experiment
2-Demonstration	SQL and PL/SQL
5–Exercise	Cartesian Product, Aggregate Functions, Nested Queries, Procedures & Functions
2-Structured Enquiry	Database Design , Cursors and Triggers

References :

1. Elmasri R. and Navathe S., Fundamentals Database Systems, 6th edition, Pearson Education, 2011.
2. Steven Feuerstein, Bill Pribyl Oracle PL/SQL Programming, 6th Edition, O'Reilly Media, 2014.
3. Ramakrishnan S. and Gehrke J., Database Management Systems, 3rd edition, McGraw Hill, 2007.
4. Silberschatz A., Korth H.F. and Sudharshan S., Data base System Concepts, 5th Edition, Mc- GrawHill, 2006.
5. PL/SQL User's Guide and Reference 10g Release 1 (10.1) December 2003.

Program: Bachelor of Engineering		
Course Title: **Digital System Design**		Course Code: **15ECSC202**
L-T-P: **3-0-0**	Credits: **3**	Contact Hrs: **03 hrs/week**
CIE Marks: **50**	SEE Marks: **50**	Total Marks: **100**
Teaching Hrs: **40**	Exam Duration: **3 hrs**	

	Unit –I	
1	**Boolean Function Minimization** Canonical representation of expressions, Complete and Incomplete Boolean Functions and significance of don't Care Conditions. Minimization of logic functions using Karnaugh –map- Prime Implicants, Essential Prime Implicants and implicates.	**06hrs**
2	**Combinational Circuit Design** Design of combinational circuits using combinational ICs: Code convertors, decoders encoders, comparators, multiplexers, de-multiplexers, Adders: Ripple adders and Parallel adders and Subtractors.	**06hrs**
3	**Introduction to Sequential Circuits** The basic bistable element, latches, flip flops and Characteristic equations	**04hrs**
	Unit –II	
4	**Sequential Circuit Design** Design of shift registers and counters.	**06 hrs**
5	**Synchronous Sequential Networks** Structure and Operation of Clocked Synchronous Sequential Networks, Analysis of clocked Synchronous Sequential Networks.	**06 hrs**
6	**Asynchronous Sequential Networks** Structure and Operation of Asynchronous Sequential Networks, Analysis of Asynchronous Sequential Networks.	**04 hrs**
	Unit –III	
7	**Logic Design with PLDs** Introduction to Programmable Devices, Architecture of PLDs.	**04 hrs**
8	**The 555 Timer:**	**04 hrs**

	Monostable Multivibrator, Astable Multivibrator.	

Text Books:

1. Donald D. Givone "Digital Principles and Design" Tata McGraw Hill edition 2003.

Reference Books:

1. M. Morris Mano and C. R. Kime "Logic and Computer Design Fundamentals" 2nd Edition Updated Publishers Pearson Education 2005.
2. Ronald J. Tocci, Neal S. Widmer, Gregory L. Moss, "Digital Systems Principles and Applications" 10th Edition, PHI/Pearson Education, 2007.

Scheme for Semester End Examination (SEE)

UNIT	8 Questions to be set of 20 Marks Each	Chapter Numbers	Instructions
I	Q.No.-1, Q.No.-2, Q.No.-3	1, 2 & 3	Solve Any **2** out of **3**
II	Q.No.-4, Q.No.-5, Q.No.-6	4, 5 & 6	Solve Any **2** out of **3**
III	Q.No.-7	7	Solve Any **1** out of **2**
	Q.No.-8	8	

Program: Bachelor of Engineering		
Course Title: **Object Oriented Programming**		Course Code: **15ECSC204**
L-T-P: **3-0-0**	Credits: **3**	Contact Hrs: **3 hrs/week**
CIE Marks: **50**	SEE Marks: **50**	Total Marks: **100**
Teaching Hrs: **40**	Exam Duration: **3 hrs**	

Unit –I		
1	**Introduction to Java** Introduction to Object Oriented concepts. Features of Java, Java Development Kit, Java Source File Structures, Basic Data Types, Arrays, Strings, StringBuffer, Class diagrams-UML notations.	**4 hrs**
2	**Classes and Objects** Class Fundamentals, Declaring objects, Assigning object reference variables, Introducing methods, Constructors, this key word, Garbage collection: The finalize method. A closer Look at Methods and Classes: Overloading: Methods, Constructors. Using objects as Parameters, Returning objects, Access control. Understanding static and final keywords. Introducing nested and inner classes.	**6 hrs**
3	**Inheritance and Polymorphism** Inheritance: Basics, types of inheritance, implementing inheritance, Method overriding, Dynamic method dispatch, Abstract classes, Object class.	**6 hrs**
Unit –II		
4	**Packages, Interfaces & Exception handling** Packages and Interfaces: Packages: creating and importing, Access protection. Interfaces: creating, implementing. Exception Handling: Fundamentals,	**6 hrs**

	Exception Types, Uncaught Exceptions, Using try, catch, throw, throws and finally, Multiple catch, Nested try statements, User defined exceptions.	
5	**Java Design Patterns** Creational, Structural and Behavioral design patterns.	**4 hrs**
6	**GUI Design using AWT and Swings** Introduction: AWT Classes, Window Fundamentals, Working with Frame Windows, Using AWT Controls, Layout managers and Menus: Control Fundamentals, Labels, Buttons, CheckBoxes, List, TextField, TextArea, Layout managers, Menu Bars and Menus. Event Handling: Event Handling Mechanism, Delegation Event Model. Swings: introduction to swings, swing features, Component and containers, swing packages, Event Handling. Exploring swing: JLabel, image Icon, JTextField, JButton, Check Boxes, Radio Button, JList, and JComboBox.	**6 hrs**
Unit –III		
7	**Collection Framework** Collections Framework, Set Interface, Set Implementation Classes, List Interface, List Implementation Classes, The Map Interface, Map Implementation Classes.	**4 hrs**
8	**Generics** Introduction, Type safety, Generic class with two type parameters, general form of generic class, Bounded types, Wild card arguments, generic method.	**4 hrs**
Text Books: 1. Herbert Schildt, The Complete Reference, 7, McGraw-Hill.		
Reference Books: 1. Kathy Sierra and Bert Bates, Head First JAVA, 2, O'Reilly Media, 2005. 2. Bruce Eckel, Thinking in Java, 5, Prentice Hall.		

Scheme for Semester End Examination (SEE)

UNIT	8 Questions to be set of 20 Marks Each	Chapter Numbers	Instructions
I	Q.No.-1, Q.No.-2, Q.No.-3	1, 2 and 3	Solve Any **2** out of **3**
II	Q.No.-4, Q.No.-5, Q.No.-6	4, 5 and 6	Solve Any **2** out of **3**
III	Q.No.-7	7	Solve Any **1** out of **2**
	Q.No.-8	8	

Program: **Bachelor of Engineering**		
Course Title: **Digital System Design Lab**		Course Code: **15ECSP202**
L-T-P: **0-0-1.5**	Credits: **1.5**	Contact Hrs: **3 hrs/week**
CIE Marks: **80**	SEE Marks: **20**	Total Marks: **100**
Teaching Hrs: **42**	Exam Duration: **3 Hrs**	

Tentative plan of lab implementation

Week No	**Lab Assignments**
1.	Introduction to digital trainer kit.
2 3 4 5 6	Design of combinational circuits using SSI and MSI components/ Verilog programming. • Code converters • Arithmetic Circuits • Decoders/encoders • Mutliplexers/Demultiplers
7 8 9 10	Design of Sequential circuits using SSI and MSI components/ Verilog programming. • Shift registers • Counters
11 12 13	Structured Enquiry

Materials and Resources Required:

Reference Books:

1. Donald D. Givone "Digital Principles and Design" Tata McGraw Hill edition 2002.
2. Hamacher C., Vranesic Z., and Zaky S., "Computer Organization", 5th Edition, McGraw Hill, 2012.
3. HDL Programming (VHDL and Verilog)-NazeithM.Botros- Creamtech Press 2006 edition.
4. John P. Hayes "Computer Architecture and Organization" Tata McGraw Hill 3rd Edition, 2012.
5. M. Morris Mano and C. R. Kime "Logic and Computer Design Fundamentals" 2nd Edition Updated Publishers Pearson Education 2005.
6. Ronald J. Tocci, Neal S. Widmer, Gregory L. Moss, "Digital Systems Principles and Applications" 10th Edition, PHI/Pearson Education, 2007.

Manuals: Lab Manual available in Lab.

Program: Bachelor of Engineering		
Course Title: **Principles of Compiler Design**		Course Code:**15ECSC205**
L-T-P: **3-0-0**	Credits: **3**	Contact Hrs: **03 hrs/week**
CIE Marks: **50**	SEE Marks: **50**	Total Marks: **100**
Teaching Hrs: **40**	Exam Duration: **03 hrs**	

Unit –I		
1	**Introduction to compilers** Brief History of Compilers, Translation process, Major data structures in Compilers, Chomsky hierarchy, **Lexical analysis:** Scanning process, Regular expressions for tokens, lexical errors, applications of Regular expressions.	**06 hrs**
2	**Finite Automata** Introduction: Language, automata, From regular expressions to Deterministic Finite Automata (DFA): Є-Nondeterministic Finite Automata (Є-NFA), NFA, DFA, Equivalence of Deterministic Finite Automata, Nondeterministic Finite Automata, Finite automata as recognizer, Implementation of Finite Automata.	**06 hrs**
3	**Introduction to Syntax Analysis** Role of parser, Regular Grammars, Context-Free Grammars (CFGs), Parsers, Parsing and ambiguity in Grammars and Languages, Different errors and recovery strategies.	**04 hrs**
Unit –II		
4	**Top Down Parsing** Top Down parsing: Recursive Parsing, Left Recursion, Left factoring, LL(1) Parsing, FIRST and FOLLOW sets, error recovery in Top Down Parsing.	**08 hrs**
5	**Bottom up Parsing** Bottom Up parsing: Overview, SLR(1) parsing, General LR(1) and LALR(1) Parsing, error recovery in bottom up parsing	**08 hrs**
Unit –III		
6	**Semantic Analysis** Attributes and Attributes grammars, Algorithm for attribute computation, Symbol table, data types and Data checking	**04 hrs**
7	**Intermediate Code Generation** Intermediate Code and data structure for code generation, Code generation of data structure references, code generation of control statements and expressions.	**04 hrs**

Text Books:

1. Alfred V Aho, Monica S. Lam, Ravi Sethi, Jeffrey D Ullman, Compilers - Principles, Techniques and Tools, 2nd Edition, Pearson, 2007
2. Kenneth C Louden, Compiler Construction Principles & Practice, 1997, Cengage Learning, 1997

Reference Books:

1. Andrew W Apple, Modern Compiler Implementation in C, Cambridge University Press, 1998
2. Charles N. Fischer, Richard J. leBlanc, Jr, Crafting a Compiler with C, Pearson, 2010.
3. Peter Linz, An Introduction to formal languages and Automata, IV edition, Narosa, 2009.

4. Basavaraj S Anami,, Karibasappa K.G, Formal Languages and Automata Theory, First, Wiley India, 2011.

Scheme for Semester End Examination (SEE)

UNIT	8 Questions to be set of 20 Marks Each	Chapter Numbers	Instructions
I	Q.No.-1, Q.No.-2, Q.No.-3	1, 2 and 3	Solve Any **2** out of **3**
II	Q.No.-4, Q.No.-5	4 and 5	Solve Any **2** out of **3**
III	Q.No.-6	6	Solve Any **1** out of **2**
	Q.No.-7	7	

Program: Bachelor of Engineering		
Course Title: **Computer Organization and Architecture**		Course Code:**15ECSC206**
L-T-P: **3-1-0**	Credits: **4**	Contact Hrs: **04 hrs/week**
CIE Marks: **50**	SEE Marks: **50**	Total Marks: **100**
Teaching Hrs: **40**	Exam Duration: **03 hrs**	

Unit –I		
1	**Basic Structure of Computers and Machine Instructions** Basic operational concepts; Bus structures; Performance; Numbers, arithmetic operations & characters; memory locations and addresses**.** **Basic Processing Unit** Fundamental concepts; Instruction Execution, Hardware Components Instruction Fetch and Execution Steps, Control Signals, Hardwired Control, CISC-Style Processors.	**06 hrs**
2	**Pipelining** Basic Concept, Pipeline Organization, Pipelining Issues , Data Dependencies, Memory Delays, Branch Delays, Resource Limitations, Performance Evaluation.	**05 hrs**
3	**Input /Output Organization** Accessing i/o devices; interrupts Bus Structure, Bus Operation, Arbitration, Interface Circuits, Interconnection Standards.	**05 hrs**
Unit –II		
4	**The Memory System** Basic Concepts, Semiconductor RAM Memories, Read-only Memories Direct Memory Access, Memory Hierarchy, Cache Memories, Performance Considerations, Virtual Memory, Memory Management Requirements, Secondary Storage.	**06 hrs**
5	**Arithmetic** Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Unsigned Numbers, Multiplication of Signed Numbers Fast Multiplication, Integer Division, Floating-Point Numbers and Operations.	**06 hrs**

6	**The ARM architecture** The Acorn RISC machine, Architectural inheritance, The ARM programmers model, ARM development tools, 3-stage pipeline ARM organization, ARM instruction execution, Addressing Modes, Examples.	**04 hrs**
Unit –III		
7	**The ARM Instruction Set** Data processing instructions, Data transfer instructions, Control flow instructions, Examples.	**04 hrs**
8	**ARM Assembly Programming** Exceptions, Conditional execution, Branch instructions.	**04 hrs**

Text Books:

1. Hamacher C., Vranesic Z., and Zaky S., Computer Organization, 6 ed., McGraw Hill, 2012.
2. Steve Furber, ARM System-on-chip Architecture, 2, Pearson, 2000

Reference Books:

1. William Stallings, "Computer Organization & Architecture", 8th Edition, Pearson Education, 2010.
2. Miles Murdocca and Vincent Heuring, "Computer Architecture and Organization an Integrated Approach", 2nd Edition, WSE, 2010.

Scheme for Semester End Examination (SEE)

UNIT	8 Questions to be set of 20 Marks Each	Chapter Numbers	Instructions
I	Q.No.-1, Q.No.-2, Q.No.-3	1,2 & 3	Solve Any **2** out of **3**
II	Q.No.-4, Q.No.-5, Q.No.-6	4, 5 & 6	Solve Any **2** out of **3**
III	Q.No.-7	7	Solve Any **1** out of **2**
	Q.No.-8	8	

Tentative plan of Tutorial implementation

Sl. No	Assignments
1.	Introduction to ARM architecture
2.	Programming on Data transfer instructions
3.	Programming on Data processing instructions: arithmetic and logical instructions
4.	Programming on Control flow instructions
5.	Interfacing techniques

Materials and Resources Required:

Text Books:

1. Steve Furber, "ARM System-on-chip Architecture" LPE, 2nd Edition, 2000.

Reference Books:

1. David E. Simon, "An Embedded Software Primer", Addison-Wesley Professional, 1st

Edition, 1999.

