

# Syllabus

(With effect from 2015-2016 Academic year)

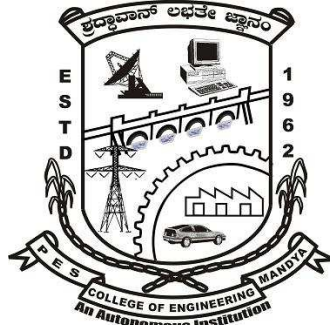
## ಪಠ್ಯಕ್ರಮ

(ಶೈಕ್ಷಣಿಕವರ್ಷ 2015-16)

### VII & VIII Semester

### Bachelor Degree in Computer Science and Engineering

**Out Come Based Education with Choice Based Credit System**  
ಫಲತಾಂಶ ಆಧಾರಿತ ಶಿಕ್ಷಣ ಹಾಗೂ ಐಚ್ಛಿಕ ವಿಷಯಾಧಾರಿತ ಗಳಿಕೆ ಪದ್ಧತಿ



**P.E.S. College of Engineering, Mandya - 571 401, Karnataka**

(An Autonomous Institution Affiliated to VTU, Belagavi)

Grant -in- Aid Institution

(Government of Karnataka)

Accredited by NBA, New Delhi

Approved by AICTE, New Delhi.

ಪಿ.ಇ.ಎಸ್. ತಾಂತ್ರಿಕ ಮಹಾವಿದ್ಯಾಲಯ

ಮಂಡ್ಯ-571 401, ಕರ್ನಾಟಕ

(ವಿ.ಟಿ.ಯು, ಬೆಳಗಾವಿ ಅಡಿಯಲ್ಲಿನ ಸ್ವಾಯತ್ತ ಸಂಸ್ಥೆ)

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## **Preface**

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

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

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

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

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

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

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

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

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

Dr.P S Puttaswamy  
Dean (Academic)  
Professor  
Dept. of Electrical & Electronics Engg

## **P.E.S. College of Engineering, Mandya**

### **VISION**

“PESCE shall be a leading institution imparting quality Engineering and Management education developing creative and socially responsible professionals

### **MISSION**

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

### **Department of Computer Science and Engineering**

#### **The Vision of the department is:**

“The Department of Computer Science and Engineering shall create professionally competent and socially responsible engineers capable of working in global environment.”

#### **The mission of the department is:**

DM1: Enforce best practices in teaching-learning, with dedicated faculty and supportive infrastructure to impart the knowledge in emerging technologies.

{Required to create professionally competent engineers}

DM2: Improve Industry-Institute relationship for mutual benefit.

{Required to create professionally competent engineers}

DM3: Inculcate ethical values, communication and entrepreneurial skills.

{Required to create professionally competent and socially responsible engineers}

DM4: Sensitize social, legal, environmental and cultural diversity issues through professional training and balanced curriculum.

{Required to create engineers capable of working in global environment}

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

Graduates of the program shall

1. Have Successful computer professional career in IT industry and related areas.
2. Pursue higher education in engineering or management with the focus on intensive research and developmental activities.
3. Develop computing systems in a responsible, professional and ethical manner to serve the society.

The National Board of Accreditation (NBA) has defined twelve Program Outcomes for Under Graduate (UG) engineering programs as listed below.

**Program Outcomes (POs)**

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization for the solution of complex engineering problem.
2. **Problem analysis:** Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling to complex engineering activities, with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess Societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with the society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

The Under Graduate (UG) of B.E Computer Science & Engineering Program has defined **Program Specific Outcomes (PSO)** which are listed below.

The students shall have the

1. Ability to design and develop network based systems in emerging technology environments like Cloud Computing, Security, Internet of Things and embedded systems.
2. Ability to develop knowledge based data management system in the areas like data analytics, data mining, business intelligence, pattern recognition and knowledge discovery in solving engineering problems.

<b>P.E.S. COLLEGE OF ENGINEERING, MANDYA</b> <b>(An Autonomous Institution)</b> <b>VII Semester B.E. (CS &amp; E)</b>								
						<b>Scheme of Teaching and Examination</b>		
Sl. No.	Course Code	Course Title	Teaching Dept.	Hrs/Week L:T:P:H	Total Credit	Examination Marks		
						CIE	SEE	Total
1.	P15CS71	Machine Learning	CS	4:0:0:4	4	50	50	100
2.	P15CS72	Multi-core architecture & Parallel Programming	CS	4:0:0:4	4	50	50	100
3.	P15CS73	Object Oriented Modeling & Design with UML	CS	4:0:0:4	4	50	50	100
4.	P15CS74	Elective-IV	CS	4:0:0:4	3	50	50	100
5.	P15CS75	Open Elective -I	CS	4:0:0:4	3	50	50	100
6.	P15CSL76	Parallel Programming Laboratory	CS	0:0:3:3	1.5	50	50	100
7.	P15CSL77	Machine Learning Laboratory	CS	0:0:3:3	1.5	50	50	100
8.	P15CS78	Project Work Phase-1	CS	0:0:4:2	2	--	50	50
Total					23	350	400	750

<b>List of Electives</b>					
Elective-4			Open Elective-1		
Sl. No.	Course code	Course Title	Sl. No.	Course code	Course Title
1	P15CS741	User Interface Technologies	1	P15CS751	Object Oriented Programming with JAVA
2	P15CS742	Internet of Things	2	P15CS752	Microcontroller and Interfaces
3	P15CS743	Wireless Sensor Networks			
4	P15CS744	Managing Big Data			

<b>P.E.S. COLLEGE OF ENGINEERING, MANDYA</b> <b>(An Autonomous Institution)</b> <b>VIII Semester B.E. (CS &amp; E)</b>								
						<b>Scheme of Teaching and Examination</b>		
Sl. No.	Course Code	Course Title	Teaching Dept.	Hrs/Week L:T:P:H	Total Credit	Examination Marks		
						CIE	SEE	Total
1.	P15CS81	Cryptography & Network Security	CS	4:0:0:4	3	50	50	100
2.	P15CS82	Elective-V	CS	4:0:0:4	3	50	50	100
3.	P15CS83	Elective-VI	CS	4:0:0:4	3	50	50	100
4.	P15CS84	Open Elective-II	CS	4:0:0:4	3	50	50	100
5.	P15CS85	Project Work Phase-II	CS	0:0:16:16	8	50	100	150
6.	P15CS86	Self Study Course & Seminar	CS	0:0:2:2	2	50	--	50
Total					22	300	300	600

<b>List of Electives</b>								
Elective-V			Elective-VI			Open Elective-II		
Sl. No.	Course code	Course Title	Sl. No.	Course code	Course Title	Sl. No.	Course code	Course Title
1	P15CS821	Cloud Computing	1	P15CS831	Network Management Systems	1	P15CS841	Data Base Management Systems
2	P15CS822	Python Programming	2	P15CS832	Software Project Planning & Management	2	P15CS842	Advanced Java
3	P15CS823	Software Testing	3	P15CS833	Agile Technologies	3	P15CS843	Unix and Shell Programming
4	P15CS824	Web Security	4	P15CS834	Business Intelligence & Applications	4	P15CS844	Foundation to IT

Course Title : Machine Learning			
Course Code : P15CS71	Semester : 7	L :T:P:H : 4:0:0:4	Credits: 4
Contact Period: Lecture: 52 Hr, Exam: 3 Hr		Weightage: CIE:50%, SEE:50%	

### **Course Content**

#### **Unit-1**

Introduction: Well posed learning problems, Designing a Learning system, Perspective and Issues in Machine Learning. Concept Learning: Concept learning task, Concept learning as search, Find-S algorithm, Version space, Candidate Elimination algorithm, Inductive Bias.

10 Hours

#### **Unit-2**

Decision Tree Learning: Decision tree representation, Appropriate problems for decision tree learning, Basic decision tree learning algorithm, hypothesis space search in decision tree learning, Inductive bias in decision tree learning, Issues in decision tree learning.

10 Hours

#### **Unit-3**

Artificial Neural Networks: Introduction, Neural Network representation appropriate problems, Perceptrons, Multilayer Networks and the Back propagation algorithm.

10 Hours

#### **Unit-4**

Introduction, Bayes theorem, Bayes theorem and concept learning, ML and LS error hypothesis, ML for predicting probabilities, MDL principle, Naive Bayes classifier, Bayesian belief networks, EM algorithm

10 Hours

#### **Unit-5**

Instance Based Learning: Introduction, k-nearest neighbor learning, locally weighted regression, radial basis function, cased-based reasoning, Reinforcement Learning: Introduction, Learning Task, Q Learning

10 Hours

#### **Text Book:**

1. Tom M. Mitchell, Machine Learning, India Edition 2013, McGraw Hill Education.

#### **Reference Books:**

1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, 2<sup>nd</sup> edition, springer series in statistics.
2. Ethem Alpaydın, Introduction to machine learning, second edition, MIT press.

#### **Course Outcomes:**

The students should be able to

1. Identify the problems for machine learning.
2. Understand the supervised and un-supervised or reinforcement learning.
3. Explain theory of probability and statistics related to machine learning
4. Investigate concept learning, ANN, Bayes classifier, k nearest neighbor.
5. Apply and Implement Instance Based Learning & Reinforcement Learning in ML.

**CO-PO Mapping**

Semester : 7			Course code : P15CS71					Title : Machine Learning							
CO	Statement	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1	Understand Identify the problems for machine learning	3	2	3										2	
CO2	Analyze supervised and un-supervised or reinforcement learning	2	2	2	3									2	
CO3	Apply & Explore theory of probability and statistics related to machine learning	2	2	3										2	
CO4	Generate & Deploy Investigate concept Learning, ANN, Bayes classifier, k nearest neighbor.	2	2	3										2	
CO5	Apply and Implement Instance Based Learning & Reinforcement Learning in ML	2	2	2	3									3	
		2.2	2	2.6	3									2.2	

Course Title : Multi-Core Architecture & Parallel Programming			
Course Code : P15CS72	Semester : 7	L :T:P:H : 4:0:0:4	Credits: 4
Contact Period: Lecture: 52 Hr, Exam: 3 Hr		Weightage: CIE:50%, SEE:50%	

**Course Content**

**Unit-1**

**Introduction to Multi-core Architecture:** Motivation for Concurrency in software, Parallel Computing Platforms, Parallel Computing in Microprocessors, Differentiating Multi-core Architectures from Hyper- Threading Technology, Multi-threading on Single-Core versus Multi-Core Platforms Understanding Performance, Amdahl's Law, Growing Returns: Gustafson's Law. **System Overview of Threading :** Defining Threads, System View of Threads, Threading above the Operating System, Threads inside the OS, Threads inside the Hardware, What Happens When a Thread Is Created, Application Programming Models and Threading, Virtual Environment: VMs and Platforms, Runtime Virtualization, System Virtualization.

11 Hours

**Unit-2**

**Fundamental Concepts of Parallel Programming :**Designing for Threads, Task Decomposition, Data Decomposition, Data Flow Decomposition, Implications of Different Decompositions, Challenges You'll Face, Parallel Programming Patterns, A Motivating Problem: Error Diffusion, Analysis of the Error Diffusion Algorithm, An Alternate Approach: Parallel Error Diffusion, Other Alternatives. **Threading and Parallel Programming Constructs:** Synchronization, Critical Sections, Deadlock, Synchronization Primitives,

Semaphores, Locks, Condition Variables, Messages, Flow Control- based Concepts, Fence, Barrier, Implementation-dependent Threading Features

11 Hours

### Unit-3

**Threading APIs :**Threading APIs for Microsoft Windows, Win32/MFC Thread APIs, Threading APIs for Microsoft. NET Framework, Creating Threads, Managing Threads, Thread Pools, Thread Synchronization, POSIX Threads, Creating Threads, Managing Threads, Thread Synchronization, Signaling, Compilation and Linking.

10 Hours

### Unit-4

**OpenMP:** A Portable Solution for Threading : Challenges in Threading a Loop, Loopcarried Dependence, Data-race Conditions, Managing Shared and Private Data, Loop Scheduling and Portioning, Effective Use of Reductions, Minimizing Threading Overhead, Work-sharing Sections, Performance-oriented Programming, Using Barrier and No wait, Interleaving Single-thread and Multi-thread Execution, Data Copy-in and Copy-out, Protecting Updates of Shared Variables, Intel Task queuing Extension to OpenMP, OpenMP Library Functions, OpenMP Environment Variables, Compilation, Debugging, performance

10 Hours

### Unit-5

**Programming using the Message-Passing Paradigm:** Principles of Message-Passing Programming, The Building Blocks: Send and Receive Operations, MPI: the Message Passing Interface, Topologies and Embedding, Overlapping Communication with Computation, Collective Communication and Computation Operations, Groups and Communicators.

10 Hours

#### Text Books:

- 1.Multicore Programming, Increased Performance through Software Multi-threading by Shameem Akhter and Jason Roberts , Intel Press , 2006
2. Michael J.Quin “Parallel Programming in C with MPI and Open MP”, McGraw Hill, 2004.

#### Reference Books:

- 1.Thomas Rauber and Gudula Runger Parallel Programming for Multicore and cluster systems, Springer International Edition, 2009 .
- 2.Hennessey and Patterson Computer Architecture: A quantitative Approach, Morgan Kaufman Publishers

#### Course outcomes:

##### The students shall able to:

1. **Analyze** the salient features of different multicore architectures .
2. **Define** fundamental concepts of parallel programming and its design issues
3. **Compare** the different threading API“S.
4. **Demonstrate** the role of OpenMP and programming concept
5. **Demonstrate** MPI programs.



**CO-PO Mapping**

Semester: 7		Course code : P15CS72					Title : Multicore Architecture & Parallel programming									
CO	Statement	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	
CO 703.1	Analyze the salient features of different multicore architectures	2														
CO 703.2	Define fundamental concepts of parallel programming and its design issues	3	2											1		
CO 703.3	Compare the different threading API'S	3	2													
CO 703.4	Demonstrate the role of OpenMP and programming concept	2	2	3	2	1				2				2		
CO 703.5	Demonstrate MPI programs	2	3	2										1		
CO703		2.4	2.2	2.5	2	1				2				1.3		

<b>Course Title : Object Oriented Modeling &amp; Design with UML</b>			
Course Code : P15CS73	Semester : 7	L :T:P:H : 4:0:0:4	Credits: 4
Contact Period: Lecture: 52 Hr, Exam: 3 Hr		Weightage: CIE:50%, SEE:50%	

**Course Content****Unit-1**

Object Technology: Background - Modelling, UML , Analysis and design models, Development process .Using the UML - Objects: combined services and data, Objects make excellent software Modules, Object interaction is expressed as messages, Classes: sets of similar objects, Specialization, Polymorphism. Tools.

Object-Oriented Analysis and Design -Fundamentals of an OOAD , A lightweight process Illustration, Realizing the use-cases, Toward design, UML diagrams, Class diagrams, Representation of objects, Association of objects, Composite aggregation of objects, Shared aggregation.

12 Hours

**Unit-2**

Implementing Objects with Java - Introduction ,Illustration, Mandatory profile , Building an application, Implementing architectural relationships, Establishing the architecture the mandatory profile revisited, The example application.

Case Study: A Library Application, Specification, Establish use-cases, Analysis, Design, Implementation, Reconcile model diagrams (for 3 iterations)

10 Hours

### **Unit-3**

Specialization - Inherited methods, Redefined methods, Polymorphism, Polymorphism at work, Protected features, The abstract class, The interface class, The interface at work.

Case Study: The Library Application Revisited: Specification, Establish use-cases, Analysis, Design, Implementation, Reconcile model diagrams (for 3 iterations)

10 Hours

### **Unit-4**

Graphical User Interfaces - Overview of Swings, Rebuilding the library case study, Events , Menu bar , Responding to a menu selection , Application menus, Application buttons, Dialogs.

Case study: Review – Refactoring, Iterations

10 Hours

### **Unit-5**

Patterns–1: Introduction to patterns, Pattern categories, Relationships between patterns, Pattern description Communication Patterns: Forwarder-Receiver, Client-Dispatcher-Server, Publisher-Subscriber.

Patterns–2: Idioms: Management Patterns: Command processor, View handler. Idioms: Introduction, what can idioms provides? Idioms and style, Where to find idioms, Counted Pointer example

10 Hours

#### **Text Books:**

1. K. Barclay, J Savage: Object-Oriented Design with UML and Java, Elsevier.
2. Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, Michael Stal: Pattern- Oriented Software Architecture, A System of Patterns, Volume 1, John Wiley and Sons, 2007.

#### **Reference Books:**

1. Grady Booch et al: Object-Oriented Analysis and Design with Applications, 3rd Edition, Pearson Education, 2007.
2. Brahma Dathan, Sarnath Ramnath: Object-Oriented Analysis, Design, and Implementation, Universities Press, 2009.