2. William Hohl, "ARM Assembly Language Fundamentals and techniques" CRC Press, 2009.

Program: Bachelor of Engineering		
Course Title: **Principles of Compiler Design**		Course Code:**17ECSC202**
L-T-P: **3-0-0**	Credits: **3**	Contact Hrs: **03 hrs/week**
ISA Marks: **50**	ESA Marks: **50**	Total Marks: **100**
Teaching Hrs: **40**	Exam Duration: **03 hrs**	

Unit –I		
1	**Introduction to compilers** Brief History of Compilers, Translation process, Major data structures in Compilers, Chomsky hierarchy, Lexical analysis: Scanning process, Regular expressions for tokens, lexical errors, applications of Regular expressions	**08 hrs**
2	**Top Down Parsing** Top Down parsing: Recursive Parsing, Left Recursion, Left factoring, LL (1) Parsing, FIRST and FOLLOW sets, error recovery in Top Down Parsing..	**08 hrs**
Unit –II		
3	**Bottom up Parsing** Bottom Up parsing: Overview, SLR (1) parsing, General LR (1) and LALR (1) Parsing, error recovery in bottom up parsing	**08 hrs**
4	**Semantic Analysis** Attributes and Attributes grammars, Algorithm for attribute computation, Symbol table, data types and Data checking.	**08 hrs**
Unit –III		
5	Intermediate Code and data structure for code generation, Code generation of data structure references, code generation of control statements and expressions.	**04 hrs**
6	**Machine Independent Code optimizer** Principal sources of optimization, Data flow analysis, Redundancy elimination, Loops in flow graphs.	**04 hrs**

Text Book:

1. Alfred V Aho, Monica S. Lam, Ravi Sethi, Jeffrey D Ullman: Compilers - Principles, Techniques and Tools, 2nd Edition, Pearson, 2008.
2. Kenneth C Louden: Compiler Construction Principles & Practice, Cengage Learning, 1997.

References:

1. Andrew W Apple: Modern Compiler Implementation in C, Cambridge University Press, 1997.
2. Charles N. Fischer, Richard J. leBlanc, Jr.: Crafting a Compiler with C, Pearson, 1991.

Program: Bachelor of Engineering		
Course Title: **Computer Organization and Architecture**		Course Code:**17ECSC205**
L-T-P: **3-0-0**	Credits: **3**	Contact Hrs: **03 hrs/week**
ISA Marks: **50**	ESA Marks: **50**	Total Marks: **100**
Teaching Hrs: **40**	Exam Duration: **03 hrs**	

Unit –I		
1	**Basic GPU Structure** Basic operational concepts. Bus structures. Performance. Numbers, arithmetic operations. Memory locations and addresses. Fundamental concepts: Instruction Execution, Hardware Components. Instruction Fetch and Execution Steps, Control Signals. CISC-Style Processors.	**06 hrs**
2	**Pipelining** Basic Concepts. Pipeline Organization. Pipelining Issues: Data DependenISAs, Memory Delays, Branch Delays, and Resource Limitations. Performance Evaluation.	**05 hrs**
3	**Input /Output Organization** Accessing i/o devices. Interrupts. Bus Structure/Operation, Arbitration. Interface Circuits. Interconnection Standards.	**05 hrs**
Unit –II		
4	**The Memory System** Basic Concepts. Semiconductor RAM Memories. Read-only Memories. Direct Memory Access. Memory Hierarchy. Cache Memories. Performance Considerations. Virtual Memory. Memory Management Requirements. Secondary Storage	**06 hrs**
5	**Arithmetic** Addition and Subtraction of Signed Numbers. Design of Fast Adders. Multiplication of Signed and Unsigned Numbers. Fast Multiplication. Integer Division. Floating-Point Numbers and Operations	**06 hrs**

6	**The ARM architecture** The Acorn RISC machine. Architectural inheritance. The ARM programmer's model. ARM development tools. 3-stage pipeline ARM organization. ARM instruction execution. Addressing Modes.	**04 hrs**
Unit –III		
7	**The ARM Instruction Set** Data processing instructions. Data transfer instructions. Control flow instructions.	**04 hrs**
8	**ARM Assembly Programming** Exceptions. Conditional execution. Branch instructions. Programming Examples.	**04 hrs**

Text Books:

1. 1Hamacher C., Vranesic Z., andZaky S., Computer Organization, Sixth, McGraw Hill, 2012.
2. Steve Furber, ARM System-on- chip Architecture, Second, Pearson Education, 2000

Reference Books:

1. William Stallings., Computer Organization & Architecture, Eighth, Pearson Education, 2010.
2. Miles Murdocca and Vincent Heuring, Computer Architecture and Organization an Integrated Approach, Second, WSE, 2010.

Scheme for Semester End Examination (ESA)

UNIT	8 Questions to be set of 20 Marks Each	Chapter Numbers	Instructions
I	Q.No.-1, Q.No.-2, Q.No.-3	1,2,3	Solve Any **2** out of **3**
II	Q.No.-4, Q.No.-5, Q.No.-6	4,5,6	Solve Any **2** out of **3**
III	Q.No.-7	7	Solve Any **1** out of **2**
	Q.No.-8	8	

Tentative plan of Tutorial implementation

Sl. No	Assignments
6.	Introduction to ARM architecture
7.	Programming on Data transfer instructions
8.	Programming on Data processing instructions: arithmetic and logical instructions
9.	Programming on Control flow instructions
10.	Interfacing techniques

Materials and Resources Required:

Text Books:

2. Steve Furber, "ARM System-on-chip Architecture" LPE, 2nd Edition, 2000.

Reference Books:

3. David E. Simon, "An Embedded Software Primer", Addison-Wesley Professional, 1st

Edition, 1999.
4. William Hohl, "ARM Assembly Language Fundamentals and techniques" CRC Press, 2009.

Program: **Bachelor of Engineering**		
Course Title: **Computer Organization and Architecture Lab**		Course Code: **18ECSP202**
L-T-P: **0-0-1.5**	Credits: **1.5**	Contact Hrs: **3 hrs/week**
ISA Marks: **80**	ESA Marks: **20**	Total Marks: **100**
Teaching Hrs: **42**	Exam Duration: **3 Hrs**	

Tentative plan of lab implementation

Experiments	Lab assignments/experiment	Hrs
1-	**Exercises on Combinational Logic**	**03 hrs**
2-	**Exercises on Sequential Circuit Design**	**08 hrs**
3-	**Structured Enquiry** **Applications of Computer Organization concepts**	**03 hrs**

Materials and Resources Required:

Text Books:

1. Donald D. Givone "Digital Principles and Design" Tata McGraw Hill edition 2003.
2. Hamacher C., Vranesic Z., and Zaky S., Computer Organization, 5ed., McGraw Hill,2002.

Reference Books:

3. John P. Hayes. Computer Architecture and Organization,3rd Edition, McGraw Hill
4. M. Morris Mano and C. R. Kime "Logic and Computer Design Fundamentals" 2nd Edition, Updated Publishers Pearson Education 2005.
5. Ronald J. Tocci, Neal S. Widmer, Gregory L. Moss, "Digital Systems Principles and Applications" 10th Edition, PHI/Pearson Education, 2007.

Course Code: 18ECSC206	Course Title: Microcontroller Programming& Interfacing	
L-T-P-SS: 3-0-1	Credits: 4	Contact Hrs: 3+2 hrs
ISA Marks: 50	ESA Marks: 50	Total Marks: 100
Teaching Hrs: 40		Exam Duration: 3 hrs

Content	Hrs
Unit – I	
Chapter No. 1.The 8051 Architecture Introduction, 8051 Microcontroller hardware, input/output pins, ports & circuits, External memory,	04 hrs
Chapter No. 2. Assembly Programming Introduction, addressing modes, External Data Moves, Code Memory Read Only Data Moves / Indexed Addressing mode, PUSH and POP opcodes, Data exchanges, assembler directives, example programs. Byte level logical Operations, Bit level Logical Operations, Rotate and Swap Operations, Example Programs. Arithmetic Operations: Flags, Incrementing and Decrementing, Addition, Subtraction, Multiplication and Division, Decimal Arithmetic, Example Programs. The JUMP and CALL Program range, Jumps, Call and Subroutines, Example programs	12hrs +08 hrs (Lab)
Unit – II	
Chapter No. 3. Timer/Counter & Serial Port Programming. C Data Types and Time delay computation in 8051 Counters and Timers, Programming 8051 Timers/counters in different modes, Basics of Serial Communication, RS232 standards, 8051 connection to RS232, 8051 serial port Programming.	12 hrs
Chapter No. 4. Interrupts Programming 8051 Interrupts, Programming Timer Interrupts, Programming external hardware interrupts, Programming the Serial Communication Interrupts, Interrupt Priority in the 8051, Interrupt programming.	04 hrs
	4 hrs
Unit – III	
Chapter No. 5. Interfacing to Peripheral Devices Interfacing 8051 to LEDs, DIP switches, BCD Decoder display, 7 Segment Display, LCD, Keypad, DAC, ADC, Stepper Motor and DC Motor	08hrs +12 Hrs (Lab)

Text Books (List of books as mentioned in the approved syllabus)

2. Ayala.K.J, "The 8051 Microcontroller", 3rd.,CENGAGELearning, 2007.
3. Mazidi.M.A, Mazidi.J.G and McKinlay.R.D, "The 8051 Microcontroller and Embedded Systems-using Assembly and C", 2ed, PHI 2006/Pearson, 2006.

References

1. Ayala.K.J., Gadre D.V., "The 8051 Microcontroller & Embedded Systems using Assembly and C", 1ed., CENGAGE Learning, 2010
2. V. Udayashankara, M.S. Mallikarajunaswamy, "8051 Microcontroller Hardware, Software and Applications", 1ed., Tata McGraw Hill, 2009.

Scheme for End Semester Assessment (ESA)

UNIT	8 Questions to be set of 20 Marks Each	Chapter Numbers	Instructions
I	Q.No.-1, Q.No.-2, Q.No.-3	1 & 2	Solve Any **2** out of **3**
II	Q.No.-4, Q.No.-5, Q.No.-6	3 &4	Solve Any **2** out of **3**
III	Q.No.-7	5	Solve Any **1** out of **2**
	Q.No.-8	5	

Program: **Bachelor of Engineering**		
Course Title: **Software Engineering**		Course Code: **15ECSC301**
L-T-P: **3-0-0**	Credits: **3**	Contact Hrs: **3 hrs/week**
ISA Marks: **50**	ESA Marks: **50**	Total Marks: **100**
Teaching Hrs: **40**	Exam Duration: **3 hrs**	

Unit –I		
1	**Chapter No. 1. Software Engineering process** Professional software development Software engineering ethics, Case studies, Software processes: Software process models, Process activities, Coping with change, The rational unified process, Continuous Integration and Continuous Deployment and Tools.	**06 hrs**
2	**Chapter No. 2. Agile Software Development** Agile methods, Plan-driven and agile development, Extreme programming, Agile project management.	**04 hrs**
3	**Chapter No. 3. Requirement Engineering** Functional and Non-functional requirements; The software requirements Document, Requirement specification, Requirements Engineering Processes, Requirements elicitation and analysis; Requirements validation; Requirements management	**06 hrs**
Unit –II		
4	**Chapter No. 4. System Modeling** Context models, Interaction Models, Structural models, Behavioral models.	**06 hrs**
5	**Chapter No. 5. Architectural Design** Architectural Design Decision, Architectural views, Architectural patterns,	**05 hrs**

	Application Architectures	
6	**Chapter No. 6. Object-Oriented design and implementation** Object oriented design using UML, design patterns, Implementation Issues, Open source development.	**05 hrs**
Unit –III		
7	**Chapter No. 7. Software Testing** Development Testing, Test Driven Development, Release Testing, User Testing	**04 hrs**
8	**Chapter No. 8. Configuration management** Change management, Version management, System building, Release management	**04 hrs**

Text Books

1. Ian Somerville, Software Engineering, 9th, Pearson Ed, 2015

Reference Books:

1. Roger S. Pressman, Software Engineering: A Practitioners Approach, 7th, McGraw- , 2007
2. Shari Lawrence Pfleeger, Joanne M. Atlee, Software Engineering Theory and Practice, 3rd, Pearson Ed, 2006
3. Jalote, P, An Integrated Approach to Software Engineering, 3rd, Narosa Pub, 2005

Scheme for End Semester Assessment (ESA)

UNIT	**8 Questions to be set of 20 Marks Each**	**Chapter Numbers**	**Instructions**
I	Q.No.-1, Q.No.-2, Q.No.-3	1, 2,3	Solve Any **2** out of **3**
II	Q.No.-4, Q.No.-5, Q.No.-6	4,5,6	Solve Any **2** out of **3**
III	Q.No.-7	7	Solve Any **1** out of **2**
	Q.No.-8	8	

Program: Bachelor of Engineering		
Course Title: **Computer Networks - I**		Course Code: **17ECSC301**
L-T-P: **3-0-0**	Credits: **3**	Contact Hrs: **3 hrs/week**
ISA Marks: **50**	ESA Marks: **50**	Total Marks: **100**
Teaching Hrs: **40**	Exam Duration: **3 hrs**	

Unit –I		
1	**Introduction** Internet, The Network Edge and Core, Protocol layer and service models: OSI and TCP/IP, Networks attacks, History of computer network and Internet	**08 hrs**
2	**Application Layer** Principles of Network Applications , HTTP , SMTP, DNS	**08 hrs**
Unit –II		
3	**Transport-Layer Services** Introduction, connectionless transport, principles of reliable data transfer	**10 hrs**

	protocol, connection-oriented and connectionless transport, principle of congestion control, TCP congestion control	
4	**Network Layer: Data plane** Introduction to data and control plane and, virtual circuit and datagram networks, Internet protocol: datagram format, fragmentation, IP addressing	**06 hrs**
Unit –III		
5	**Network Layer: Data plane** NAT, IPv6, generalized forward and SDN	**04hrs**
6	**Network tools** HTTP, DNS, SMTP tools, packet analysis	**04 hrs**

Text Books:

1. J. F. Kurose, K. W. Ross, "Computer Networking, A Top-Down Approach", 7th Edition, Pearson Education, 2017.

Reference Books:

1. Peterson, Larry L, "Computer networks : a systems approach", 5th Edition, The Morgan Kaufmann series in networking, 2012
2. Behrouz Forouzan, Data Communications and Networking, McGraw Hill 4ed., 2007

Scheme for End Semester Assessment (ESA)

UNIT	8 Questions to be set of 20 Marks Each	Chapter Numbers	Instructions
I	Q.No.-1, Q.No.-2, Q.No.-3	1,2	Solve Any **2** out of **3**
II	Q.No.-4, Q.No.-5, Q.No.-6	3,4	Solve Any **2** out of **3**
III	Q.No.-7	5	Solve Any **1** out of **2**
	Q.No.-8	6	

Program: Bachelor of Engineering		
Course Title: **System Software**		Course Code: **17ECSC302**
L-T-P: **3-0-0**	Credits: **3**	Contact Hrs: **3 hrs/week**
ISA Marks: **50**	ESA Marks: **50**	Total Marks: **100**
Teaching Hrs: **40**	Exam Duration: **3 hrs**	

Unit –I		
1	**Introduction to a Machine Architecture** Introduction, System Software and Machine Architecture, Simplified Instructional Computer (SIC) - SIC Machine Architecture, SIC/XE Machine Architecture, SIC and SIC/XE Programming Examples.	**06hrs**
2	**Assembler** Basic Assembler Function - A Simple SIC Assembler, Assembler Algorithm and Data Structures, Machine Dependent Assembler Features - Instruction Formats & Addressing Modes, Program Relocation.	**09hrs**

	Unit –II	
3	**Assembler M/c Independent Features and Design options** Machine Independent Assembler Features: Literals, Symbol Defined Statements, Expression, Program Blocks, Control Sections and Programming Linking, Assembler Design Options: One Pass Assembler, Multi Pass Assembler, Implementation Examples: Assembler(8086): MASM	**07 hrs**
4	**Loaders and Linkers** Basic Loader Functions: Design of an Absolute Loader, A Simple Bootstrap Loader, Machine Dependent Loader Features: Relocation, Program Linking, Algorithm and Data Structures for a Linking. **Loader M/c Independent Features:** Automatic Library Search, Loader Options, Loader Design Options - Linkage Editor, Dynamic Linkage, Bootstrap Loaders, Implementation Examples: 8086 Linker.	**08 hrs**
	Unit –III	
5	**Macro Processor** 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 Implementation Examples: 8086 Macro Processor.	**05 hrs**
6	**Back end of Compiler: Code generation and Machine dependent features.** Review of phases of compilers, code generation routines, machine dependent features.	**05 hrs**

Text Books:

4. Leland.L.Beck and D. Manjula: System Software, 3 ed, Pearson Education, 2007
2. Ayala: The 8051 Microcontroller , 3rd ed, Cenagage Learning- 2009

Reference Books:

1. Alfred V Aho, Monica S. Lam, Ravi Sethi, Jeffrey D Ullman, "Compilers- Principles, Techniques and Tools", 2nd Edition, Addison-Wesley, 2007.
2. Muhammad Ali Mazidi et al: The 8051 Microcontroller and Embedded systems, 2nd Edition, Pearson education, 2009.