#### **Course Outcomes:**

At the end of the course the student would have the:

1. The Knowledge to create basic concepts of Object oriented modeling and Design.
2. Able to analyse Object Oriented notations and process that extends from analysis through design to implementations.
3. To use all the standard UML notations.
4. To develop the model with use cases and describe the dynamic behavior and structure of the design.
5. Create a modular and pattern design with components and relate the logical design to the physical environment.

**CO-PO Mapping**

Semester: 7		Course code : P15CS73		Title : Object Oriented Modeling and Design with UML											
CO	Statement	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO 702.1	<b>Differentiate</b> how the Object oriented approach differs from traditional approach to systems analysis and design	3			3	2						1	2		
CO 702.2	<b>Recognize</b> the difference between various object relationships: inheritance, association, whole-part, and dependency relationships.	3	1	2										1	
CO 702.3	<b>Construct</b> models using UML to show the importance of system analysis and design in number of modeling views to solve complex problems	1	2	2	2	3				2		1		2	
CO 702.4	<b>Construct</b> various UML models including use case, Class and implementation diagrams, using the appropriate notations	1	2	3	2	2				2		1		2	1
CO 702.5	<b>Comprehend</b> the nature of design patterns by understanding a small number of examples from different pattern categories, and to be able to apply these patterns in creating an OO design	2	1	2	2	2				2		1		2	1
C702		2	1.5	2.25	2.25	2.25				2		1	2	1.75	1

**ELECTIVE – IV**

Course Title : User Interface Technologies			
Course Code : P15CS741	Semester : 7	L:T:P:H : 4:0:0:4	Credits: 3
Contact Period: Lecture: 52 Hr, Exam: 3 Hr		Weightage: CIE:50%, SEE:50%	

**Course Content**

**Unit-1**

**Introduction to NoSQL Database - MongoDB :** What is NoSQL Database - Why to Use MongoDB - Difference between MongoDB& RDBMS - Download & Installation - Common Terms in MongoDB – Implementation of Basic CRUD Operations using MongoDB

10 Hours

### Unit-2

**Introduction to Server-side JS Framework – Node.js :** Introduction - What is Node JS – Architecture – Feature of Node JS - Installation and setup - Creating web servers with HTTP (Request & Response) – Event Handling - GET & POST implementation - Connect to NoSQL Database using Node JS – Implementation of CRUD operations.

10 Hours

### Unit-3

**Introduction to TypeScript :** TypeScript : Introduction to TypeScript – Features of TypeScript – Installation setup – Variables – Datatypes – Enum – Array – Tuples – Functions – OOP concepts – Interfaces – Generics – Modules – Namespaces – Decorators – Compiler options – Project Configuration

11 Hours

### Unit-4

**Introduction to Client-side JS Framework – Basics of Angular 4.0 :** Introduction to Angular 4.0 - Needs & Evolution – Features – Setup and Configuration – Components and Modules – Templates – Change Detection – Directives – Data Binding – Pipes – Nested Components

11 Hours

### Unit-5

**Introduction to Client-side JS Framework – Forms and Routing in Angular 4.0 :** Template Driven Forms - Model Driven Forms or Reactive Forms - Custom Validators - Dependency Injection - Services - RxJS Observables - HTTP - Routing

10 Hours

#### Text Books:

1. Nathan Rozentals, “Mastering TypeScript”, April 2015
2. Nate Murray, Felipe Coury, Ari Lerner and Carlos Taborda, The Complete Book on Angular 4, September 2016
3. AmolNayak, “MongoDB Cookbook Paperback” , November 2014
4. KrasimirTsonev, “Node.js by Example Paperback”, May 2015

#### Reference Book :

1. Web link for TypeScript: <https://www.typescriptlang.org/>
2. Web link for Angular4.0: <https://angular.io/>
3. Web link for Node.js : <https://nodejs.org/en/>
4. Web link for MongoDB: <https://www.mongodb.com/>

#### Course Outcomes

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

1. Implement NoSQL Database CURD operations
2. Acquire knowledge about Server-side JS framework to make Database Connectivity
3. Acquire knowledge about functionalities of Client-side and Server-side JS frameworks
4. Explore Angular features and create component based web pages using them
5. Able to design Front-end web pages and connect to the Back-end Databases.

**CO-PO Mapping**

Semester : 7		Course code : P15CS741					Title : User Interface Technologies								
CO	Statement	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO-1	Implement NoSQL Database CURD operations	2		3	1										1
CO-2	Acquire knowledge about Server-side JS framework to make Database Connectivity	3	1												
CO-3	Acquire knowledge about functionalities of Client-side and Server-side JS frameworks	2	2	2											
CO-4	Explore Angular features and create component based web pages using them	3	2	1											
CO-5	Able to design Front-end web pages and connect to the Back-end Databases.	2	2	3	1	1						1		2	
CO		2.4	1.75	2	1	1						1		2	1

Course Title : Internet of Things			
Course Code : P15CS742	Semester : 7	L :T:P:H : 4:0:0:4	Credits: 3
Contact Period: Lecture: 52 Hr, Exam: 3 Hr		Weightage: CIE:50%, SEE:50%	

**Course Content**

**Unit-1**

**M2M to IoT**-The Vision-Introduction, From M2M to IoT, M2M towards IoT-the global context, A use case example, Differing Characteristics.

10 Hours

**Unit-2**

**M2M to IoT – A Market Perspective**– Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies. **M2M to IoT-An Architectural Overview**– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations.

10 Hours

**Unit-3**

**M2M and IoT Technology Fundamentals**- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service(XaaS), M2M and IoT Analytics, Knowledge Management

11 Hours

#### Unit-4

**IoT Architecture-State of the Art** – Introduction, State of the art, **Architecture Reference Model**- Introduction, Reference Model and architecture, IoT reference Model

10 Hours

#### Unit-5

**IoT Reference Architecture**- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. **Real-World Design Constraints**- Introduction, Technical Design constraints-hardware is popular again, Data representation and visualization, Interaction and remote control. **Industrial Automation**- Service-oriented architecture-based device integration, SOCRADES: realizing the enterprise integrated Web of Things, IMC-AESOP: from the Web of Things to the Cloud of Things, **Commercial Building Automation**- Introduction, Case study: phase one-commercial building automation today, Case study: phase two- commercial building automation in the future.

11 Hours

#### Textbook:

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, **“From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”**, 1<sup>st</sup> Edition, Academic Press, 2014.

#### Reference Books:

1. Vijay Madiseti and Arshdeep Bahga, **“Internet of Things (A Hands-on-Approach)”**, 1<sup>st</sup> Edition, VPT, 2014.
2. Francis daCosta, **“Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”**, 1<sup>st</sup> Edition, Apress Publications, 2013

#### Course Outcomes:

At the end of the course the student will be able to:

1. Understand the vision of IoT from a global context.
2. Determine the Market perspective of IoT.
3. Use of Devices, Gateways and Data Management in IoT.
4. Building state of the art architecture in IoT.
5. Application of IoT in Industrial and Commercial Building Automation and Real World Design Constraints.

#### CO-PO Mapping

Semester : 7		Course code : P15CS742					Title : Internet of Things								
CO	Statement	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO -1	Understand the vision of IoT from a global context	2	1	1		1								1	1
CO 2	Determine the Market perspective of IoT	2	1	1		1								1	1
CO -2	Use of Devices, Gateways and Data Management in IoT	2	2	2		1								1	1
CO-3	Building state of the art architecture in IoT	2	1	3										1	1
CO-4	Application of IoT in Industrial and Commercial Building Automation and Real World Design Constraints	2	2	2		1								1	1
C763		2	1.8	1.4		1		1						1	1

Course Title : Wireless Sensor Networks			
Course Code : P15CS743	Semester : 7	L:T:P:H : 4:0:0:4	Credits : 3
Contact Period: Lecture: 52 Hr, Exam: 3 Hr		Weightage: CIE:50%, SEE:50%	

### Course Content

#### **Unit 1**

**Introduction:** The vision of Ambient Intelligence, Application Examples, Types of applications, Challenges for WSNs, Mobile ad hoc networks and wireless sensor networks, Enabling Technologies for wireless sensor networks.

**Single-node architecture:** Hardware components, Energy consumption of sensor nodes, Operating systems and execution environments

**Network Architecture:** Sensor network scenarios, Optimization goals and figures of merit, Design principles for WSNs, Gateway concepts.

10 Hours

#### **Unit 2**

**Physical Layer:** Introduction, Wireless channel and communication fundamentals, Physical layer and transceiver design considerations in WSNs.

**MAC protocols:** Fundamentals of MAC protocols, Low duty cycle protocols and wakeup concepts – sparse topology and energy management, S-MAC, Contention based protocol – CSMA protocols, Schedule-based protocols – LEACH, IEEE 802.15.4 MAC protocol

10 Hours

#### **Unit 3**

**Link-Layer protocols:** Fundamentals: tasks and requirements, Error control – Causes and characteristics of transmission errors, ARQ techniques, FEC techniques, Framing – Adaptive Schemes, Intermediate checksum schemes, Link management – Link quality characteristics.

**Naming and addressing:** Fundamentals, Address and name management in wireless sensor networks, Assignment of MAC addresses, Distributed assignment of locally unique addresses – Address assignment algorithm, Content based and geographic addressing.

10 Hours

#### **Unit 4**

**Localization and Positioning:** Properties of localization and positioning procedures, Possible approaches, Mathematical basics for the lateration problem, Single hop localization, Positioning in multihop environments.

**Routing protocols:** The many faces of forwarding and routing, Gossiping and agent based unicast forwarding – Basic idea, Randomized forwarding, Random walks, Multipath unicast routing, Geographic routing, Mobile nodes.

11 Hours

#### **Unit 5**

**Data centric and content based networking:** Introduction, Data centric routing, One-shot interactions, Repeated Interactions, Data aggregation – Overview, A database interface to describe aggregation operations, Categories of aggregation operations, Placement of aggregation points, when to stop waiting for more data, aggregation as an optimization problem, Broadcasting an aggregated value, Information directed routing and aggregation, Data centric storage.

11 Hours

**Text Book:**

1. Holger Karl, Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks", 2013, Wiley Publications

**Reference Books:**

1. Wireless Sensor Network by KazemSohraby, Daniel Minoli, and TaiebZnati Pub: Wiley
2. Wireless sensor networks Edited by C. S. Raghavendra Pub: Springer
3. C. Siva Ram Murthy & B. S. Manoj, "Ad hoc Wireless, Networks – Architecture and Protocols", Prentice Hall, 2004, ISBN – 013-147-023x

**Course Outcomes:**

1. Explain applications of WSN , typical node and network architectures.
2. Analyze protocol design issues (especially energy-efficiency) and protocol designs for wireless sensor networks
3. Apply naming and addressing schemes in WSN
4. Determine the singlehop and multi hop localization, positioning and routing using different algorithms.
5. Explain in- network processing.

**CO-PO Mapping**

Semester: 7		Course code : P15CS743					Title : Wireless Sensor Networks									
CO	Statement	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	
CO 763.1	Explain applications of WSN , typical node and network architectures	2	1	2			1	1						2	2	
CO 763.2	Analyze protocol design issues (especially energy-efficiency) and protocol designs for wireless sensor networks	2	2	1				1						2	1	
CO 763.3	Apply naming and addressing schemes in WSN	2	2	1										2	2	
CO 763.4	Determine the single hop and multi hop localization, positioning and routing using different algorithms	2	2	1										2	2	
CO 763.5	Explain in- network processing.	2	2	2				1						2	2	
C763		2	1.8	1.4			1	1						2	1.8	

Course Title : Managing Big Data			
Course Code : P15CS744	Semester : 7	L :T:P:H : 4:0:0:4	Credits: 3
Contact Period: Lecture: 52 Hr, Exam: 3 Hr		Weightage: CIE:50%, SEE:50%	

**Course Content**

**Unit-1**

**Getting an Overview of Big Data:** Introduction to Big Data, History of Data Management – Evolution of Big Data, Structuring Big Data, Elements of Big Data, Big Data Analytics, Careers in Big Data, Future of Big Data.



**Exploring the Use of Big data in Business Context:** Use of Big data in Social Networking, Preventing Fraudulent activities, Detecting Fraudulent activities in Insurance sector, Retail Industry.

10 Hours

### Unit-2

**Introducing Technologies for Handling Big Data and Hadoop Ecosystem:** Distributed and Parallel Computing for Big Data, Introducing Hadoop, Cloud Computing and Big Data, In-Memory Computing Technology for Big Data, Hadoop Ecosystem, Hadoop Distributed File System, MapReduce, Hadoop YARN, HBase, Hive, Pig, Sqoop, Flume.

**Understanding MapReduce Fundamentals and HBase:** The MapReduce Framework, Techniques to Optimize MapReduce Jobs, Uses of MapReduce, Role of HBase in Big Data Processing.

11 Hours

### Unit-3

**Understanding Hadoop YARN Architecture:** Background, Advantages, Architecture and working of YARN, YARN schedulers, background compatibility with YARN.

**NoSQL Data Management:** Introduction to NoSQL, Characteristics of NoSQL, types of NoSQL data models, Schema-Less Databases, Materialized Views, Distribution Models, Sharding.

10 Hours

### Unit-4

**Understanding Analytics and Big Data:** Comparing Reporting and Analysis, Types of Analytics, Points to Consider during Analysis, Developing an Analytic Team, Understanding Text Analytics.

**Analytical Approaches and Tools to Analyze Data:** Analytical Approaches, History of Analytical Tools, Introducing Popular Analytical Tools, Comparing Various Analytical Tools.

10 Hours

### Unit-5

**Exploring R:** Installing R, R Studio, Exploring Basic Features of R, Exploring RGui, Exploring RStudio, Handling Basic Expressions in R, Variables in R, Calling Functions in R, Working with Vectors, Storing and Calculating Values in R, Creating and Using Objects, Interacting with Users, Handling Data in R Workspace, Executing Scripts, Creating Plots, Accessing Help and Documentation in R.

**Reading Datasets and exporting data from R:** Using the `c()` command, Using the `scan()` command, reading multiple data values from large files, reading data from Rstudio, Exploring data from R.

11 Hours

### Text Book:

1. Big Data: Black Book, DT Editorial Services, Wiley India Pvt Ltd, 2015 Edition.

### Reference Books:

1. Tom White, "Hadoop: The Definitive Guide", 4<sup>th</sup> Edition, O'reilly, 2015.
2. Big Data Analytics with R and Hadoop, VigneshPrajapati, -Packt Publishing 2013

### Course Outcomes :

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

1. Overview of Big Data and Related Technologies
2. Analyze Technologies for Handling Big Data and Hadoop Ecosystem
3. Acquire clear understanding of Hadoop YARN and NoSQL Data Management

4. Acquire a clear understanding of Analytics and Big Data
5. Explore R Tool to Analyze Data

### CO-PO Mapping

Semester: 7		Course code : P15CS744					Title : Managing Big Data									
CO	Statement	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	
CO-1	Overview of Big Data and Related Technologies	2	1	1			2	2							2	
CO-2	Analyze Technologies for Handling Big Data and Hadoop Ecosystem	2	3	1		2	2	2							2	
CO-3	Acquire clear understanding of Hadoop YARN and NoSQL Data Management	2	2	1		2	2	2							2	
CO-4	Acquire a clear understanding of Analytics and Big Data	2	2	1			2	2							2	
CO-5	Explore R Tool to Analyze Data	2	2	2	2	2	2	2							2	
		2	2	1.2	2	2	2	2							2	

### OPEN ELECTIVE – I

Course Title : Object Oriented Programming with Java			
Course Code : P15CS751	Semester : 7	L:T:P:H : 4:0:0:4	Credits: 3
Contact Period: Lecture: 52 Hr, Exam: 3 Hr		Weightage: CIE:50%, SEE:50%	

### Course Content

#### **Unit-1**

**Object Oriented Concepts :** Introduction to Object Oriented Concepts :A Review of structures, Procedure–Oriented Programming system, Object Oriented Programming System, Comparison of Object Oriented Language with C, Console I/O, variables and reference variables, Function Prototyping, Function Overloading. Class and Objects: Introduction, member functions and data, objects and functions, objects and arrays, Namespaces, Nested classes, Constructors, Destructors.

11 Hours

#### **Unit-2**

**Program Structure in Java :** Introduction - Importing Packages and Classes ,Writing Simple Java Programs , Installing and Configuring Java Compiling and Running Java Program, Elements or Tokens in Java Programs, Java Statements , Command Line Arguments ,Data Types, Declaration of Variables, User Input to Programs, Sample Programs. Data types, variables and arrays, Operators, Control Statements.

11 Hours

### Unit-3

**Classes, Inheritance and Interfaces : Classes and Objects-** Introduction, Class Declaration and Modifiers, Class Modifiers, Declaration of Class Objects, Assigning One Object to Another ,Access Control for Class Members, Accessing Private Members of Class, Constructor Methods for Class, Overloaded Constructor Methods, Nested Classes, Final Class and Methods , Passing Arguments by Value and by Reference, Keyword this.