Scheme for End Semester Assessment (ESA)

UNIT	8 Questions to be set of 20 Marks Each	Chapter Numbers	Instructions
I	Q.No.-1, Q.No.-2, Q.No.-3	1, 2	Solve Any **2** out of **3**
II	Q.No.-4, Q.No.-5, Q.No.-6	3,4	Solve Any **2** out of **3**
III	Q.No.-7	5	Solve Any **1** out of **2**
	Q.No.-8	6	

Program: Bachelor of Engineering		
Course Title: **Data Mining & Analysis**		Course Code: **18ECSC301**
L-T-P: **3-0-1**	Credits: **4**	Contact Hrs: **5 hrs/week**
ISA Marks: **80**	ESA Marks: **20**	Total Marks: **100**
Teaching Hrs: **40**	Exam Duration: **3hrs**	

Unit –I		
1	**Data Pre-Preprocessing** Introduction to data mining, Data Warehouse and OLAP Technology for Data mining: Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Major tasks in data preprocessing- data reduction, data transformation and data Discretization, data cleaning and data integration.	**08 hrs**
2	**Frequent Pattern Mining** Frequent item sets and association rules; Item set mining algorithms; Generating association rules; Summarizing item sets: maximal and closed frequent item sets; Interesting patterns: pattern evaluation methods;	**08 hrs**
Unit –II		
3	**Classification Techniques** Probabilistic classification: naïve Bayes classifier, K-nearest neighbours; Decision tree classifier: decision tree induction, tree pruning; Model evaluation and selection: metrics, cross validation, random sampling, ROC curves;	**08 hrs**
4	**Cluster Analysis** Cluster Analysis- Partitioning methods, Hierarchical Methods, Density based methods, Outlier Detection.	**08 hrs**
Unit –III		
5	**Advanced Mining Techniques** Popular data pre-processing techniques: One hot encoding, stacking; Techniques to improve classification accuracy: ensemble methods, random forests, XGBoosting; Bias-variance trade-off; Post processing: Visualization and Interpretation;	**08 hrs**

Text Books:

2. Jiawei Han, Micheline Kamber and Jian Pei, Data Mining: Concepts and Techniques, 3rd edition, Morgan Kaufmann, 2012.

Reference Books:

7. Ian H. Witten, Eibe Frank, Mark A. Hall and Christopher J. Pal, Data Mining:

Practical Machine Learning Tools and Techniques, Morgan Kaufmann; 4th edition, 2016.

8. Pang-Ning, Michael Steinbach and Vipin Kumar, Introduction to Data Mining, Pearson, International edition, 2013.
9. Mohammed J. Zaki and Wagner Meira, Jr., Data Mining and Analysis: Fundamental Concepts and Algorithms, Cambridge University Press, 2014.
10. M. H. Dunham, Data Mining: Introductory and Advanced Topics, Pearson Education, 1st edition, 2006.

Scheme for End Semester Assessment (ESA)

UNIT	8 Questions to be set of 20 Marks Each	Chapter Numbers	Instructions
I	Q.No.-1, Q.No.-2, Q.No.-3	1, 2	Solve Any **3** out of **4**
II	Q.No.-4, Q.No.-5, Q.No.-6	3, 4,5	Solve Any **3** out of **4**
III	Lab exam	6	Lab exam evaluation

Program: Bachelor of Engineering		
Course Title: **Machine Learning**	Course Code: **17ECSC306**	
L-T-P: **2-0-1**	Credits: **3**	Contact Hrs: **30**
ISA Marks: **50**	ESA Marks: 50	Total Marks: **100**
Teaching Hrs: **30**	Exam Duration: **3 hrs**	

Content	**Hrs**
Unit – 1	
Chapter No 1. Introduction to machine learning Introduction to Machine Learning, Applications of Machine Learning, Types of Machine Learning: Supervised, Unsupervised and Reinforcement learning, Dataset formats, Features and observations.	5 hrs
Chapter No 2. Supervised Learning: Linear Regression, Logistic Regression Linear Regression: Single and Multiple variables, Sum of squares error function, The Gradient descent algorithm, Application, Logistic Regression, The cost function, Classification using logistic regression, one-vs.-all classification using logistic regression, Regularization.	7 hrs

Unit – 2	
Chapter No 3. Supervised Learning: Neural Network Introduction to perceptron learning, Model representation, Gradient checking, Back propagation algorithm, Multi-class classification, and Application- classifying digits. Support vector machines,	6 hrs
Chapter No 4. Unsupervised Learning : Dimensionality reduction and Learning Theory Expectation Maximization (EM), Factor Analysis, The dimensionality reduction,PCA : PCA for compression, Incremental PCA, Randomized PCA, Kernel PCA , ICA (Independent Component Analysis). Bias/variance tradeoff, Union and Chernoff / Hoeffding bounds VC dimension.	6 hrs
Unit – 3	
Chapter No 5. Reinforcement Learning Reinforcement Learning: Introduction, Applications, Model of the environment, Policy search, Learning to optimize rewards and value functions, Evaluating actions: The credit assignment problem, Policy gradients, Markov decision processes, Q-learning.	6 hrs

Text Book

1. Tom Mitchell., Machine Learning, Mc Graw Hill, McGraw-Hill Science, 3rd edition.
2. Christopher Bishop., Pattern Recognition and Machine Learning, Springer, 2006.

References:

1. Hands-On Machine Learning with Scikit-Learn and TensorFlow, Concepts, Tools, and Techniques to Build Intelligent Systems, AurelianGerona, Publisher: O'Reilly Media , July 2016.
2. Advanced Machine Learning with Python Paperback, 28 Jul 2016 by John Hearty.

Program: Bachelor of Engineering		
Course Title: **System Software Lab**		Course Code: **15ECSP301**
L-T-P: **0-0-1.5**	Credits: **1.5**	Contact Hrs: **3 hrs/week**
ISA Marks: **80**	ESA Marks: **20**	Total Marks: **100**
Teaching Hrs: **36**	Exam Duration: **3 hrs**	

Sl No	***Experiments***	***Slots/Hrs***
1.	Practice programs on user defined functions , structures and programs on file handling	3 hrs

2.	Introduction to basics of given assembly language Programs	3 hrs
3.	Evaluation on given assembly language Program	3 hrs
4.	Implementation of Pass 1 Assembler	3 hrs
5.	Implementation of Pass 2 Assembler	6 hrs
6.	Implementation of Pass 1 Linking loader	3 hrs
7.	Implementation of Pass 2 linking loader	6 hrs
8.	Course Project on Identifying machine to implement assembler , learning its architectural features and design Pass 1 Assembler or Pass2 Assembler	6 hrs

Reference Books:

1. Leland.L.Beck and D. Manjula: System Software, 3 ed, Pearson Education, 2007
2. Alfred V Aho, Monica S. Lam, Ravi Sethi, Jeffrey D Ullman, "Compilers- Principles, Techniques and Tools", 2nd Edition, Addison-Wesley, 2007.

Program: **Bachelor of Engineering**		
Course Title: **Mini Project**		Course Code: **15ECSW301**
L-T-P: **0-0-3**	Credits: **3**	Contact Hrs: **3 hrs/week**
CIE Marks: **50**	SEE Marks: **50**	Total Marks: **100**
Teaching Hrs: **39**	Exam Duration: **3 Hrs**	

Student Evaluation Matrix

Sl. No	Continuous Internal Evaluation	Assessment	Weightage in Marks
1	Review 1 :	Problem identification & Defining a problem statement, test plan and Construction of software system	15
2.	Review 2 :	Software Requirement Specification (SRS)	10
3.	Review 3 :	Software Design	05
4.	Review 4 :	Construction (as per design) & testing	10
5.	Review 5 & peer review:	Final Demo & exhibition Peer review will be done after review 1 & review 4)	10
		Total	**50**

Program: Bachelor of Engineering		
Course Title: **Computer Networks-II**		Course Code: **17ECSC304**
L-T-P: **3-0-0**	Credits: **3**	Contact Hrs: **3 hrs/week**
CIE Marks: **50**	SEE Marks: **50**	Total Marks: **100**
Teaching Hrs: **40**	Exam Duration: **3 hrs**	

Unit –I		
1	**Introduction:** Overview of IP addressing, Network layer control plane: routing algorithms, routing in internet, broadcast and multicast routing, SDN control plane, Network management and SNMP	**08 hrs**
2	**Data Link Layer** Error-Detection and -Correction Techniques, Parity Checks, Check summing Methods, Cyclic Redundancy Check (CRC), multiple access links and protocols	**08 hrs**
Unit –II		
3	**Switched Local Area Networks** Link-Layer Addressing and ARP, Ethernet, Link-Layer Switches, Virtual Local Area Networks (VLANs), Multiprotocol Label Switching (MPLS), Data Center Networking.	**08 hrs**
4	**Wireless Networks** Wireless Links and Network Characteristics, 802.11 Wireless LANs, Architecture, MAC Protocol, Frame, Mobility, Advanced Features, Personal Area Networks: Bluetooth and Zigbee, Cellular networks and internet access	**08 hrs**
Unit –III		
6	**Mobility Management** Mobility, mobile IP, managing mobility in cellular network, wireless and mobile: impact on higher layer protocols	**04 hrs**
7	**Multimedia Networking:** Applications, Voice-over-IP, Protocols for real-time applications.	**04 hrs**

Text Books:

1. J. F. Kurose, K. W. Ross, "Computer Networking, A Top-Down Approach", 7th Edition, Pearson Education, 2017.

Reference Books:

1. Peterson, Larry L, "Computer networks : a systems approach", 5th Edition, The Morgan Kaufmann series in networking, 2012
2. Behrouz Forouzan, Data Communications and Networking, McGraw Hill 4ed., 2007

Scheme for End Semester Assessment (ESA)

UNIT	8 Questions to be set of 20 Marks Each	Chapter Numbers	Instructions
I	Q.No.-1, Q.No.-2, Q.No.-3	1, 2	Solve Any **2** out of **3**
II	Q.No.-4, Q.No.-5, Q.No.-6	3,4	Solve Any **2** out of **3**
III	Q.No.-7	5	Solve Any **1** out of **2**
	Q.No.-8	6	

Program: Bachelor of Engineering		
Course Title: **Distributed and Cloud Computing**		Course Code:**17ECSC305**
L-T-P: **2-0-1**	Credits: **3**	Contact Hrs: **04 hrs/week**
ISA Marks: **50**	ESA Marks: **50**	Total Marks: **100**
Teaching Hrs: **30**	Exam Duration: **03 hrs**	

Unit –I		
1	**Distributed System Models and Enabling Technologies** Scalable Computing over the Internet, Technologies for Network-Based Systems, System Models for Distributed and Cloud Computing.	**04 hrs**
2	**Virtual Machines and Virtualization of Clusters and Data Centers** Implementation Levels of Virtualization, Virtualization Structures/Tools and Mechanisms, Virtualization of CPU, Memory, and I/O Devices, Virtual Clusters and Resources Management.	**04 hrs**
3	**Cloud Platform Architecture over Virtualized Data Centers** Cloud Computing and Service Models, Architectural Design of Compute and Storage Clouds, Public Cloud Platforms.	**04 hrs**
Unit –II		
4	**Cloud Programming and Software Environments** Features of Cloud and Grid Platforms, Parallel and Distributed Programming Paradigms, Programming Support of Google App Engine.	**04 hrs**
5	**Cloud Resource Management** Policies and mechanisms for resource management, Applications of control theory to task scheduling on a cloud, Stability of a two-level resource allocation architecture, Feedback control based on dynamic thresholds, Coordination of specialized autonomic performance managers.	**04 hrs**
6	**Cloud Resource Scheduling** Resource bundling; combinatorial auctions for cloud resources, Scheduling algorithms for computing clouds. Fair queuing, Start-time fair queuing, Borrowed virtual time, Cloud scheduling subject to deadlines, Scheduling MapReduce applications subject to deadlines.	**04 hrs**
Unit –III		

6	**Cloud Security** Cloud security risks, Security; the top concern for cloud users, Privacy; privacy impact assessment, Trust, Operating system security, Security of virtualization.	**03 hrs**
7	**Hypervisor & Operating System security** Security risks posed by shared images, Security risks posed by a management OS, Xoar - breaking the monolithic design of the TCB, A trusted virtual machine monitor.	**03 hrs**

Text Books:

3. Kai Hwang, Geoffrey C. Fox, Jack J. Dongarra, "Distributed and Cloud Computing from Parallel Processing to the Internet of Things", Morgan Kaufman, Elsevier- 2012.
4. Dan C. Marinescu "Cloud Computing Theory and Practice", Morgan Kaufman, Elsevier- 2013.

Reference Books:

5. Rajkumar Buyya, Christian Vecchiola, S.Thamarai Selvi "Mastering Cloud Computing", McGraw Hill Education (India) Pvt. Limited, 2013.
6. Anthony T. Velte, Toby J. Velte, Robert Elsenpeter: Cloud Computing, A Practical Approach, McGraw Hill, 2010.

Scheme for End Semester Assessment (ESA)

UNIT	8 Questions to be set of 20 Marks Each	Chapter Numbers	Instructions
I	Q.No.-1, Q.No.-2, Q.No.-3	1, 2, 3	Solve Any **2** out of **3**
II	Q.No.-4, Q.No.-5, Q.No.-6	4,5,6	Solve Any **2** out of **3**
III	Q.No.-7	7	Solve Any **1** out of **2**
	Q.No.-8	8	

Expt./Job No.	Brief description about the experiments	No. of Lab slots per batch (estimate)
1.	Hypervisors (Type-I and Type-II)	01
2.	Instance building using Infrastructure as a Service	01
3.	Application hosting using Platform as a Service	01
4.	Private cloud setup	01
5.	Developing Task Model Applications using Aneka Management Studio	02
6.	Developing Thread Model Applications using Aneka Management Studio	02
7.	VMware Online Hands on Lab (HOL)	01

Program: Bachelor of Engineering		
Course Title: **Professional Aptitude and Logical Reasoning**		Course Code:15EHSC301
L-T-P:3-0-0	Credits: **3**	Contact Hrs: **03 hrs/week**
ISA Marks: **50**	ESA Marks: **50**	Total Marks: **100**

Unit –I		
1	Arithmetical Reasoning	10hrs
2	Analytical Thinking	4hrs
3	Syllogistic Logic	3hrs
Unit –II		
4	Verbal Logic	
5	Non-Verbal Logic	
Unit –III		
6	Lateral Thinking	

Text Books:

1. A Modern Approach to Verbal and Non – Verbal Reasoning – R. S. Aggarwal, Sultan Chand and Sons, New Delhi
2. Quantitative Aptitude – R. S. Aggarwal, Sultan Chand and Sons, New Delhi

Evaluation Scheme

Reference Books:

1. Verbal and Non – Verbal Reasoning – Dr. Ravi Chopra, MacMillan India
2. Lateral Thinking – Dr. Edward De Bono, Penguin Books, New Delhi

Scheme for End Semester Assessment (ESA)

ISA Scheme

Assessment	**Weight age in Marks**
Minor Exam 1	15
Minor Exam 2	15
Assignments	

Written	10
Class Tests	10
Total	**50**

Program: Bachelor of Engineering		
Course Title: **Computer Networks Lab**		Course Code: **15ECSP302**
L-T-P: **0-0-1.5**	Credits: **1.5**	Contact Hrs: **3 hrs/week**
CIE Marks: **80**	SEE Marks: **20**	Total Marks: **100**
Teaching Hrs: **36**	Exam Duration: **3hrs**	

Expt. /Job No.	**Brief description about the experiment/job**
1.	Introduction to Hardware components and Ethernet LAN set up.
2.	Introduction to socket programming
3.	Implementation of FTP
4.	Implementation of error control techniques.
5.	Implementation of flow control ARQs
6.	Introduction to NOS.
7.	Subnet design
8.	VLAN setup
9.	OSPF and RIP configuration and performance analysis
10.	eBGP and iBGP configuration and performance analysis
11.	Wireless network performance analysis
12.	Wireless network performance analysis

Program: Bachelor of Engineering		
Course Title: **Web Technologies Lab**		Course Code:**15ECSP303**
L-T-P: **0-0-1.5**	Credits: **1.5**	Contact Hrs: **3 hrs/week**
CIE Marks: **80**	SEE Marks: **20**	Total Marks: **100**
Teaching Hrs: **42**	Exam Duration: **3** hrs	

	Tutorial	
1	**Javascript Frameworks** **Angular2:** Introduction, Navigation: Angular router, Dependency injection, Bindings, observables, and pipes, component communications, forms, Interacting with servers using HTTP and WebSockets, Bundling and deploying applications. **Node.js** Introduction to Node.js Building servers using the http and net modules, Node modules and events, Express, Accessing Data.	**12 hrs**

2	**Python Frameworks** Introduction to Python Frameworks, components of frameworks,-building RESTful web services.	**06 hrs**
3	**Using Python full stack frameworks** Django**:** Introduction to Django, Django's take on MVC: Model, View and Template, Django Forms: Form classes, Validation, Authentication, Advanced Forms processing techniques, working with databases, Integrate with RESTful web services.	**06 hrs**
4	**Building Enterprise Web Applications.** Ruby on Rails: An Overview Of Ruby on Rails, Rails and HTML Forms, Form Helpers and Validation, Databases and Rails, Adding Style to an Application, Sessions.	**06 hrs**

Tentative Lab Plan

Expt./ Job No.	Lab assignments/experiment	No. of Lab. Slots per batch (estimate)
1	Demonstration on Angular.js	01
2	Exercise on Angular.js	01
3	Demonstration on Node.js	01
4	Exercise on Node.js	01
5	Demonstration on Django	01
6	Exercise on Django	01
7	Demonstration on Ruby on Rails	01
8	Exercise on Ruby on Rails	01
9	Structured enquiry 1 – JavaScript	02
10	Structured enquiry 2 – Django	02
11	Structured enquiry 3 – Ruby on Rails	02

Reference Books:

1. Yakov Fain, Anton Moiseev, "Angular 2 Development with TypeScript", Manning Publications Company, 2016.
2. Azat Mardan, "Practical Node.js: Building Real-World Scalable Web Apps", Apress, 2014.
3. Jeff_Forcier, "Python Web Development with Django", 1st edition, Pearson Education, 2008.
4. Michael Hartl, "Ruby on Rails Tutorial: Learn Web Development with Rails (2nd Edition) (Addison-Wesley Professional Ruby)".

Program: **Bachelor of Engineering**		
Course Title: **Minor Project**		Course Code: **15ECSW302**
L-T-P: **0-0-6**	Credits: **6**	Contact Hrs: **3 hrs/week**
CIE Marks: **50**	SEE Marks: **50**	Total Marks: **100**
Teaching Hrs: **39**	Exam Duration: **3 hrs**	

Student Evaluation Matrix

	Assessment	**Weightage in Marks**
Continuous Internal Evaluation Review -1	Problem Definition & Literature survey	05
	Requirement analysis and System design	05
	Synopsis and SRS report	07
	Presentation skills and team work	03
	Total	**20**
Continuous Internal Evaluation Review -2	Implementation and testing	15
	Presentation skills and team work	05
	Total	**20**
Continuous Internal Evaluation Review -3	Result Analysis	03
	Project Report	05
	Presentation skills and Viva-voce	02
	Total	**10**

Program: **Bachelor of Engineering**		
Course Title: **Computer Vision**		Course Code**:17ECSE308**
L-T-P: 3-0-0	Credits: 3	Contact Hrs: **3hrs/week**
ISA Marks: 50	ESA Marks: 50	Total Marks: 100
Teaching Hrs: 30		Exam Duration: 3 hrs

.

Unit – 1		
1	**Introduction** Computer Vision Overview, Pixels and image representation, Filters: Linear systems, Convolutions and cross-correlations; Lab: Basics, Filters	**4hrs**

2	**Features and filtering** Edge detection: Gaussian, Sobel filters, Canny edge detector, Features and fitting: RANSAC Local features, Harris corner detection, Feature descriptors: Difference of gaussians, Scale invariant feature transform; Lab: Filters, Edges, Features	**8hrs**
Unit – 2		
3	**Semantic segmentation** Perceptual grouping, Agglomerative clustering, Super pixels and over segmentation; Clustering: K-means, Mean shift; Visual Bag of Words: Texture features, Visual bag of words; Lab: Resizing, clustering, recognition	**6 hrs**
4	**Motion** Optical Flow, Lucas-Kanade method, Horn-Schunk Method, Pyramids for large motion, Tracking: Feature Tracking, Lucas KanadeTomasi (KLT) tracker; Lab: Object detection, optical flow	**6hrs**
Unit – 3		
5	**Advanced Techniques** Image stitching, Image pyramids, Object recognition, Dimensionality reduction, Face identification, Detecting objects by parts	**6hrs**

Reference Books:

1. Richard Szeliski, Computer Vision: Algorithms and Applications, Springer, 2011.
2. D. Forsyth and J. Ponce, Computer Vision: A Modern Approach, Pearson Education India, 2nd Ed, 2015.
3. R. I. Hartley and A. Zisserman, Multiple View Geometry in Computer Vision, Cambridge University Press, 2nd Edition, 2004.

Scheme for End Semester Assessment (ESA)

UNIT	8 Questions to be set of 20 Marks Each	Chapter Numbers	Instructions
I	Q.No.-1, Q.No.-2, Q.No.-3	1, 2	Solve Any 3 out of 4
II	Q.No.-4, Q.No.-5, Q.No.-6	3, 4	Solve Any 3 out of 4
III	Q.No-7,Q.No-8	5	Solve Any 1 out of 2

Program: **Bachelor of Engineering**		
Course Title: **Algorithmic Problem Solving**		Course Code: **17ECSE309**
L-T-P: **0-0-6**	Credits: **6**	Contact Hrs: 74
ISA Marks: **70**	ESA Marks: 30	Total Marks: **100**
Teaching Hrs: 74	Exam Duration: 2 to 3 days	

Course Content

Unit – 1	
Chapter 0: Building Blocks Understanding coding platforms and tools, Data Structures and Algorithms revisited	**06 hrs**
Chapter 1: Strategies and Performance Warm up problems, Parsing and Formatting text, Code performance analysis and tools	**06 hrs**
Chapter 2: Advanced Data Structures Matrix, Grids, Trees and variants, Lists, Skip lists, Hash, Trie and variants	**10 hrs**
Chapter 3: Dynamic Programming Memory functions, Optimization problems	**08 hrs**
Unit – 2	
Chapter 4: Graph algorithms Traversal Algorithms, Shortest Path Algorithms, Spanning Tree Algorithms and variants	**25 hrs**
Chapter 5: Introduction to Computational Geometry Points, Line Segments, Polygons and Basics of Geometric Problems	**05 hrs**
Unit – 3	
Chapter 6: Problem Solving Assortment of problems and techniques.	**14 hrs**

Text Book

1. Levitin A., "Introduction to the Design and Analysis of Algorithms", Third Edition, Pearson Education, 2017.
2. Levitin A, Levitin M, "Algorithmic Puzzles", First Edition, Oxford University Press, 2011.
3. Online Coding Platforms

References

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", Third Edition, MIT Press, 2010.

Program: Bachelor of Engineering		
Course Title: **Internet of Things**		Course Code: **17ECSE303**
L-T-P: **2-0-1**	Credits: 3	Contact Hrs: **4 hrs/week**
ISA Marks: 50	ESA Marks: 50	Total Marks: 100
Teaching Hrs: 30 **hrs**	Exam Duration: 3 **hrs**	

	Unit –I	
1	**Introduction to Internet of Things (IoT)** Definition & Characteristics of IoT, Things in IoT, IoT protocols, IoT functional blocks, communication models and APIs.	**04 hrs**
2	**IoT Architecture** Enabling technologies: Sensors, Zigbee, Bluetooth, IoT ecosystem, Data Link protocols: IEEE 802.15.4e, IEEE 802.11.ah, DASH7, Low Power Wide Area Network (LoRaWAN).	**04 hrs**
3	**Network protocols** Routing Protocol for Low-Power and Lossy Networks (RPL), cognitive RPL (CORPL), Channel-Aware Routing Protocol (CARP), Low power Wireless Personal Area Networks (LoWPAN).	**04 hrs**
	Unit –II	
4	**Application and Security protocols** Message Queue Telemetry Transport (MQTT), MQTT for Sensor Networks, Secure MQTT, Advanced Message Queuing Protocol (AMQP), Constrained Application Protocol (CoAP), OPC UA, 6LoWPAN), Routing Protocol for Low-Power and Lossy Networks (RPL).	**04 hrs**
5	**IoT Platforms Design Methodology** IoT Design Methodology, Case Study on IoT System for Weather Monitoring etc., Basic building blocks of an IoT device, Raspberry Pi, interface (serial, SPI, I2C), IoT Operating Systems: Contiki, RIOT.	**04 hrs**
6	**Programming with Raspberry Pi** XML, JSON, SOAP and REST-based approach, WebSocket protocol.	**04 hrs**
	Unit –III	
7	**IoT prototyping** Business models, example applications: Case studies on Home automation, Cities, Environment, Energy, Agriculture, Health with emphasis on data analytics and security.	**06 hrs**

Text Books:

2. Arshdeep Bahga, Vijay Madisetti "Internet of Things (A Hands-on-Approach)" Universities Press- 2014.
3. Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things: Key Applications and Protocols" John Wiley & Sons – 2012.

Reference Books:

1. Subhas Chandra Mukhopadhyay "Internet of Things Challenges and Opportunities" Springer- 2014.

Scheme for Semester End Examination (SEE)

UNIT	8 Questions to be set of 20 Marks Each	Chapter Numbers	Instructions
I	Q.No.-1, Q.No.-2, Q.No.-3	1, 2,3	Solve Any **2** out of **3**
II	Q.No.-4, Q.No.-5, Q.No.-6	4,5,6	Solve Any **2** out of **3**
III	Q.No.-7	7	Solve Any **1** out of **2**

Expt./Job No.	Brief description about the experiments	No. of Lab slots per batch (estimate)
1.	Programming with Raspberry Pi	3
2.	Cloud service interface for data storage and retrieval	2
3.	Performance analysis of Data link protocols, routing and application protocols	3
4.	Open Ended Experiment with focus on data analytics and security	2

Program: Bachelor of Engineering		
Course Title: **Active Directory Domain Services**		Course Code:**17ECSE304**
L-T-P: **3-0-0**	Credits: **3**	Contact Hrs: **03 hrs/week**
ISA Marks: **50**	ESA Marks: **50**	Total Marks: **100**
Teaching Hrs: **40**	Exam Duration: **03 hrs**	

Unit –I		
1	**Introduction to Microsoft Active Directory** Introduction to Microsoft Active Directory, Roles of Active directory services, Features in ADDS.	**06 hrs**
2	**Domains and Forests** Active Directory Structure Storage and Technologies, Data Store Components,	**05 hrs**

	Active Directory Domains and Forests, The Logical Structure of Active Directory.	
3	**Physical Structure** The Physical Structure of Active Directory, Network Ports used by Domains and Forests.	**04 hrs**
Unit –II		
4	**Installation of R2 server** Requirements for installing ADDS, Understanding of Active Directory Domain Services Functional levels.	**06 hrs**
5	**Administration** Guidelines for raising domain and forests functional levels, Introduction to various AD Snap-ins and their functions	**04 hrs**
6	**Domain Services** Active Directory Users and Computers, Active Directory Domains and Trusts, Active Directory Sites and Services.	**05 hrs**
Unit –III		
7	**Backup/Restore** Backing Up Directory Domain Services Active, Recovering Active Directory Domain Services. Authoritative restore, Methods of authoritative restore	**10 hrs**
Text Books: 1. Introduction to MICROSOFT Active Directory Domain Services (ADDS), Microsoft reference materials.		

Scheme for End Semester Assessment (ESA)

UNIT	8 Questions to be set of 20 Marks Each	Chapter Numbers	Instructions
I	Q.No.-1, Q.No.-2, Q.No.-3	1,2,3	Solve Any **2** out of **3**
II	Q.No.-4, Q.No.-5, Q.No.-6	4,5,6	Solve Any **2** out of **3**
III	Q.No.-7, 8	7	Solve Any **1** out of **2**

Program: Bachelor of Engineering		
Course Title: **Parallel Computing**		Course Code: **17ECSE307**
L-T-P: **3-0-0**	Credits: **3**	Contact Hrs: **03 hrs/week**
ISA Marks: **50**	ESA Marks: **50**	Total Marks: **100**
Teaching Hrs: **43**	Exam Duration: **03 hrs**	

Unit –I		
1	**Introduction to Parallel Computing & Parallel Programming Platforms:** Motivating Parallelism, Scope of Parallel Computing, Implicit Parallelism: Trends in Microprocessor Architectures, Limitations of Memory System Performance, Dichotomy of Parallel Computing Platforms, Physical Organization of Parallel Platforms, Communication Costs in Parallel Machines, Routing Mechanisms for Interconnection Networks, Impact of Process-Processor Mapping and Mapping Techniques	**07 hrs**
2	**Principles of Parallel Algorithm Design:** Preliminaries, Decomposition Techniques, Characteristics of Tasks and Interactions, Mapping Techniques for Load Balancing, Methods for Containing Interaction Overheads, Parallel Algorithm Models	**09 hrs**
Unit –II		
3	**Analytical Modeling of Parallel Programs:** Sources of Overhead in Parallel Programs, Performance metrics for parallel systems, The effect of Granularity on performance, Scalability of Parallel Systems, Minimum execution time and minimum cost optimal execution time, Asymptotic analysis of Parallel programs, Other Scalability Metrics	**09 hrs**
4	**Programming Using the Message Passing Paradigm:** Principles of Message – Passing Programming, The Building Blocks, MPI: The Message passing Interface, Overlapping Communication with Computation, Collective Communication and Computation Operations, Groups & Communicators	**07 hrs**
Unit –III		
5	**Programming Shared Address Space Platforms:** Thread Basics, POSIX Thread API, Synchronization Primitives in Pthreads, Controlling Thread and Synchronization Attributes, Thread Cancellation, Composite Synchronization Constructs, OpenMP: A standard for Directive Based Parallel Programming.	**06 hrs**
6	**Case Study/ Projects and Recent Trends:** Case Study/ Projects and Recent Trends	**05 hrs**

Text Books:

1. Ananth Grama, George Karypis, Vipin Kumar and Anshul Gupta, Introduction to Parallel Computing, Second Edition, Pearson India, 2013

References:

1. Michael Quinn, Parallel Computing Theory and Practice, Tata McGraw Hill, 2003

Scheme for End Semester Assessment (ESA)

UNIT	8 Questions to be set of 20 Marks Each	Chapter Numbers	Instructions
I	Q.No.-1, Q.No.-2, Q.No.-3	1,2	Solve Any **2** out of **3**
II	Q.No.-4, Q.No.-5, Q.No.-6	3,4	Solve Any **2** out of **3**
III	Q.No.-7, 8	5,6	Solve Any **1** out of **2**

Program: **Bachelor of Engineering**		
Course Title: **Quantum Computing**		Course Code:17ECSE306
L-T-P: **3-0-0**	Credits: **3**	Contact Hrs: **3 hrs/week**
ISA Marks: **50**	ESA Marks: **50**	Total Marks: **100**
Teaching Hrs: **50**	Exam Duration: **3hrs**	

Unit –I		
1	**Introduction and Background:** Overview, Computers and the Strong Church–Turing Thesis, The Circuit Model of Computation, A Linear Algebra Formulation of the Circuit Model, Reversible Computation, A Preview of Quantum Physics, Quantum Physics and Computation.	**07hrs**
2	**Linear Algebra and the Dirac Notation:** The Dirac Notation and Hilbert Spaces, Dual Vectors, Operators, The Spectral Theorem, Functions of Operators, Tensor Products, The Schmidt Decomposition Theorem, Some Comments on the Dirac Notation.	**05hrs**
3	**Introduction to Quantum Toolbox in Python:** Installation, Basics and Quantum mechanics	**04 hrs**
Unit –II		
4	**Qubits and the Framework of Quantum Mechanics:** The State of a Quantum System, Time-Evolution of a Closed System, Composite Systems, Measurement, Mixed States and General Quantum Operations, Mixed	

	States, Partial Trace, General Quantum Operations.	**08hrs**
5	**A Quantum Model of Computation:** The Quantum Circuit Model, Quantum Gates, 1-Qubit Gates, Controlled-U Gates, Universal Sets of Quantum Gates, Efficiency of Approximating Unitary Transformations, Implementing Measurements with Quantum Circuits.	**05hrs**
6	Exploring Python for Solving Problems / Projects using Quantum Computing	**03 hrs**
Unit –III		
7	**Introductory Quantum Algortihms:** Probabilistic Versus Quantum Algorithms, Phase Kick-back, The Deutsch Algorithm, The Deutsch–Jozsa Algorithm, Simon's Algorithm.	**04hrs**
8	**Case Studies and Projects done during the course:** Image processing, Data Sciences, Machine Learning, Networking	**04 hrs**
Text Books 2. Phillip Kaye, Raymond Laflamme and Michele Mosca "An Introduction to Quantum Computing ", Oxford University, Press, 2007 3. User Guide - Quantum Toolbox in Python, Release 4.2.0 – Qutip.org		
References: 1. Internet References, toolbox and other relevant software's.		