**Methods-** Introduction, Defining Methods, Overloaded Methods, Overloaded Constructor Methods, Class Objects as Parameters in Methods, Access Control, Nesting of Methods, Overriding Methods, Attributes Final and Static.

**Inheritance** Introduction, Process of Inheritance, Types of Inheritances, Universal Super Class, Inhibiting inheritance of Class Using Final, Access Control and Inheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Interfaces and Inheritance.

**Interfaces-** Introduction- Similarities between Interface and Class, Declaration of Interface, Implementation of interface, Multiple Interfaces.

10 Hours

### Unit-4

**Packages, Exception Handling and Multithreaded Programming: Packages** Introduction, Defining, Importing Packages and Classes into Programs, Path and Class Path, Access Control, Packages in Java SE, Java.lang Package and its Classes

**Exception Handling-** Introduction, Hierarchy of Standard Exception Classes, Keywords throws and throw, try, catch, and finally Blocks, Multiple Catch Clauses, Class Throwable, Unchecked Exceptions, Checked Exceptions

**Multithreaded Programming-**Introduction, Need for Multiple Threads, Thread Class, Main Thread, Creation of New Threads, Thread States, Thread Priority, Synchronization, Deadlock and Race Situations, Inter-thread Communication, Suspending, Resuming, and Stopping of Threads, Sample Programs.

10 Hours

### Unit-5

**Event Handling and Applets : Event Handling** –Introduction, Delegation Event Model, Hierarchy of Event Classes, Types and Sources of Events, Event Listener Interfaces, class ActionEvent, class AdjustmentEvent, changeEvent and ChangeListener, class ComponentEvent, class ContainerEvent, class FocusEvent, class ItemEvent, class KeyEvent, class MouseEvent, class TextEvent, class WindowEvent, Details of Event Listener Interfaces, interface WindowListener

**Applets-**Introduction, Applet Architecture, Applet Class and Methods, Creating Applets, HTML Tags, Simple Applet Display Methods, Passing Parameters to Applets, Passive Applet Programs, Adding Images to Applet Windows, Display of Numerical Values on Applet Windows, Managing Colours in Applet Window, Interactive Applets with AWT Graphical Components, AWT Text fields in Applets, Animation in Applet Windows

10 Hours

#### Text Books:

1. Sourav Sahay, Object Oriented Programming with C++ , Oxford University Press,2006  
(Chapters 1: 1.1 to 1.9 Ch 2: 2.1 to 2.6 Ch 4: 4.1 to 4.2, 2, 4)
2. Java: One Step Ahead by Anita Seth , B.L. Juneja ,OXFORD University press - First Edition 2017.

**Reference Books:**

1. Herbert Schildt, Java The Complete Reference, 9<sup>th</sup> Edition, Tata McGraw Hill.
2. E Balagurusamy Programming With Java : A Primer 5<sup>th</sup> Edition Tata McGraw Hill.

**Course outcomes:**

**CO1:** Explain the object-oriented concepts.

**CO2:** Apply Java features to develop simple Java programs.

**CO3:** Demonstrate the usage of Inheritance and Interfaces.

**CO4:** Develop programs using Packages, Exception Handling and Multithreaded Programming

**CO5:** Develop applications using applets with event handling

**CO-PO Mapping**

Semester: 7		Course code : P15CS751			Title : Object Oriented Programming with Java											
CO	Statement	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	
CO-1	Explain the object-oriented concepts.	1	1	1											2	
CO-2	Apply Java features to develop simple Java programs	2	2	2		2									2	
CO-3	Demonstrate the usage of Inheritance and Interfaces	2	2	2		2	2	2							2	
CO-4	Develop programs using Packages, Exception Handling and Multithreaded Programming	2	2	2		2	2	2							2	
CO-5	Develop applications using applets with event handling	2	2	2		2	2	2							2	
		1.2	1.2	1.2		2	2	2							2	

Course Title : Microcontroller and Interfaces			
Course Code : P15CS752	Semester : 7	L :T:P:H : 4:0:0:4	Credits: 3
Contact Period: Lecture: 52 Hr, Exam: 3 Hr		Weightage: CIE:50%, SEE:50%	

**Course Content**

**Unit 1**

**The PIC Microcontrollers :** History and features : Microcontrollers and embedded processors, overview of the PIC18 family.

**PIC Architecture & Assembly language programming :** The WREG register in the PIC, PIC file register, using instruction with the default access bank, PIC status register, data format and directives.

10 Hours

### Unit 2

Introduction to PIC assembly programming, assembly and linking a PIC program, program counter and program counter and program ROM space in the PIC, RISC architecture in the PIC.

**Branch, Call and Time delay loop :** Branch instructions and looping, call instructions and stack, PIC18 time delay and instruction pipeline.

10 Hours

### Unit 3

**PIC I/O Port programming :** I/O port programming in PIC18, I/O bit manipulation programming.

**Arithmetic, Logic instructions and programs :** Arithmetic instructions, signed number concepts and arithmetic operations, logic and compare instructions, rotate instruction and data serialisation, BCD to ASCII conversion.

11 Hours

### Unit 4

**PIC Programming in C :** Data types and time delays in C, I/O programming in C, logical operations, in C data conversion programs in C data serialisation in C, program ROM allocation in C18, data RAM allocation in C18.

**PIC18 Serial port programming in Assembly and C :** Basics of serial communication, PIC18 connection to RS232, PIC18 serial port programming in assembly and C.

10 Hours

### Unit 5

**PIC18F Hardware connection and ROM LOADERS :** PIC 18F458/452 pin connection, PIC18 configuration registers, explaining the Intel hex file for PIC18, PIC18 trainer design and loading.

**PIC18 Timer Programming in assembly and C :** Programming timers 0 and 1, counter programming, programming timer 0 and 1 in C, programming timer 2 and 3.

**LCD Interfacing :** Sending commands and data to LCDs with time delay, sending commands or data to the LCD using busy flag.

**ADC, DAC and Sensor interfacing :** ADC characteristics, ADC programming the PIC18, DAC interfacing, sensor interfacing and signal conditioning.

11 Hours

### Text Book:

1. PIC Microcontroller and embedded systems : Using assembly and C for PIC18 by Muhammad Ali Mazidi, Rolin D. McKinlay and Danny Causey.

### Course outcomes:

At the end of the course the student will be able to:

1. Explain the architecture of PIC microcontroller
2. Write Assembly level problems using PIC
3. Write ALP for peripheral interfacing using PIC
4. Write C code for a given problem related to serial input and peripherals
5. Analyze the i/o device and timers with PIC microcontroller

**CO-PO Mapping**

Semester: 7		Course code : P15CS752		Title : Microcontroller and Interfaces											
CO	Statement	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO-1	Explain the architecture of PIC microcontroller	1	1	1											2
CO-2	Write Assembly level problems using PIC	2	2	2		2									2
CO-3	Write ALP for peripheral interfacing using PIC	2	2	2		2	2	2							2
CO-4	Write C code for a given problem related to serial input and peripherals	2	2	2		2	2	2							2
CO-5	Analyze the i/o device and timers with PIC microcontroller	2	2	2		2	2	2							2
		1.2	1.2	1.2		2	2	2							2

Course Title : Parallel Programming Laboratory			
Course Code : P15CSL76	Semester : 7	L :T:P:H : 0:0:3:3	Credits: 1.5
Contact Period: 3Hr/Week, Exam: 3 Hr		Weightage: CIE:50%, SEE:50%	

**Course Contents**

**PART-A**

**OPENMP Programs**

1. Write an OpenMp program which performs  $C=A+B$  &  $D=A-B$  in separate blocks/sections where A,B,C& D are arrays.
2. Write an OpenMp program to add all the elements of two arrays A & B each of size 1000 and store their sum in a variable using reduction clause.
3. Write an OpenMp program to multiply two matrices A & B and find the resultant matrix C.
4. Write an OpenMp program to find the number of processors, number of threads, etc (the environment information).
5. Write an OpenMp program to print all the letters of the alphabet A-Z using threads.
6. Write an OpenMp program to show how thread private clause works.
7. Write an OpenMp program to show how first private clause works (Factorial program).
8. Write an OpenMP program to find prime numbers (split)

**PART-B**

**MPI PROGRAMS**

1. Write a MPI program to send the message from a process whose rank=3 to all other remaining processes.
2. Write a MPI program where each processor sends an integer number and its rank to the master processor, where the master gathers all the information and prints the data accordingly.

3. Write a MPI program to broadcast a message.
4. Write a MPI program to find sum of 'n' integers on 'p' processors using point-to-point communication libraries call.
5. Write an MPI program where the master processor broadcasts a message “HELLO” to the remaining processors using broadcast system call.

**Course Outcomes:**

***At the end of the course, the student should be able to:***

1. Develop the programs using OPENMP.
  2. Develop the programs using MPI.
  3. Examine the performance of OPENMP, MPI Program.
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Course Title : Machine Learning Laboratory			
Course Code : P15CSL77	Semester : 7	L :T:P:H : 0:0:3:3	Credits: 1.5
Contact Period: 3Hr/Week, Exam: 3 Hr		Weightage: CIE:50%, SEE:50%	

**Course Contents**

1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.
2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
4. Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.
5. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
6. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/ API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.
7. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
8. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k -Means algorithm Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.



9. Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.
10. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

#### Course Outcomes

1. Understand the implementation procedures for the machine learning algorithms.
  2. Design Java/Python programs for various Learning algorithms.
  3. Apply appropriate data sets to the Machine Learning algorithms.
  4. Identify and apply Machine Learning algorithms to solve real world problems.
- 

Course Title : Cryptography & Network Security			
Course Code : P15CS81	Semester : 8	L :T:P:H : 4:0:0:4	Credits: 3
Contact Period: Lecture: 52 Hr, Exam: 3 Hr		Weightage: CIE:50%, SEE:50%	

#### Course Content

##### **Unit-1**

**Introduction:** Security goals, Cryptographic Attacks, Services and Mechanism , technique  
**Mathematics of Cryptography:** Integer Arithmetic, Modular Arithmetic, Matrices  
**Traditional Symmetric-Key Ciphers:** Introduction , Substitution Ciphers, Transposition Ciphers, Stream and Block Ciphers

11 Hours

##### **Unit-2**

**Data Encryption Standard:** Introduction, DES Structure, DES Analysis, Security of DES.  
**Advanced Encryption Standard:** Introduction, Transformations, Key Expansion, Analysis of AES.

10 Hours

##### **Unit-3**

**Mathematics of Asymmetric Key Cryptography:** Primes, Primality testing, Factorization, Chinese remainder theorem, **Asymmetric key cryptography:** RSA Cryptosystem, Rabin Cryptosystem, Message Authentication

11 Hours

##### **Unit-4**

**Key management:** Symmetric Key Distribution, Kerberos, Symmetric Key Agreement, **Security at the Application Layer:** Email, PGP: scenarios, key rings, PGP certificate, Trust model in PGP, PGP Packet, PGP Messages ,S/MIME:MIME,S/MIME.

10 Hours

##### **Unit-5**



**Security at the Transport Layer** : SSL Architecture, Services, Key Exchange Algorithm, Encryption/Decryption Algorithm, Hash Algorithm SSL Message Formats, **Security At the Network Layer:** Two Modes, Two Security Protocols, ISAKMP

10 Hours

**Text Book:**

1. Behrouz A. Forouzan and Debdeep Mukhopadhyay, "Cryptography and Network Security", 2<sup>nd</sup> Edition, McGraw Hill Education, 2014.

**Reference Books:**

1. Cryptography and Network Security: Principles and Practice , 2013 by William Stallings
2. Cryptography and Network Security (UPTU) Paperback-2012 by V S Bagad and I A Dhotre

**Course Outcomes:**

C01: Understanding the importance of security attacks and service mechanism.

(Level 2 :Understanding and Level 3: Application)

C02: Explain the basic structure of DES,AES (Level 2:Understanding)

C03: Understand the importance of primes,CRT,RSA (Level 3:Application)

C04: Explain concept of Kerbores, Symmetric Key Agreement,PGP,S/MIME (Level 3:applicatio Application)

C05:Understanding the importance of SSL Architecture,Hash Algorithm, SSL Message Formats, ISAKMP (Level 1:Knowledge)

**CO-PO Mapping**

Semester: 8		Course code : P15CS81				Title : Cryptography & Network Security									
CO	Statement	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO-1	Understanding the importance of security attacks and service mechanism. (Level 2 : Understanding and Level 3: Application)	3	1		2					1				1	
CO-2	Explain the basic structure of DES,AES (Level 2:Understanding)		2		1										3
CO-3	Understand the importance of primes, CRT, RSA (Level 3: Application)	1		3									1	3	
CO-4	Explain concept of Kerbores, Symmetric Key Agreement, PGP,S/MIME (Level 3: Application)		2	1	1	2								1	
CO-5	Understanding the importance of SSL Architecture, Hash Algorithm, SSL Message Formats, ISAKMP (Level 1:Knowledge)					2									

## **ELECTIVE – V**

<b>Course Title : Cloud Computing</b>			
Course Code : P15CS821	Semester : 8	L :T:P:H : 4:0:0:4	Credits: 3
Contact Period: Lecture: 52 Hr, Exam: 3 Hr		Weightage: CIE:50%, SEE:50%	

### **Course Content**

#### **Unit-1**

##### **Introduction, Cloud Infrastructure**

Cloud computing, Cloud computing delivery models and services, Ethical issues, Cloud vulnerabilities, Cloud computing at Amazon, Cloud computing the Google perspective, Microsoft Windows Azure and online services, Open-source software platforms for private clouds, Cloud storage diversity and vendor lock-in, Energy use and ecological impact, Service level agreements, User experience and software licensing.

10 Hours

#### **Unit-2**

##### **Cloud Computing: Application Paradigms.**

Challenges of cloud computing, Architectural styles of cloud computing, Workflows: Coordination of multiple activities, Coordination based on a state machine model: The Zookeeper, The Map Reduce programming model, A case study: The GrepTheWeb application, Cloud for science and engineering, High-performance computing on a cloud, Cloud computing for Biology research, Social computing, digital content and cloud computing.

10 Hours

#### **Unit-3**

##### **Cloud Resource Virtualization.**

Virtualization, Layering and virtualization, Virtual machine monitors, Virtual Machines, Performance and Security Isolation, Full virtualization and paravirtualization, Hardware support for virtualization, Case Study: Xen a VMM based paravirtualization, Optimization of network virtualization, vBlades, Performance comparison of virtual machines, The dark side of virtualization.

10 Hours

#### **Unit-4**

##### **Cloud Resource Management and Scheduling.**

Policies and mechanisms for resource management, Application 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, A utility-based model for cloud-based Web services, Resourcing 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 Map Reduce applications subject to deadlines, Resource management and dynamic scaling,

10 Hours

### Unit-5

#### Cloud Security, Cloud Application Development.

Cloud security risks, Security: The top concern for cloud users, Privacy and privacy impact assessment, Trust, Operating system security, Virtual machine Security, Security of virtualization, Security risks posed by shared images, Security risks posed by a management OS, A trusted virtual machine monitor, Amazon web services: EC2 instances, Connecting clients to cloud instances through firewalls, Security rules for application and transport layer protocols in EC2, How to launch an EC2 Linux instance and connect to it, How to use S3 in java, Cloud-based simulation of a distributed trust algorithm, A trust management service, A cloud service for adaptive data streaming, Cloud based optimal FPGA synthesis.

10 Hours

#### Text Book:

1. Dan C Marinescu: Cloud Computing Theory and Practice. Elsevier(MK) 2013.

#### Reference Books:

1. Rajkumar Buyya, James Broberg, Andrzej Goscinski: Cloud Computing Principles & Paradigms, Wiley 2014.
2. John W Rittinghouse, James F Ransome: Cloud Computing Implementation, Management and Security, CRC Press 2013.