Scheme for Semester End Examination (ESA)

UNIT	8 Questions to be set of 20 Marks Each	Chapter numbers	Instructions
I	Q.No.-1, Q.No.-2, Q.No.-3	1, 2,3	Solve Any **2**
II	Q.No.-4, Q.No.-5, Q.No.-6	4, 5, 6	Solve Any **2**
III	Q.No.-7	7	Solve Any **1**
	Q.No.-8	8	

Program: **Bachelor of Engineering**		
Course Title: **Embedded Intelligent Systems**		Course Code: **18ECSE302**
L-T-P: 0-0-3	Credits: 3	Contact Hrs: **6hrs/week**
ISA Marks: 80	ESA Marks: 20	Total Marks: 100
Teaching Hrs: 60	Exam Duration: 3 hrs	

1	**Basics of embedded systems** Linux Application Programming, System V IPC, . Linux Kernel Internals and Architecture , Kernel Core , Linux Device Driver Programming, Interrupts &	**10 hrs**

	Timers , Sample shell script, application program, driver source build and execute	
2	**Heterogeneous computing** Basics of heterogeneous computing with various hardware architectures designed for specific type of tasks, Advanced heterogeneous computing with a. Introduction to Parallel programming b.GPU programming (OpenCL) c. Open standards for heterogeneous computing (Openvx) , Basic OpenCL examples - Coding, compilation and execution	**12 hrs**
3	**ML Frameworks lab with the target device** Caffe, tensorflow, TF Lite machine learning frameworks & architecture ,Model parsing, feature support and flexibility ,Supported layers , advantages and disadvantages with each of these frameworks, Android NN architecture overview , Full stack compilation and execution on embedded device	**16 hrs**
4	**Model Development and Optimization** Significance of on device AI ,Quantization , pruning, weight sharing, Distillation ,Various pre-trained networks and design considerations to choose a particular pre-trained model ,Federated Learning , Flexible Inferencing	**8 hrs**
6	**Android Anatomy** Android Architecture ,Linux Kernel , Binder , HAL Native Libraries , Android Runtime, Dalvik Application framework , Applications, IPC	**8 hrs**

Program: Bachelor of Engineering			
Course Title: **JAVA Programming**		Course Code: 19ECSP301	
L-T-P:**1-0-1.5**	Credits: **2.5**	Contact Hrs: 4 Hrs/week	
ISA Marks: **80**	ESA Marks: **20**	Total Marks: **100**	
Teaching Hrs: **52**	Exam Duration: **3hrs**		
Unit –I			
1	**JAVA Language Fundamentals:** Java Features, Programming basics, Arrays and Strings, classes and objects		**4 Hrs**
2	**Inheritance**: Introduction, types of inheritance, static and dynamic polymorphism.		**2 Hrs**
Unit –II			
3	**Interfaces and Exception Handling:** Introduction,Create and implement interfaces, Exception handling,		**2 Hrs**
4	**Generics and Collections Frame work:** Introduction to generic programming, Collections: Interfaces: List, Set, Queue Classes: ArrayList, LinkedList and HashSet, Map		**2 Hrs**
Unit –III			
5	**Lambda Expressions:** Functional programming, Functional interface, Bulk operations on collections		**2hrs**

6	**Java Database Connectivity (JDBC):** Introduction, Drivers, Interfaces and classes to develop data base applications, case study	**2 Hrs**

Text Books:

1. JAVA The Complete Reference, Herbert Schildt, 10th Ed, 2017, McGraw-Hill

Reference Book

1. Kathy Sierra and Bert Bates, Head First Java: A Brain-Friendly Guide, 2nd Edition, O'Reilly Media
2. Introduction to Java Programming, Liang Y D, Pearson, 11th Edition

Program: **Bachelor of Engineering**		
Course Title: **Semantic Web**		Course Code:**19ECSE303**
L-T-P: **3-0-0**	Credits: **3**	Contact Hrs: **3hrs/week**
ISA Marks: **50**	ESA Marks: **50**	Total Marks: **100**
Teaching Hrs: **40**	Exam Duration: **03 hrs**	

Unit –I		
1	**Introduction to Semantics** History of the Web, Limitations, Vision of Semantic Web, Principles, Data Integration Across Web, Data Modeling Methods, Semantic Relationships, Metadata, Perpetual Data	**4 hrs**
2	**Expressing Meaning** Triple Store, Merging Graphs, Querying: Case Study	**4 hrs**
3	**Using Semantic Data** Query Language, Feed Forward Inference, Searching for Connections, Linked Data, Freebase	**8 hrs**
Unit –II		
4	**Working with Semantics** RDF—The Basis of the Semantic Web, OWL, Metadata with RDF, Metadata Taxonomies, Ontology	**8 hrs**
5	**Reasoning and Social Web** Reasoning types: Approximate Reasoning and Bounded Reasoning, Social Semantic Web, Semantic Crawlers	**8 hrs**
Unit –III		
6	**Semantic Modeling** Semantic Modeling, Semantic Web Applications, Logic for Semantic Web, Case Studies: Dr. Watson, Yahoo! SearchMonkey	**8 hrs**

Text Books

1. Grigoris Antoniou, Paul Groth, Frank van Harmelen and Rinke Hoekstra, A Semantic Web Primer, MIT Press; 3rd edition, 2012.
2. Toby Segaran, Colin Evans, and Jamie Taylor, Programming the Semantic Web: Build Flexible Applications with Graph Data, O'Reilly Media; 2 edition, July 2009.

Reference Books:

1. Pascal Hitzler, Markus Krötzsch, Sebastian Rudolph, Foundations of Semantic Web Technologies, Chapman and Hall; 1st edition, 2009.
2. Dean Allemang, and James Hendler, Semantic Web for the Working Ontologist, Effective Modeling in RDFS and OWL, Morgan Kaufmann; 2nd edition, 2011.
3. John Hebeler, Matthew Fisher, Ryan Blace, Andrew Perez-Lopez, and Mike Dean (Foreword), Semantic Web Programming, Wiley Publishers, 1 edition 2009.

Scheme for End Semester Assessment (ESA)

UNIT	8 Questions to be set of 20 Marks Each	Chapter Numbers	Instructions
I	Q.No.-1, Q.No.-2, Q.No.-3	1, 2,3	Solve Any **2**
II	Q.No.-4, Q.No.-5, Q.No.-6	4,5	Solve Any **2**
III	Q.No.-7	6	Solve Any **1**
	Q.No.-8	6	

Course Title: Block Chain Technology		Course ode:19ECSE301
L-T-P: **2-0-1**	Credits: **3**	Contact Hrs: **3hrs/week**
ISA Marks: **50**	ESA Marks: **50**	Total Marks: **100**
Teaching Hrs: **40**	Exam Duration: **3 hrs**	

	Unit –I	
1	**Introduction** Overview of Blockchain, History: Digital Money to Distributed Ledgers, Design Primitives: Protocols, Security, Consensus, Permissions, Privacy	**08 hrs**
2	**Blockchain Architecture and Design** Crypto primitives- Hash, Signature, Hashchain to Blockchain, basic consensus mechanisms, Requirements for the consensus protocols, Proof of Work, Proof of State, Scalability issues of consensus protocols	**08 hrs**
	Unit –II	
3	**Blockchain Contracts** Financial Services, Crowdfunding, Bitcoin Prediction Markets, Smart Property, Smart Contracts, Blockchain Development Platforms and APIs, Blockchain Ecosystem: Decentralized Storage, Communication, and Computation	**08 hrs**
4	**Etherium** Etherium transactions, accounts, smart contracts, smart contract development, Solidity basics, basic contracts, distributed storage, Etherium scaling	**08 hrs**
	Unit –III	
5	**Blockchain Applications** Blockchain in Financial Software and Systems: Settlements, KYC, InsuranceBlockchain for Government: Digital identity, land records and other kinds of record keeping between government entities, public distribution system social welfare systems	**08hrs**

Text Books:

1. Melanie Swan, "Blockchain: Blueprint for New Economy", 1st Edition, O'Reilly Media, 2014.

Reference Books:

1. ArshdeepBhaga, Vijay Madisetti, "Blockchain Applications: A Hands-On Approach", Paperback– January 31, 2017

Scheme for End Semester Assessment (ESA)

UNIT	8 Questions to be set of 20 Marks Each	Chapter Numbers	Instructions
I	Q.No.-1, Q.No.-2, Q.No.-3	1,2	Solve Any **2**
II	Q.No.-4, Q.No.-5, Q.No.-6	3,4	Solve Any **2**
III	Q.No.-7, 8	5	Solve Any **1**

Course Title: The ARM Architecture		**Coursecode:19ECSE302**
L-T-P: 2-1-0	**Credits: 3**	**Contact Hrs: 3hrs/week**
ISA Marks: 50	**ESA Marks: 50**	**Total Marks: 100**
Teaching Hrs: 30	**Exam Duration: 3 hrs**	

	Unit –I	
1	**ARM Embedded Systems and Processor Fundamentals** The RISC Design Philosophy , The ARM Design Philosophy, Embedded System Hardware, Embedded System Software, Registers, Current Program Status Register, Pipeline, Exceptions, Interrupts, and the Vector Table, Core Extensions, Architecture Revisions, ARM Processor Families	06 hrs
2	**Introduction to the ARM Instruction Set & Assembly Programming** Data Processing Instructions, Branch Instructions, Load-Store Instructions, Software Interrupt Instruction, Program Status Register Instructions, Loading Constants, ARMv5E Extensions, Conditional Execution, Thumb instruction set.	06 hrs
	Unit –II	
3	**Efficient C Programming** Overview of C Compilers and Optimization, Basic C Data Types, C Looping Structures, Register Allocation, Function Calls, Pointer Aliasing, Structure Arrangement, Bit-fields, Unaligned Data and Endianness, Division.	06 hrs
4	**Writing and Optimizing ARM Assembly Code** Writing Assembly Code, Profiling and Cycle Counting, Instruction Scheduling, Register Allocation, Conditional Execution, Looping Constructs, Bit Manipulation, Efficient Switches, Handling Unaligned Data.	06 hrs
	Unit –III	
5	**Introduction to LPC-2148 controller**	03 hrs

	Input output Ports, Pin select registers, Input output select registers, direction control and control registers, Introduction to interfacing standards	
6	**ARM Interfacing** ARM interfacing to peripherals like LED, LCD, Seven segments, Motors, Converters, Keypad.	03 hrs

Text Books

1. Andrew N.Sloss et al, ARM System Developer's Guide- Designing and Optimizing System Software

Reference Books:

1.Marilyn Wolf, Computers as Components: Principles of embedded computing system design, Morgan Ka, 2012

2.Steve Furber, ARM System-on-chip Architecture, 2, Pearson, 2000

Tutorial Plan

Expt./ Job No.	assignments/experiment	No. of Lab. Slots per batch (estimate)
1	ALP on arithmetic instructions set	*01*
2	ALP on logical instructions set	01
3	ALP on loop and branch instructions	01
4	Interface LED and Seven segments to ARM for displaying message.	01
5	Interface LCD to ARM for displaying message.	01
6	Interface Keypad to read the characters	01
7	Rotate DC and stepper motor for variable speed and direction	01
8	Interface DAC to ARM controller	01

Scheme for End Semester Assessment (ESA)

UNIT	8 Questions to be set of 20 Marks Each	Chapter Numbers	Instructions
I	Q.No.-1, Q.No.-2, Q.No.-3	1,2	Solve Any **2** out of **3**
II	Q.No.-4, Q.No.-5, Q.No.-6	3,4	Solve Any **2** out of **3**
III	Q.No.-7, 8	5	Solve Any **1** out of **2**

Program: **Bachelor of Engineering**		
Course Title: **Big Data and Analytics**		Course Code: **17ECSC401**
L-T-P: **2-0-1**	Credits: **03**	Contact Hrs: **04 hrs/week**
ISA Marks: **50**	ESA Marks: **50**	Total Marks: **100**
Teaching Hrs: **54**	Exam Duration**: 03 hrs**	

Unit –I		
1	**Understanding Big Data -** What is Big Data?, Data Analytics, Data Analytics Life Cycle, Big Data Characteristics , Different Types of Data.	**04hrs**
2	**Big Data Storage Concepts -** Clusters , File Systems and Distributed File Systems , NoSQL , Sharding, Replication , Combining Sharding and Replication.	**06 hrs**
3	**Big Data Processing Concepts -** Parallel Data Processing, Distributed Data Processing, Hadoop.	**03 hrs**
Unit –II		
4	**Big Data Processing Concepts - Map Reduce -** Processing Workloads, Cluster, Processing in Batch Mode, Processing in Real-time Mode.	**06hrs**
5	**Introduction to MongoDB-** What is MongoDB?, WhyMongoDB?, Terms Used in RDBMS and MongoDB, Data Types in MongoDB, MongoDB Query Language.	**06hrs**
Unit –III		
6	**Introduction to Hive -** What is Hive?, Hive Architecture, Hive Data Types, Hive File Format, Hive Query Language (HQL), RCFile Implementation, User-Defined Function (UDF).	**05hrs**

Text Books

1. Thomas Erl, WajidKhattak,and Paul Buhler,"Big Data Fundamentals Concepts, Drivers & Techniques", Prentice Hall, 2015.
2. SeemaAcharya, SubhashiniChellappan,"Big Data and Analytics", Wiley India Pvt Ltd, 2014.

Reference Books

1. Frank J Ohlhorst, "Big Data Analytics: Turning Big Data into Big Money", Wiley and SAS Business Series, 2012.
2. Colleen Mccue, "Data Mining and Predictive Analysis: Intelligence Gathering and Crime Analysis", Elsevier, 2007.

Scheme for End Semester Assessment(ESA)

UNIT	8 Questions to be set of 20 Marks Each	Chapter Numbers	Instructions
I	Q.No.-1, Q.No.-2, Q.No.-3	1, 2,3	Solve Any **2** out of **3**
II	Q.No.-4, Q.No.-5, Q.No.-6	4,5	Solve Any **2** out of **3**
III	Q.No.-7, Q.No.-8	6	Solve Any **1** out of **2**

Program: **Bachelor of Engineering**		
Course Title: **Capstone Project**		Course Code: **18ECSW401**
L-T-P: **0-0-14**	Credits: **6**	Contact Hrs: **3 hrs/week**
ISA Marks: **50**	ESA Marks: **50**	Total Marks: **100**
	Exam Duration: **3hrs**	

Project themes:

Networking	Data Engineering	System Engineering
• Internet of Things • Cloud Computing • Software Defined Network • Social Network Analysis	• Data Analytics • Image and video processing • Computer Vision and Graphics • Natural Language Processing	• Parallel Computing • High Performance Computing • Parallel system design

***Evaluation*:**

Students Assessment through ISA (50%) + ESA (50%)

	Assessment	Weightage in Marks
Internal Semester Assessment* (50%)	Periodic reviews by Project Guide	25
	Periodic reviews by Committee	25
End Semester Assessment (50%)	Final Review	50
	Total	**100**

Program: **Bachelor of Engineering**		
Course Title: **Industry Training**		Course Code: 18ECSI493
Credits: 6	ISA Marks: 50	ESA Marks: 50
Total Marks: 100	Exam Duration: 3 hrs	L-T-P: 0-0-6

Overview of the Course

Industry Training is a supervised, practical training periods for which Undergraduate, final year students earn academic credits. Industry Training provide excellent opportunities for students to put into practice much of the knowledge and skills acquired during their studies and to gain firsthand knowledge of the software industry. It is also an opportunity for employers to observe the student in the work environment and evaluate their potential for possible future employment.
The companies selected for the Industry Training can range from start-ups to large scale industries.The students who got placed in campus interviews may be offered Industry Training depending upon the need of the company. Other students who wish to do internship are responsible to find a company on their own for the Training.

Course Learning Outcomes.
CO 1. Apply the knowledge and skills acquired on campus in a real-life work situation.
CO 2. Provide students with opportunities for practical, hands-on learning from practitioners.
CO 3. Enhance the employability skills of the students.
CO 4. Practice ethical standards appropriate to Internship site.
CO 5. Ability to write technical documents and give oral presentations of the work completed.

Scheme for In Semester Assessment(ISA) and End Semester Assessment (ESA)

Course	Course Code	Max ISA marks	Max ESA marks	Minimum Passing Marks
Industry Training	18ECSI493	50	50	Students must secure minimum of 40% marks in both ISA and ESA.

Program: **Bachelor of Engineering**		
Course Title: **Industry Project**		Course Code: 18ECSW494
Credits: 14	ISA Marks: 50	ESA Marks: 50
Total Marks: 100	Exam Duration: 3 hrs	L-T-P: 0-0-14

Overview of the Course

The purpose of providing the Industry Project is to give you the opportunity for students, to apply the knowledge, skills and competencies they have acquired, in real life practice. An Industry Project involves a stay in a relevant company or organization.

The students who got placed in campus interviews may be offered Industry Project depending upon the need of the company. Other students who wish to do Industry Project are responsible to find a company on their own.

Course Learning Outcomes.
CO 1. Identify the problem and perform requirement analysis

CO 2. Design potential solutions and evaluate to select optimal solution

CO 3. Apply professional norms of project implementation to meet specified requirements

CO 4. Apply fundamental activities of module, integration and system testing to validate the system

CO 5. Analyze results and present technical/scientific findings effectively through written and oral mode

Scheme for In Semester Assessment(ISA) and End Semester Assessment (ESA)

Course	Course Code	Max ISA marks	Max ESA marks	Minimum Passing Marks
Industry Project	18ECSW494	50	50	Students must secure minimum of 40% marks in both ISA and ESA.

Program: Bachelor of Engineering		
Course Title: Cyber Security		Course Code: **18ECSE401**
L-T-P: **2-0-1**	Credits: **3**	Contact Hours: **04 hrs/week**
CIE Marks: **50**	SEE Marks: **50**	Total Marks: **100**
Teaching Hours: **40**	Examination Duration: **03 Hrs**	

Unit I	
Chapter No. 1. Introduction to Cybercrime, Cyber offenses & Cybercrime: Cybercrime definition and origins of the world, Cybercrime and information security, Classifications of cybercrime, A global Perspective on cybercrimes. Cyber attack plans, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets, Proliferation of Mobile and Wireless Devices, Credit Card Frauds in Mobile and Wireless Computing Era.	**06 hrs**
Chapter No. 2. Cybercrimes and Cyber security: The Legal Perspectives: Why do we need Cyber law: The Indian Context, The Indian IT Act, Digital Signature and the Indian IT Act, Amendments to the Indian IT Act, Cybercrime and Punishment.	**06 hrs**
Unit II	
Chapter No. 3. Understanding computer forensic: Historical background of cyber forensic, Forensic analysis of email, Digital forensic life cycle, Network forensic, Setting up a computer forensic Laboratory, Forensic analysis of digital media.	**06 hrs**
Chapter No. 4. Cyber security: Organizational Implications: Cost of Cybercrimes and IPR Issues, Protecting People's Privacy in the Organization, Organizational Guidelines for Internet Usage, Intellectual Property in the Cyberspace of Cyber security.	**06 hrs**
Unit III	
Chapter No. 5. Cybercrime: Illustrations, Examples and Case studies: Introduction, Real-Life Examples, Case Studies: Illustrations of Financial Frauds in Cyber Domain, Digital Signature-Related Crime Scenarios, Online Scams.	**06 hrs**

Text Books:

1. Nina Godbole&SunitBelapure, "Cyber Security", Wiley India, 2012.

Reference Books:

1. Harish Chander, "Cyber laws & IT protection", PHI learning pvt.ltd, 2012.
2. Dhiren R Patel, "Information security theory & practice", PHI learning pvt.ltd, 2010.
3. Ms.M.K.Geetha&Ms.Swapne Raman, "Cyber Crimes and Fraud Management", Mc. MILLAN, 2012.
4. Bill Nelson, "Guide to Computer Forensics and Investigations", 4th Edition, CENGAGE Publication. 2009.

Tentative list of lab experiments:

1. Crime Scene / Field Response Evidence Preservation -1 Hr

2. System Image Restoration and Target drive preparation -1Hr
3. Removable/External Media Imaging -1 Hr
4. Evidence Search -1 Hr
5. Forensic analysis on Image documents -2 Hr
6. Forensic analysis on Audio files -2 Hr
7. Forensic analysis on Video files -2 Hr
8. Forensic analysis on Text Document -2 Hr

Scheme for End Semester Assessment(ESA)

UNIT	8 Questions to be set of 20 Marks Each	Chapter Numbers	Instructions
I	Q.No.-1, Q.No.-2, Q.No.-3	1, 2	Solve Any **2** out of **3**
II	Q.No.-4, Q.No.-5, Q.No.-6	3, 4	Solve Any **2** out of **3**
III	Q.No.-7, Q.No.-8	5	Solve Any **1** out of **2**

Program: **Bachelor of Engineering**		
Course Title: **Social Network Analysis**		Course Code: **18ECSE402**
L-T-P: **3-0-0**	Credits: **3**	Contact Hrs: **03 hrs/week**
ISA Marks: **50**	ESA Marks: **50**	Total Marks: **100**
Teaching Hrs: **40**	Exam Duration: **03 hrs**	

	Unit –I	
1	**Introduction** Introduction : Motivation, different sources of network data, types of networks, tools for visualizing network data.	**06 hrs**
2	**Structural properties of networks** Structural properties of networks : Notions of centrality, cohesiveness of subgroups, roles and positions, structural equivalence, equitable partitions, stochastic block models.	**10 hrs**
	Unit –II	
3	**Cascading properties of networks** Cascading properties of networks : Information/influence diffusion on networks, maximizing influence spread, power law and heavy tail distributions, preferential attachment models.	**10 hrs**
4	**Small world phenomenon** Small world phenomenon : Six Degrees of Separation, Structure and Randomness, Decentralized Search, Empirical Analysis and Generalized Models, Core-Periphery Structures and Difficulties in Decentralized Search, Advanced Material: Analysis of Decentralized Search.	**06 hrs**

Unit –III		
5	**Mining Graphs- I** Mining Graphs- I : Community and cluster detection: random walks.	**04 hrs**
6	**Mining Graphs- II** Mining Graphs- II : Spectral methods; link analysis for web mining.	**04 hrs**

Text Books

1. Stanley Wasserman, Katherine Faust, Social network analysis: methods and applications, Cambridge University Press, 1994.
2. David Easley and Jon Kleinberg, Networks, Crowds, and Markets: Reasoning About a Highly Connected World., Cambridge University Press, 2010.

Reference Books:

1. Peter R. Monge, Noshir S, Contractor, Theories of communication networks, Oxford University Press, 2003.
2. Duncan Watts, Six degrees: the science of a connected age. Norton, 2004.

Scheme for Semester End Examination (ESA)

UNIT	8 Questions to be set of 20 Marks Each	Chapter numbers	Instructions
I	Q.No.-1, Q.No.-2, Q.No.-3	1, 2	Solve Any **2** out of **3**
II	Q.No.-4, Q.No.-5, Q.No.-6	3, 4	Solve Any **2** out of **3**
III	Q.No.-7	5	Solve Any **1** out of **2**
	Q.No.-8	6	

Program: **Bachelor of Engineering**		
Course Title: **Unix Network Programming**		Course Code: **18ECSE404**
L-T-P: **3-0-0**	Credits: **3**	Contact Hrs: **03 hrs/week**
ISA Marks: **50**	ESA Marks: **50**	Total Marks: **100**
Teaching Hrs: **40**	Exam Duration: **3 hrs**	

Unit –I		
1	**Communication Protocols** Introduction TCP/IP – Internet Protocols XNS SNA NetBIOS UUCP Protocol comparisons.	5 hrs
2	**Elementary Socket Programming** Introduction Overview UNIX Domain Protocols Socket Addresses Elementary Socket system calls A simple example.	5 hrs

3	**Advanced Socket Programming** Advanced Socket System calls Reserved Ports Stream Pipes Passing file descriptors Socket options Asynchronous I/O Input/output Multiplexing Out-of-Band Data Sockets and Signals Internet Super server Socket implementation.	6 hrs
Unit –II		
4	**Time and Date Routines** Introduction Internet Time and Date Client Network Time Synchronization.	5 hrs
5	**Ping Routines** Introduction Internet Ping Client XNS Echo Client.	5 hrs
6	**Trivial File Transfer Protocol** Introduction Protocol Data Formats Connections Client user interface UDP implementation TCP implementation.	6 hrs
Unit –III		
7	**Remote Command Execution** Introduction Security Issues rcmd function and rshd Server rexec function and rexecd Server.	4 hrs
8	**Remote Login** Introduction Terminal Line disciplines A simple Example.	4 hrs

Text Books

1. W.R. Stevens, Unix Network Programming, PHI 2003.
2. M. J. Rochkind, Advanced Unix Programming, 2nd Edition, Pearson Education 2004.

Reference Books

1. Sumitabha Das, Unix Concepts and Applications, 3rd Edition, Tata McGraw-Hill 2006.

Scheme for End Semester Assessment(ESA)

UNIT	8 Questions to be set of 20 Marks Each	Chapter Numbers	Instructions
I	Q.No.-1, Q.No.-2, Q.No.-3	1, 2,3	Solve Any **2** out of **3**
II	Q.No.-4, Q.No.-5, Q.No.-6	4,5,6	Solve Any **2** out of **3**
III	Q.No.-7	7	Solve Any **1** out of **2**
	Q.No.-8	8	

Program: **Bachelor of Engineering**		
Course Title: **Software Testing**		Course Code:**18ECSE407**
L-T-P:**3-0-0**	Credits: **3**	Contact Hrs: **03 hrs/week**
ISA Marks: **50**	ESA Marks: **50**	Total Marks: **100**
Teaching Hrs: **40**	Exam Duration**: 3 hrs**	

Content	Hrs
Unit - 1	
Chapter No. 1.Software Testing Principles: Need for testing ,The Psychology and Economics of Program Testing Program ,Inspections, Walkthroughs, and Reviews.	04hrs
Chapter No. 2. Test-Case Design: Overview, White box testing, Error Guessing, strategies , Module (Unit) Testing-Incremental Testing, Top-down versus Bottom-up Testing, Performing the Test.	06hrs
Chapter No. 3. Higher-Order Testing: Function testing, System testing, Acceptance testing, Installation testing, Test planning and Control, Test completion criteria, Extreme testing.	06hrs
Unit - 2	
Chapter No. 4. Testing Tools and Standards: Automated Tools for Testing - Static code analyzers - Test case generators - GUI Capture/Playback – Stress Testing - Testing Client – server applications – Testing compilers and language processors - Testing web-enabled applications.	10hrs
Chapter No 5 :CMM Model and its stages – Introduction to PCMM, CMMI and Six Sigma concept – ISO 9000.	06hrs
Unit - 3	
Chapter No. 6. Software Quality and Testing: Introduction to software quality and quality control – Benefits of quality control - Quality assurance - quality circles and quality improvement.	04hrs
Chapter No. 7. Introduction to quality cost – Measuring quality cost – Total Quality Management (TQM).Architecture, Process, memory and file management in Mobile OS, Network OS.	04hrs

Text Books

1. Glenford J. Myers, Tom Badgett, Corey Sandler, and Todd M. Thomas, “The Art of Software Testing”, John Wiley & Sons, Second edition, 2004.
2. Roger S. Pressman, “Software Engineering. A Practitioners Approach”, McGraw-Hill International Edition, Seventh edition, 2009.

References

1. William E. Perry, “Effective Methods for Software Testing”, John Wiley & Sons, Secondedition, 2000.
2. Boris Beizer, “Techniques for Functional Testing of Software and Systems”, John Wiley & Sons, 1995.
3. P.C. Jorgensen, “Software Testing - A Craftman's Approach”, CRC Press, 1995.