#### Course outcomes:

1. Describe the usage of Cloud Service.
2. Demonstrate the application paradigm of cloud computing.
3. Implement Virtualization techniques and layering
4. Implement Task Scheduling algorithm.
5. Analyze the security in Cloud application development

#### CO-PO Mapping

Semester: 8		Course code : P15CS821					Title : Cloud Computing								
CO	Statement	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO-1	Describe the usage of Cloud Service	3													
CO-2	Demonstrate the application paradigm of cloud computing	2	3												
CO-3	Implement Virtualization and layering	2	2	2											2
CO-4	Implement Task Scheduling algorithm.	3	2	1										1	
CO-5	Analyze the security in Cloud application development	2	2	3	1	1						1			
CO		2.4	2.25	2	1	1						1		1	2

Course Title : Python Programming			
Course Code : P15CS822	Semester : 8	L :T:P:H : 4:0:0:4	Credits: 3
Contact Period: Lecture: 52 Hr, Exam: 3 Hr		Weightage: CIE:50%, SEE:50%	

### **Course Content**

#### **Unit-1**

Basics of Python Programming: Features, Literal constants, Variables and Identifiers, Data types, Operators and Expressions, Decision control statements

10 Hours

#### **Unit-2**

Functions and Modules: Function definition, call, Variable scope and lifetime, Recursive functions, Modules, Packages in Python, Standard Library modules, Globals(), RLocals(), eload() Python Strings: Various string operations, built in methods and functions, Regular expressions, Metacharacters in regular expression

10 Hours

#### **Unit-3**

File Handling: File path, Types of files, various file operations

Data Structures: Sequences, Lists, Functional Programming, Tuple, Sets, Dictionaries

11 Hours

#### **Unit-4**

Classes and Objects, Inheritance, Operator Overloading, Error and Exception handling

11 Hours

#### **Unit-5**

Graphical user interfaces; event-driven programming paradigm; creating simple GUI; buttons, labels, entry fields, dialogs; widget attributes - sizes, fonts, colors layouts, nested frames; Multithreading, Networks, and Client/Server Programming.

10 Hours

#### **Text Books:**

1. Reema Thareja, Python Programming using Problem Solving approach, Oxford University Press, 2017
2. Kenneth A. Lambert, The Fundamentals of Python: First Programs, 2011, Cengage Learning

#### **Reference Books:**

1. Magnus Lie Hetland, Beginning Python from Novice to Professional, Second Edition.
2. Mark Summerfield, Programming in Python 3 - A Complete Introduction to the Python Language, Second Edition.
3. Y. Daniel Liang, "Introduction to Programming Using Python", Pearson, ISBN:978-0-13-274718-9, 2013.

### **Course Outcomes**

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

1. Explain the basic programming constructs in Python
2. Design Python programs using the concepts of functions, modules and strings
3. Implement various file handling operations and data structures in python.
4. Write object oriented programs in Python
5. Create a Graphical User Interface, multiple threads and Client/Server programs in python.

**CO-PO Mapping**

Semester: 8		Course code : P15CS822					Title : Python Programming								
CO	Statement	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO-1	Explain the basic programming constructs in Python	3													
CO-2	Design Python programs using the concepts of functions, modules and strings	2	3												
CO-3	Implement various file handling operations and data structures in python.	2	2	2											2
CO-4	Write object oriented programs in Python	3	2	1										1	
CO-5	Create a Graphical User Interface, multiple threads and Client/Server programs in python.	2	2	3	1	1						1			
CO		2.4	2.25	2	1	1						1		1	2

Course Title: Software Testing			
Course Code: P15CS823	Semester: 8	L-T-P-H: 4:0:0:4	Credits 3
Contact Period: Lecture: 52 Hrs., Exam: 3 Hrs		Weightage: CIE:50%, SEE:50%	

**Course Content**

**Unit 1**

**Basics of Software Testing and Examples:** Basic definitions, Test cases, Insights from a Venn diagram, Identifying test cases, Error and fault taxonomies, Levels of testing. Examples: Generalized pseudo code, the triangle problem, The NextDate function, the commission problem, The SATM (Simple Automatic Teller Machine) problem.

10 Hours

**Unit 2**

**Decision Table-Based Testing:** Decision tables, Test cases for the triangle problem, Test cases for the Next Date function, Test cases for the commission problem, Guidelines and observations. Data Flow Testing: Definition-Use testing, Slice-based testing, Guidelines and observations. Levels of Testing: Traditional view of testing levels, Alternative life-cycle models, The SATM system, Separating integration and system testing. Integration Testing: A closer look at the SATM System, Decomposition-based, call graph-based, Path-based integrations, Case study.

10 Hours

### Unit 3

**System Testing:** Threads, Basic concepts for requirements specification, Finding threads, Structural strategies and functional strategies for thread testing, SATM test threads, System testing guidelines, ASF (Atomic System Functions) testing example. **Interaction Testing:** Context of interaction, A taxonomy of interactions, Interaction, composition, and determinism, Client/Server Testing,. **Issues in Object-Oriented Testing:** Units for object-oriented testing, Implications of composition and encapsulation, inheritance, and polymorphism, Levels of object-oriented testing, GUI testing, Dataflow testing for object-oriented software, Examples. **Class Testing:** Methods as units, Classes as units.

12 Hours

### Unit 4

**Object-Oriented Integration Testing:** UML support for integration testing, MM-paths for object-oriented software, A framework for object-oriented dataflow integration testing. **GUI Testing:** The currency conversion program, Unit testing, Integration Testing and System testing for the currency conversion program. **Object-Oriented System Testing:** Currency converter UML description, UML-based system testing, State chart-based system testing.

10 Hours

### Unit 5

**Exploratory Testing:** The context-driven school, Exploring exploratory testing, Exploring a familiar example, Exploratory and context-driven testing observations. **Model-Based Testing:** Testing based on models, Appropriate models, Use case-based testing, Commercial tool support for model-based testing. **Test-Driven Development:** Test-then-code cycles, Automated test execution, Java and JUnit example, Remaining questions, Pros, cons, and open questions of TDD, Retrospective on MDD versus TDD.

10 Hours

#### Text Book:

1. Paul C. Jorgensen: Software Testing, A Craftsman's Approach, 3rd Edition, Auerbach Publications, 2013.

#### Reference Books:

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

#### Course Outcomes:

Upon Completion of the course, students shall be able to

1. **Choose** the right type of software testing process for any given real world problem.
2. **Execute** the software testing process in efficient way.
3. **Illustrate** the testing process by using several testing tools.
4. **Establish** a quality environment as specified in standards for developing quality software.
5. **Analyze** the quality procedures based on the past experience.

**CO-PO mapping**

Semester : 8		Course code : P15CS83					Title : Software Testing								
CO	Statement	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1	Choose the right type of software testing process for any given real world problem.	2	3	2	2	-	-	-	-	-	-	-	2	2	-
CO2	Execute the software testing process in efficient way.	2	2	2	2	-	-	-	-	-	-	-	-	2	-
CO3	Illustrate the testing process by using several testing tools.	2	3	3	-	-	-	-	-	-	-	-	-	2	-
CO4	Establish a quality environment as specified in standards for developing quality software.	2	2	3	-	-	-	2	-	-	-	-	-	2	-
CO5	Analyze the quality procedures based on the past experience.	2	2	2	-	-	-	-	-	-	-	-	-	2	-
		2	2.4	2.4	0.8			0.4						2	

Course Title : Web Security			
Course Code : P15CS824	Semester : 8	L :T:P:H : 4:0:0:4	Credits: 3
Contact Period: Lecture: 52 Hr, Exam: 3 Hr		Weightage: CIE:50%, SEE:50%	

**Course Content**

**Unit-1**

**The Web Security Landscape: The Web Security Landscape:** The Web Security Problem, Risk Analysis and Best Practices; **Cryptography and the Web:** Cryptography and Web Security, Working Cryptographic Systems and Protocols, What Cryptography Can't Do?, Legal Restrictions on Cryptography.

10 Hours

**Unit-2**

**The Web's War on Your Privacy:** Understanding Privacy, User-Provided Information, Log Files, Understanding Cookies, Web Bugs, Conclusion; **Privacy-Protecting Techniques:** Choosing a Good Service Provider, Picking a Great Password, Cleaning Up After Yourself, Avoiding Spam and Junk Email, Identity Theft; **Privacy-Protecting Technologies:** Blocking Ads and Crushing Cookies, Anonymous Browsing, Secure Email, Backups and Anti Theft: Using Backups to Protect Your Data, Preventing theft.

11 Hours

**Unit-3**

**Physical security for Servers:** Planning for the Forgotten Threats, Protecting Computer Hardware, Protecting Your Data, **Host Security for Servers:** Current Host Security Problems, Securing the Host Computer, minimizing Risk by Minimizing Services, Operating Securely,

Secure Remote Access and Content Updating, firewalls and the Web, **Securing Web Applications:** A Legacy of Extensibility and Risk, Rules to Code By, Security Using Fields, Hidden Fields and Cookies, Rules for Programming languages, Using PHP Securely, Writing Scripts That Run with Additional Privileges, Connecting to Databases.

10 Hours

#### Unit-4

**Deploying SSL Server Certificates:** Planning for your SSL Server, Creating SSL Servers with FreeBSD, Installing an SSL Certificate on Microsoft IIS, Obtaining a Certificate from a Commercial CA, When Things Go Wrong; **Securing Your Web Service:** Protecting Via Redundancy, Protecting Your DNS, Protecting Your Domain Registration.