4. Boris Beizer, “Software Testing Techniques”, Van Nostrand Reinhold, Second edition, 1990.

Scheme for End Semester Assessment(ESA)

UNIT	8 Questions to be set of 20 Marks Each	Chapter Numbers	Instructions
I	Q.No.-1, Q.No.-2, Q.No.-3	1, 2, 3	Solve Any **2** out of **3**
II	Q.No.-4, Q.No.-5, Q.No.-6	4, 5	Solve Any **2** out of **3**
III	Q.No.-7, Q.No.-8	6, 7	Solve Any **1** out of **2**

Program: **Bachelor of Engineering**		
Course Title: **C# Programming and .NET**		Course Code: **18ECSE409**
L-T-P: 3-0-0	Credits: 3	Contact Hrs: **3hrs/week**
ISA Marks: 50	ESA Marks: 50	Total Marks: 100
Teaching Hrs: 40	Exam Duration: 3 hrs	

Unit –I		
1	**The Philosophy of .NET** Understand the motivation behind the .NET platform, Common Language Infrastructure (CLI). Know the role of the Common Type System (CTS), the Common Language Specification (CLS) and the Common Language Runtime (CLR), Understand the assembly, metadata, namespace, type distinction, Contrast single-file and multi-file assemblies, Know the role of the Common Intermediate Language (CIL), Platform independent .NET(Mono / Portable .NET distributions).	**5hrs**
2	**C# Language Fundamentals** Language Fundamentals, Reference and value Types, primitive types the Nullable and enum types, Classes and objects, Defining classes Creating objects, Using static members, Overloading Methods, Various Constructors. Encapsulating data, access modifiers, properties, indexers arrays and readonly fields. Structures. String and DateTime classes, three pillars of OOPs	**7 hrs**
3	**Exceptions and Object Life Time** Ode to Errors, Bugs and Exceptions, The Role of .NET Exception handling, the System. Exception base class, Throwing a generic Exception, Catching Exceptions, CLR System-Level Exceptions (System.SystemException), Custom Application-Level Exceptions (System.ApplicationException). Handling	**4 hrs**

	Multiple Exception, The Finally Block, The Last Chance Exception, Understanding Object Life time. The CIL of "new", The Basics of Garbage Collection	
	Unit –II	
4	**Event handling paradigm Interfaces and Collections** Understanding the .NET Delegate type, Multicast Delegate and events. Interfaces, overriding interface implementation. Explicit interface implementation, Collection, IEnumerable, IEnumerator, IList, IComparer and their Generic equivalent. Working with generic List, Stack, Dictionary and Queue	**6 hrs**
5	**Programming Window Forms Applications** Anatomy of a Form, Component Class, Control Class, Control Events, Responding to Keyboard Events, Form Class, Building Menus with Windows Forms, Building your Menu System, Creating Pop-Up Menu, Adding Controls to Forms (IDE-Free), Adding Controls to Forms (via VS.NET), Working with Basic Controls like Buttons, Configuring Tab Order.	**5 hrs**
6	**Working with Database** Introduction to ADO.NET , Connecting to a database, Understanding DataTables, Creating a DataAdapter, Referencing fields in a DataRow, Navigating records ,Adding, editing, and deleting records, Building an ADO.NET example.	**5 hrs**
	Unit –III	
7	**Understanding the .NET Assemblies** Problems with Classic.COM Binaries, An overview of .NET Assembly, Building a single file test assembly, A C# Client Application, A Visual Basic .NET Client Application, Cross-Language Inheritance, Exploring the Car Library's Manifest, Exploring the Car Library's Types.	**4 hrs**
8	**Using .NET Assemblies** Building a multi file assembly, Using the Multifile Assembly , Understanding the private Assemblies, Probing for private Assemblies (The Basics), Private Assemblies and XML Configuration Files, Probing for Private Assemblies(The details), Understanding Shared Assemblies, Understanding Shared Names, Building a Shared Assembly, Understanding Delay Signing, Installing/Removing Shared Assembly, Using a Shared Assembly.	**4 hrs**

Text Books:

1. Herbert Schildt, "The Complete Reference C# 4.0", Tata McGraw –Hill, 2010
2. Andrew Troelsen, "Pro C# with .NET 3.0", Special Edition, Dream tech Press, India, 2007.

Reference Books:

1. Stephen C. Perry, AtulKahate, Stephen Walther, Joseph Mayo, "Essential of .net and

Related Technologies with a focus on C#, XML, ASP.net and ADO.net", 2nd Edition, Pearson, 2009.

2. Paul J. Deitel, Harvey Deitel, "Visual C# 2010 for Programmers", 4th Edition, Pearson, 2010.
3. Joseph Albahari and Ben Albhari, "C# 3.0/4.0 in Nutshell", 3rd Edition, O'Rilley, 2007.

Scheme for End Semester Assessment (ESA)

UNIT	8 Questions to be set of 20 Marks Each	Chapter Numbers	Instructions
I	Q.No.-1, Q.No.-2, Q.No.-3	1, 2,3	Solve Any **2** out of **3**
II	Q.No.-4, Q.No.-5, Q.No.-6	4,5,6	Solve Any **2** out of **3**
III	Q.No.-7	7	Solve Any **1** out of **2**
	Q.No.-8	8	

Program: Bachelor of Engineering		
Course Title: Database Management System		Course Code: 15ECSO402
L-T-P: 3-0-0	Credits: 3	Contact Hrs: 3hrs/week
ISA Marks: 50	ESA Marks: 50	Total Marks: 100
Teaching Hrs: 40	Exam Duration: 3 hrs	

	Unit –I	
1	**Introduction to Database:** Introduction to DBMS and an example, Characteristics of Database approach, Actors On and Behind the Scene, Advantages and Disadvantages of using DBMS, Data models, schemas and instances, Three-schema architecture and data independence, Database languages and interfaces, The database system environment.	**6 Hrs**
2	**Data Modeling Using ER Model:** Using High-Level Conceptual Data Models for Database Design, An Example Database Application, Entity Types, Entity Sets, Attributes and Keys, Relationship types, Relationship Sets. Roles and Structural Constraints, Weak Entity Types, Refining the ER Design, Degree of Relationship type, ER Diagrams, Naming Conventions and Design Issues.	**6 hrs**
3	**Relational Data Model :** Relational Model Concepts, Relational Model Constraints and Relational Database Schemas, Update Operations, Transactions and dealing with constraint violations.	**4 hrs**
	Unit –II	
4	**Structured Query Language(SQL):** SQL Data Definition and Data Types, Specifying basic constraints in SQL, Schema change statements in SQL, Views in SQL, Basic queries in SQL.	**6 hrs**

5	**Basics of Functional Dependencies and Normalization for Relational Databases**: Informal Design Guidelines for Relation Schemas, Functional Dependencies, Normal Forms Based on Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form.	**6 hrs**
6	**Introduction to Transaction Processing:** Introduction to Transaction Processing, Transactions and System concepts, Desirable Properties of Transaction, Transaction support in SQL.	**4 hrs**
	Unit –III	
7	**Emerging Database Technologies:** Introduction, cloud computing and data management, Mobile databases, Multimedia Databases.	**4 hrs**
8	**Emerging Database Technologies:** GIS Database, Biological Database, Dealing with massive datasets-MapReduce and Hadoop.	**4 hrs**

Text Books:

1. Elmasri R. and Navathe S., Fundamentals of Database Systems, 6th Edition, Pearson Education, 2011.

Reference Books:

1. Ramakrishnan S. and Gehrke J., Database Management Systems, 3rd Edition, McGraw Hill, 2007.
2. Silberschatz A., Korth H.F. and Sudharshan S., Database System Concepts, 6th Edition, Mc- GrawHill, 2010

Scheme for End Semester Assessment (ESA)

UNIT	8 Questions to be set of 20 Marks Each	Chapter Numbers	Instructions
I	Q.No.-1, Q.No.-2, Q.No.-3	1, 2,3	Solve Any **2** out of **3**
II	Q.No.-4, Q.No.-5, Q.No.-6	4,5,6	Solve Any **2** out of **3**
III	Q.No.-7	7	Solve Any **1** out of **2**
	Q.No.-8	8	

Program: **Bachelor of Engineering**		
Course Title: **High Performance Computing for Engineering Applications**		Course Code:15ECSO404
L-T-P: **3-0-0**	Credits: **3**	Contact Hrs: **3 hrs/week**
ISA Marks: **50**	ESA Marks: **50**	Total Marks: **100**
Teaching Hrs: **40**	Exam Duration: **3hrs**	

Unit –I

1	**Introduction to High Performance Computing:** Computational Science and Engineering Applications; characteristics and requirements, Review of Computational Complexity, Performance: metrics and measurements, Granularity and Partitioning, Locality: temporal/spatial/stream/kernel, Basic methods for parallel programming, Real-world case studies like CFD, Bioinformatics, Flow analysis etc.	**08hrs**
2	**High Performance Computing Systems:** Memory Hierarchies, Multi-core Processors: Homogeneous and Heterogeneous, Shared-memory Symmetric Multiprocessors, Vector Computers, Distributed Memory Computers, Supercomputers and Petascale Systems, Application Accelerators / Reconfigurable Computing, Novel computers: Stream, multithreaded, and purpose-built	**08hrs**
Unit –II		
3	**Parallel Algorithms:** Parallel models: ideal and real frameworks, Basic Techniques: Balanced Trees, Pointer Jumping, Divide and Conquer, Partitioning, Regular Algorithms: Matrix operations and Linear Algebra, Irregular Algorithms: Lists, Trees, Graphs, Randomization: Parallel Pseudo-Random Number Generators, Sorting, Monte Carlo techniques	**08hrs**
5	**Parallel Programming:** Revealing concurrency in applications, Task and Functional Parallelism, Task Scheduling, Synchronization Methods, Parallel Primitives (collective operations), SPMD Programming (threads, OpenMP, MPI)	**08hrs**
Unit –III		
5	**Achieving Performance:** Measuring performance, Identifying performance bottlenecks, Restructuring applications for deep memory hierarchies, Partitioning applications for heterogeneous resources, using existing libraries, tools, and frameworks	**04hrs**
6	**Case Studies and Projects done during the course:** Various case studies from various engineering discipline	**04 hrs**

Text Books

4. Introduction to Parallel Computing, AnanthGrama, Anshul Gupta, George Karypis, and Vipin Kumar, 2nd edition, Addison-Welsey, 2003.
5. Petascale Computing: Algorithms and Applications, David A. Bader (Ed.), Chapman & Hall/CRC Computational Science Series, 2007

Reference Books:

2. G.E. Karniadakis, R.M. Kirby II, Parallel Scientific Computing in C++ and MPI: A Seamless Approach to Parallel Algorithms and their Implementation, Cambridge University Press,2003.
3. M.J. Quinn, Parallel Programming in C with MPI and OpenMP, McGraw-Hill, 2004.

Scheme for Semester End Examination (ESA)

UNIT	8 Questions to be set of 20 Marks Each	Chapter numbers	Instructions
I	Q.No.-1, Q.No.-2, Q.No.-3	1, 2	Solve Any **2**
II	Q.No.-4, Q.No.-5, Q.No.-6	3 ,4	Solve Any **2**
III	Q.No.-7	5	Solve Any **1**
	Q.No.-8	6	

Program: **Bachelor of Engineering**		
Course Title: **Essential of Information Technology**		Course Code: 15ECSO405
L-T-P: 0-0-3	Credits: 3	Contact Hrs: **6hrs/week**
ISA Marks: 80	ESA Marks: 20	Total Marks: 100
Teaching Hrs: 60	Exam Duration: 3 hrs	

	Unit - I	
1	**Introduction to computer systems:** Components of computer systems, program execution cycle, computer networks, software and its classification, Operating System: introduction, memory management, process management, file management.	**06 hrs**
2	**Programming basics:** Introduction to problem solving, SDLC overview and need for object oriented approach, object oriented concepts, introduction to java, control structures, arrays, strings.	**06 hrs**
3	**Classes and Objects:** Class fundamentals, access specifiers, constructors and its types, method overloading, static members.	**04 hrs**
	Unit - II	
4	**Data structures:** Introduction, Linear data structures: stack, queue, linked lists, Non-Linear data structures: trees, binary search tree, illustration using java collection framework.	**05 hrs**
5	**Inheritance and Polymorphism:** Inheritance: basics, types of inheritance, method overloading and overriding, dynamic method dispatch.	**05 hrs**

6	**Packages, Interfaces and Exceptions:** Introduction to packages, access protection, interfaces, exception handling mechanism, and user defined exceptions.	**06 hrs**
	Unit - III	
7	**Database Design Process:** Characteristics of DBMS, ER model, mapping ER model to relational schema, normalization.	**04 hrs**
8	**Structured Query Language:** SQL data types, database languages, operators, aggregate functions, order by and group by clause, joins and sub queries.	**04 hrs**

Text Books

1. Infosys Campus Connect Foundation Program Volume:1–3, Education and Research Department, Infosys Technologies Ltd, 2013.
2. Herbert Schildt, "Java The Complete Reference", 8th Edition, McGraw-Hill, 2012.

Reference Books:

1. Elmasri. and Navathe, "Fundamentals of Database Systems", 6th Edition, Pearson Education, 2011.
2. Silberschatz, Galvin, and Gagne, "Operating System Concepts", 8th Edition, Wiley, 2009.

Scheme for End Semester Assessment (ESA)

UNIT	Experiments to be set of 10 Marks Each	Chapter Numbers	Instructions
I	Project Examination	4 - 8	Project implementation and demonstration 20 marks

Program: **Bachelor of Engineering**		
Course Title: **Natural Language Processing**		Course Code: **18ECSE403**
L-T-P: **2-0-1**	Credits: **3**	Contact Hrs: **04 hrs/week**
ISA Marks: **50**	ESA Marks: **50**	Total Marks: **100**
Teaching Hrs: **30**	Exam Duration: **3 hrs**	

	Unit –I	
1	**Introduction to NLP and Deep Learning** Introduction to Natural Language Processing, Applications of Natural Language Processing, Word2vec introduction, Word2vec objective function gradients	**05 hrs**
2	**Dependency Parsing, Recurrent Neural Networks** Dependency Grammar , Neural dependency parsing, Recurrent Neural Networks and Language Models, Vanishing Gradients, Fancy RNNs	**07 hrs**

	Unit –II	
3	**Machine Translation, Seq2Seq and Attention** Machine Translation, Seq2Seq and Attention, Advanced Attention	**06 hrs**
4	**Transformer Networks , Coreference Resolution, Memory Networks** Transformer Networks and CNNs, Tree Recursive Neural Networks and Constituency Parsing , Advanced Architectures and Memory Networks	**06 hrs**
	Unit –III	
5	**Reinforcement Learning** Reinforcement Learning for NLP, Semi-supervised Learning for NLP, Future of NLP Models, Multi-task Learning and QA Systems	**06 hrs**

Text Books:

1. Yoav Goldberg. A Primer on Neural Network Models for Natural Language Processing , 2016.

Reference Books:

Dan Jurafsky and James H. Martin. Speech and Language Processing (3rd ed. draft).

Ian Goodfellow, YoshuaBengio, and Aaron Courville. *Deep Learning*. MIT Press.

Scheme for End Semester Assessment(ESA)

UNIT	**8 Questions to be set of 20 Marks Each**	**Chapter Numbers**	**Instructions**
I	Q.No.-1, Q.No.-2, Q.No.-3	1, 2	Solve Any **2** out of **3**
II	Q.No.-4, Q.No.-5, Q.No.-6	4,5	Solve Any **2** out of **3**
III	Q.No.-7	6	Solve Any **1** out of **2**
	Q.No.-8		

Program: Bachelor of Engineering		
Course Title: **Wireless Ad Hoc and Sensor Networks**		Course Code: **18ECSE406**
L-T-P: **3-0-0**	Credits: **3**	Contact Hrs: **3hrs/week**
CIE Marks: **50**	SEE Marks: **50**	Total Marks: **100**
Teaching Hrs: **40 hrs**	Exam Duration: **3 hrs**	

Unit –I		
1	**Introduction:** Fundamentals of wireless communication technology, Characteristics of wireless channel, Multiple Access Techniques, IEEE802.11 Standards, Bluetooth, Cellular Concept, Cellular Architecture.	**07 hrs**
2	**Ad hoc Networks:** Introduction, Issues in Ad hoc wireless networks, Ad hoc wireless internet.	**04 hrs**

3	**MAC Protocols:** Introduction, Issues in Designing MAC protocol, Design goals, Classification, Contention Based Protocols with Reservation Mechanisms. Contention-Based MAC Protocols with Scheduling Mechanism.	**05 hrs**
Unit –II		
4	**Routing Protocols:** Introduction, Issues in designing a routing protocol, classification, Table drive routing protocol, On-demand routing protocol, Hybrid routing protocol, Hierarchical routing protocols, Power aware routing protocols.	**06 hrs**
5	**Energy Management:** Introduction, Need for Energy Management, Classification, Battery Management Scheme, Transmission Power Management Schemes, System Management Scheme.	**05 hrs**
6	**Sensor Networks:** Introduction, Architecture, Data Dissemination, Data Gathering, MAC Protocols (schedule based protocols).	**05 hrs**
Unit –III		
7	**Routing Protocols for Sensor Networks:** Routing Characteristics, Routing Strategies, LEACH, SPIN.	**04 hrs**
8	**Sensor Network Applications:** Case Study: Traffic Control, Health Care, Green House Monitoring.	**04 hrs**

Text Books:

1. C. Siva Ram Murthy and B. S. Manoj, "Ad hoc Wireless Networks",2nd Edition, Pearson Education, 2006.
2. KazemSohraby, Daniel Minoli, TaiebZnati, "Wireless Sensor Networks: Technology, Protocols, and Applications", John Wiley and Sons, 2007.

Reference Books:

1. Ozan K. Tonguz and Gianguigi Ferrari, "Ad hoc Wireless Networks",John Wiley, 2006.
2. C.K. Toh, "Adhoc Mobile Wireless Networks",Protocols and Systems, Prentice-Hall PTR, 2002.

UNIT	8 Questions to be set of 20 Marks Each	Chapter Numbers	Instructions
I	Q.No.-1, Q.No.-2, Q.No.-3	1, 2,3	Solve Any **2** out of **3**
II	Q.No.-4, Q.No.-5, Q.No.-6	4,5,6	Solve Any **2** out of **3**
III	Q.No.-7	7	Solve Any **1** out of **2**
	Q.No.-8	8	

Program: **Bachelor of Engineering**		
Course Title: **Advanced Parallel Computing**		Course Code:**18ECSE408**
L-T-P:**3-0-0**	Credits: **3**	Contact Hrs: **03 hrs/week**
CIE Marks**: 50**	SEE Marks: **50**	Total Marks: **100**
Teaching Hrs: **40**	Exam Duration: **3 hrs**	

Unit –I		
1	**Introduction and History** GPUs as Parallel Computers; Architecture of a Modem GPU; Parallel Programming Languages and Models; Overarching Goals; Evolution of Graphics Pipelines; The Era of Fixed- Function ; Graphics Pipelines; Evolution of Programmable Real-Time Graphics; Unified Graphics and Computing Processors; GPGPU; An Intermediate Step; GPU Computing; Scalable GPUs Recent Developments; Future Trends.	**07 hrs**
2	**Introduction to CUDA** Data Parallelism; CUDA Program Structure; A Matrix-Matrix Multiplication Example; Device Memories and Data Transfer; Kernel Functions and Threading; Function declarations; Kernel launch; Predefined variables; Runtime API.CUDA Thread Organization; Using b1ock Id x and thread Id x ; Synchronization and Transparent Scalability; Thread Assignment ; Thread Scheduling and Latency Tolerance.	**09 hrs**
Unit –II		
3	**CUDA Memories** Importance of Memory Access Efficiency; CUDA Device Memory Types; A Strategy for Reducing Global Memory Traffic; Memory as a Limiting Factor to Parallelism; Global Memory Bandwidth; Dynamic Partitioning of SM Resources; Data Perfetching; Instruction Mix; Thread Granularity; Measured Performance.	**07 hrs**
4	**Introduction to OPENCL** Introduction to OPENCL; Background; Data Parallelism Model; Device Architecture; Kernel Functions; Device Management and Kernel Launch; Electrostatic Potential Map in OpenCL.	**09 hrs**
Unit –III		
5.	**Case Study** Concepts of Game Design, Applications like Matrix multiplication, MRI reconstruction Molecular Visualization and Gaming.	**04 hrs**
6.	**Parallel Programming and Computational Thinking** Goals of Parallel Programming, Problem Decomposition, Algorithm Selection, Computational Thinking.	**04 hrs**

Text Books:

3. David B. Kirk, Wen-mei W. Hwu, "Programming Massively Parallel Processors: A Hands on Approach", Morgan Kaufmann/Elsevier India reprint, 2010.

Reference Books:

1. Benedict R Gaster, Lee Howes, David Kaeli, Perhaad Mistry and Dana Schaa, "Heterogeneous Computing with OpenCl", Morgan Kaufmann/Elsevier reprint, 2012.

Scheme for End Semester Assessment(ESA)

UNIT	8 Questions to be set of 20 Marks Each	Chapter Numbers	Instructions
I	Q.No.-1, Q.No.-2, Q.No.-3	1, 2	Solve Any **2** out of **3**
II	Q.No.-4, Q.No.-5, Q.No.-6	3,4	Solve Any **2** out of **3**
III	Q.No.-7	5	Solve Any **1** out of **2**
	Q.No.-8	6	

Program: **Bachelor of Engineering**		
Course Title: **Software Architecture and Design Thinking**		Course Code:**18ECSE410**
L-T-P:**3-0-0**	Credits: **3**	Contact Hrs: 3**hrs/week**
CIE Marks**: 50**	SEE Marks: **50**	Total Marks: **100**
Teaching Hrs: **40**	Exam Duration: **3 hrs**	

Unit –I		
1	**Chapter No. 1 What Is Software Architecture?** What Software Architecture Is and What It Isn't ,Architectural Structures and Views, Architectural Patterns, What Makes a "Good" Architecture?	**5 hrs**
2	**Chapter No. 2 Why Is Software Architecture Important?** Inhibiting or Enabling a System's Quality Attributes, Reasoning About and Managing Change, Predicting System Qualities, Enhancing Communication among Stakeholders, Carrying Early Design Decisions, Defining Constraints on an Implementation, Influencing the Organizational Structure, Enabling Evolutionary Prototyping, Improving Cost and Schedule Estimates, Supplying a Transferable, Reusable Model, Allowing Incorporation of Independently Developed Components, Restricting the Vocabulary of Design Alternatives, Providing a Basis for Training	**6hrs**
3	**Chapter No. 3 The Many Contexts of Software Architecture** Architecture in a Technical Context, Architecture in a Project Life-Cycle Context, Architecture in a Business Context, Architecture in a Professional Context, Stakeholders, How Is Architecture Influenced?,What Do Architectures Influence?	**5 hrs**
Unit –II		

4	**Chapter No. 4. Understanding Quality Attributes** Architecture and Requirements, Functionality, Quality Attribute Considerations, Specifying Quality Attribute Requirements, Achieving Quality Attributes through Tactics, Guiding Quality Design Decisions	**5 hrs**
5	**Chapter No. 5. Quality Attributes** Tactics for Availability, Tactics for Interoperability, Tactics for Modifiability, Tactics for Performance, Tactics for Security, Tactics for Testability, Tactics for Usability,	**6hrs**
6	**Chapter No. 6. Architectural Tactics and Patterns** Architectural Patterns, Overview of the Patterns Catalog, Relationships between Tactics and Patterns, Using Tactics Together	**5 hrs**
Unit –III		
5.	**Chapter No. 7 Architecture and Requirements** Gathering ASRs from Requirements Documents, Gathering ASRs by Interviewing Stakeholders, Gathering ASRs by Understanding the Business Goals, Capturing ASRs in a Utility Tree, Tying the Methods Together	**4 hrs**
6.	**Chapter No. 8 Designing an Architecture, Implementation, Testing and EvaluationDesigning:** Design Strategy, The Attribute-Driven Design Method, The Steps of ADD, Implementation, and Testing:Architecture and Implementation, Architecture and Testing, Evaluation:Evaluation Factors, The Architecture Tradeoff Analysis Method, Lightweight Architecture Evaluation	**4 hrs**
Text Books: 1. Len Bass, Paul Clements, Rick Kazman, Software Architecture in Practice (3rd Edition), Addison-Wesley Professional; 3 edition		
Reference Books:		

Scheme for End Semester Assessment(ESA)

UNIT	8 Questions to be set of 20 Marks Each	Chapter Numbers	Instructions
I	Q.No.-1, Q.No.-2, Q.No.-3	1, 2	Solve Any **2** out of **3**
II	Q.No.-4, Q.No.-5, Q.No.-6	3,4	Solve Any **2** out of **3**
III	Q.No.-7	5	Solve Any **1** out of **2**
	Q.No.-8	6	

Course Title: **Model Thinking**	Course Code: **18ECSE411**	
L-T-P: **3-0-0**	Credits: **3**	Contact Hrs: **30**
CIA Marks: **50**	SEE Marks: 50	Total Marks: **100**
Teaching Hrs: **40**		Exam Duration: **3 hrs**

Content	40 Hrs

Unit – 1	
1. **Why Model** Model Thinking - The need, Advantages and disadvantages, Segregation/Peer Effects, Case study	4 hrs
2.**Modeling People, Tipping Points & Economic Growth** Rational models, Behavioral models, Rule based models, Percolation Models, Growth and its kinds	6 hrs
3. **Special Topics** Standing ovation model, Game of Life, Lyapunov Functions: Equilibrium, A cycle, Randomness or complexity, Coordination and culture. Urn models, Polya process, paths and networks, Prisoners' Dilemma, Collective Action & Mechanism Design	6 hrs
Unit – 2	
4. **Randomness and Learning Models** Luck as randomness, Random Walks & Colonel Blotto, Replicator Dynamics, Fisher's fundamental theorem, Prediction and the Many Model Thinker	8 hrs
5**. Model Checking and Modelling Concurrent Systems** Model Checking, Characteristics of Model Checking, Transition Systems, Parallelism and Communication, The State Space Explosion	8 hrs
Unit – 3	
6**. Linear-Time Properties** Linear-Time behavior, Safety Properties and Invariants, Liveness Properties, Fairness	4 hrs
7. **Regular Properties** Automata on Finite Words, Model-Checking Regular Safety Properties, Automata on Infinite Words, Model Checking with omega-regular properties	4 hrs

Text Books

1. Scott E Page, The Model Thinker, Basic Books Publication, 2018
2. ChristelBaier and Joost-Pieter Katoen, Principles of Model Checking (Representation and Mind Series), The MIT Press, 2008

References

1. Model Thinking Coursera online course from Michigan University.

Program: **Bachelor of Engineering**		
Course Title: **Cyber Security**		Course Code: 19ECSE401
L-T-P: **2-0-1**	Credits: 3	Contact Hrs: **04 hrs/week**
ISA Marks: 50	ESA Marks: 50	Total Marks:100
Teaching Hrs: 40	Exam Duration: 03hrs	

Unit –I

1	**Introduction to Cybercrime** Cybercrime definition and origins of the world, Cybercrime and information security, Classifications of cybercrime, A global Perspective on cybercrimes. Cyber attack plans, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets, Proliferation of Mobile and Wireless Devices, Credit Card Frauds in Mobile and Wireless Computing Era.	**08hrs**
2	**Methods used in Cybercrime** Phishing, password Cracking, Keyloggers and Spyware, Virus and Worms, Trojan and backdoors, Steganography, DOS and DDOS attack, SQLinjection, Buffer Overflow, Attack on wireless networks, Identity theft	**08hrs**
Unit II		
3	**Cybercrimes and Cyber security: The Legal Perspectives** Why do we need Cyber law: The Indian Context, The Indian IT Act, Digital Signature and the Indian IT Act, Amendments to the Indian IT Act, Cybercrime and Punishment.	**08hrs**
4	**Cybercrime: Illustrations, Examples and Case studies** Introduction, Real-Life Examples, Case Studies: Illustrations of Financial Frauds in Cyber Domain, Digital Signature-Related Crime Scenarios, Online Scams.	**08hrs**
Unit III		
5	**Digital Forensics** Historical background of cyber forensic, Forensic analysis of email, Digital forensic life cycle, Network forensic, Setting up a computer forensic Laboratory, Forensic analysis of digital media.	

Text Books:

1. Nina Godbole&SunitBelapure, "Cyber Security", Wiley India, 2012.

Reference Books:

5. Dhiren R Patel, "Information security theory & practice", PHI learning pvt.ltd, 2010.
6. Bill Nelson, "Guide to Computer Forensics and Investigations", 4th Edition, CENGAGE Publication. 2009.

List of Experiments

Expt./Job No.	**Experiment**	***No. of Lab. Slots (2hrs)***
1.	Password cracking and recovery	1
2.	DDOS attack detection	1
3.	Firewall and IPS	1
4.	SQL Injection	1
5.	Forensic analysis of email	1
6.	Forensic analysis on digital media	1

7.	Removable/External Media Imaging	1
8.	Course Project	3

Scheme for End Semester Assessment(ESA)

UNIT	**8 Questions to be set of 20 Marks Each**	**Chapter Numbers**	**Instructions**
I	Q.No.-1, Q.No.-2, Q.No.-3	1, 2	Solve Any **2** out of **3**
II	Q.No.-4, Q.No.-5, Q.No.-6	3, 4	Solve Any **2** out of **3**
III	Q.No.-7, Q.No.-8	5	Solve Any **1** out of **2**

Program: **Bachelor of Engineering**		
Course Title: **Capstone Project**		Course Code: **18ECSW401**
L-T-P: **0-0-14**	Credits: **6**	Contact Hrs: **3 hrs/week**
ISA Marks: **50**	ESA Marks: **50**	Total Marks: **100**
	Exam Duration: **3hrs**	

Project themes:

Networking	**Data Engineering**	**System Engineering**
• Internet of Things • Cloud Computing • Software Defined Network • Social Network Analysis	• Data Analytics • Image and video processing • Computer Vision and Graphics • Natural Language Processing	• Parallel Computing • High Performance Computing • Parallel system design

***Evaluation*:**

Students Assessment through ISA (50%) + ESA (50%)

	Assessment	**Weightage in Marks**
Internal Semester Assessment* (50%)	Periodic reviews by Project Guide	25
	Periodic reviews by Committee	25
End Semester Assessment (50%)	Final Review	50

	Total	**100**

Program: **Bachelor of Engineering**		
Course Title: **Fuzzy Set Theory**		Course Code: **19ECSE402**
L-T-P: **3-0-0**	Credits: 3	Contact Hrs: 3**hrs/week**
ISA Marks: 50	ESA Marks: 50	Total Marks:100
Teaching Hrs: 40	Exam Duration: 3hrs	

Unit –I		
1	**Introduction** : Introduction to Fuzzy Logic, Fuzzy Membership Functions, Operations on Fuzzy Sets	8hrs
2	**Fuzzy Measures:** Fuzzy Relations,Fuzzy Proposition,Fuzzy Implications,Fuzzy Inferences	8hrs
Unit –II		
3	**Fuzzy Relations and Fuzzy Graphs**: Fuzzy Relations, Compositions of Fuzzy Relations, Properties of the Min-Max Composition, DefuzzificatinTechniques,Lambda-cut method, Weighted average method, Maxima methods, Centroid methods, Output of a Fuzzy System	8 hrs
4	**Uncertainty Modeling:** Application-oriented Modeling of Uncertainty, Causes of Uncertainty, Uncertainty Methods, Possibility Theory	8hrs
Unit –III		
5	**Fuzzy Data Bases and Queries:** Introduction, Fuzzy Relational Databases, Fuzzy Queries in Crisp Databases	4 hrs
6	**Fuzzy Sets and Expert Systems:** Introduction to Expert Systems, Uncertainty Modeling in Expert Systems, Applications	4 hrs

Text Books:

1. H. J. Zimmermann ., Fuzzy Set Theory-and Its Applications, Fourth Edition, 4th Ed., Springer Science Business Media, LLC , 2001
2. Chander Mohan, An Introduction to Fuzzy Set Theory and Fuzzy Logic,2nd ed. Vivo Books pvt ltd , 2015

Reference Books:

1. Timothy J. Ross, Fuzzy Logic With Engineering Applications, 3ed., 2010, A John Wiley and Sons, Ltd., Publication
2. Kumar S. Ray,Soft Computing and Its Applications: Fuzzy Reasoning and Fuzzy Control, 1st Edition, Apple Academic Press 2014
3. Ahmed M. Ibrahim, Fuzzy Logic for Embedded Systems Applications, Elesvier Press, 2004.

Scheme for End Semester Assessment (ESA)

UNIT	**8 Questions to be set of 20 Marks Each**	**Chapter Numbers**	**Instructions**
I	Q.No.-1, Q.No.-2, Q.No.-3	1, 2	Solve Any **2**
II	Q.No.-4, Q.No.-5, Q.No.-6	3,4	Solve Any **2**
III	Q.No.-7	5	Solve Any **1**
	Q.No.-8	6	