10 Hours

#### Unit-5

**Controlling Access to Your Web Content:** Access Control Strategies, Controlling Access with Apache, Controlling Access with Microsoft IIS; **Client-Side Digital Certificates:** Client Certificates, A Tour of the VeriSign Digital ID Center; **Pornography, Filtering Software and Censorship:** Pornography Filtering, PICS, RSAC, **Privacy Policies, Legislation and P3P:** Policies that Protect Privacy and Privacy Policies, Children's Online Privacy Protection Act, P3P.

11 Hours

#### Text Book :

1. **Web Security, Privacy & Commerce:** Simson Garfinkel, Gene Spafford, SPD O'reilly. Second Edition, 2011

#### Reference Books:

1. **Web Application Security:** Bryan Sullivan, Vincent Liu, Mc Graw Hill.
2. **Web Application Hacker's Handbook:** Dafydd Stuttard, Marcus Pinto, 2nd Edition, Wiley India.
3. **Hacking Exposed Web Applications 3:** Joel Scambray, Vincent Liu, Caleb Sima, TMH.

#### Course Outcomes:

The students should be able to

1. **Understand** the web security landscape and risks of running a web server on the internet by defending against risks.
2. **Analyze** the hype surrounding web security and use the phrase "secure web server," and discuss overall strategies for reducing the risks of operating a site and publishing.
3. **Apply** Privacy-Protecting Technologies Backups and Anti Theft.
4. **Apply** Physical security, Host Security and Web Application Security for Servers.
5. **Generate & Deploy** SSL Server Certificates, securing the web services.
6. **Controlling** Access to Your Web Content, Client-Side Digital Certificates and Privacy Policies, Legislation and P3P.



**CO-PO Mapping**

Semester : 8		Course code : P15CS824					Title : Web Security									
CO	Statement	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	
CO1	Understand Security Landscape and Protocols	3	2	3										2		
CO2	Analyze the hype surrounding web security and use the phrase "secure web server," and discuss overall strategies for reducing the risks of operating a site and publishing.	2	2	2	3									2		
CO3	Apply Privacy-Protecting Technologies Backups and Anti Theft, Physical security, Host Security and Web Application Security for Servers.	2	2	3										2		
CO4	Generate & Deploy SSL Server Certificates, securing the web services.	2	2	3										2		
CO5	Controlling Access to Your Web Content, Client-Side Digital Certificates and Privacy Policies, Legislation and P3P	2	2	2	3									3		
		2.2	2	2.6	3									2.2		

**ELECTIVE – VI**

Course Title: Network Management Systems			
Course Code: P15CS831	Semester : 8	L-T-P-H: 4:0:0:4	Credits 3
Contact Period: Lecture: 52 Hrs., Exam: 3 Hrs		Weightage: CIE:50%, SEE:50%	

**Course Content**

**Unit-1**

**Data Communications And Network Management Overview :** Analogy of Telephone Network Management, Data and Telecommunication Network, Distributed computing Environment, TCP/IP Based Networks: Internet and Intranet, Communications protocols and Standards, Networks, Systems and Services, Case Histories of Network, System and Service Management, Challenges of IT Managers, Network Management: Goals, Organization, and Functions, Network Management Architecture and Organization, Network Management Perspectives, NMS Platform, Current Status and future of Network Management.

**Basic Foundations: Standards, Models, And Language:** Network Management Standards, Network Management Models, Organization Model, Information Model, Communication Model, Abstract Syntax Notation One: ASN.1, Encoding Structure, Macros, Functional Model.

10 Hours

### Unit -2

**SNMPv1 Network Management: Organization And Information Models:** Managed Network: Case Histories and Examples, History of SNMP Management, Internet Organizations and Standards, The SNMP Model, The Organization Model, System Overview. The Information Model.

**SNMPv1 Network Management: Communication And Functional Models:** The SNMP Communication Model – The SNMP Architecture, Administrative Model, SNMP Specifications, SNMP Operations, SNMP MIB Group, And Functional Model.

10 Hours

### Unit-3

**SNMP Management: SNMPv2:** Major Changes in SNMPv2, SNMPv2 System Architecture, SNMPv2 Structure of Management Information, SNMPv2 Management Information Base, SNMPv2 Protocol, Compatibility with SNMPv1.

**SNMP Management: SNMPv3:** SNMPv3 System Architecture, Applications, SNMPv3 MIB, Security.

**SNMP Management RMON:** What is Remote Monitoring? , RMON SMI and MIB, RMON1, RMON2, ATM Remote Monitoring, A Case Study of Internet Traffic Using RMON.

11 Hours

### Unit-4

**Telecommunications Management Network:** Why TMN, Operations Systems, TMN Conceptual Model, TMN Standards, TMN Architecture, TMN Management Service Architecture, TMN Integrated View, TMN Implementation.

**Network Management Applications:** Configuration Management, Fault Management, Performance Management, Event Correlation Techniques, Security Management, Accounting Management, Report Management, Policy- Based Management, Service Level Management.

11 Hours

### Unit-5

**Broadband Network Management: Wired And Optical Access Networks:** Broadband Access Networks , Broadband Access Technology, Cable Modem Technology, Cable Access Network Management, DSL Access Network, Asymmetric Digital Subscriber Line, ADSL Management, ADSL2, ADSL2+and VDSL2,Passive Optical Network, PON Management.

**Advanced Management Topics:**Early Web-Based Development, XML-Based NM Technology.

10 Hours

#### Text Book:

1. Mani Subramanian:Network Management- Principles and Practice, 2<sup>nd</sup> Ed. , Pearson Ed, 2012

#### Reference Book:

1. J. Richard Burke: N/W management concepts and practices:a Hands-On Approach, PHI, 2008

#### Course Outcomes:

Upon completion of this course, the students will be able to,

1. **Analyze** the issues and challenges pertaining to management of emerging network technologies and apply network management standards to manage practical networks.
2. **Describe** basic foundations of model that are needed to build Network Management architecture, protocols, SMNP and IP network management.
3. **Describe** the management features of SNMP v2, SNMP v3 and RMON for monitoring the behavior of the network.

4. **Describe** network management for the management of telecommunication, which includes network, systems, operations and business services and management.
5. **Analyze** the various technologies of network management with respect to applications of broadband networks and the latest trends in management technology.

### CO-PO Mapping

Semester : 8		Course code : P15CS831			Title : Network Management Systems											
CO	Statement	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	
CO1	<b>Analyze</b> the issues and challenges pertaining to management of emerging network technologies and apply network management standards to manage practical networks.	3	2	3										2	-	
CO2	<b>Describe</b> basic foundations of model that are needed to build Network Management architecture, protocols, SMNP and IP network management	2	2	2	3									2	-	
CO3	<b>Describe</b> the management features of SNMP v2, SNMP v3 and RMON for monitoring the behavior of the network	2	2	3										2	-	
CO4	<b>Describe</b> network management for the management of telecommunication, which includes network, systems, operations and business services and management	2	2	3										2	-	
CO5	<b>Analyze</b> the various technologies of network management with respect to applications of broadband networks and the latest trends in management technology	2	2	2	3									3	-	
		2.2	2	2.6	3									2.2	-	

Course Title : Software Project Planning & Management			
Course Code : P15CS832	Semester : 8	L :T:P:H : 4:0:0:4	Credits: 3
Contact Period: Lecture: 52 Hr, Exam: 3 Hr		Weightage: CIE:50%, SEE:50%	

### Course Content

#### Unit-1

Metrics: Introduction, The Metrics Roadmap, A Typical Metrics Strategy, , Set Targets and track Them, Understanding and Trying to minimize variability, Act on data, People and Organizational issues in Metrics Programs, Common Pitfalls to watch out for in Metrics Programs, Matrices implementation checklists and tools, Software configuration management ,configuration status accounting, configuration audit, software configuration management in geographically distributed teams, software configuration management tools and automation.

10 Hours

### **Unit-2**

Risk Management: Introduction, risk management and its importance , Risk management cycle, Risk identification, Project Planning and Tracking Project Closure . An Effective Closure Process, Interfaces to the Process Database.

10 Hours

### **Unit -3**

Software Requirements gathering, Metrics for requirements phase. Estimation: Design and Development Phases: Some differences in our chosen approach, salient features of design, evolving an architecture/ blueprint, design for reusability, technology choices constraints, design to standards, design for portability, user interface issues, design for testability, design for diagnose ability, design for maintainability, design for install ability, inter-operability design, challenges during design and development phases, skill sets for design and development, metrics for design and development phases.

10 Hours

### **Unit-4**

Project management in the testing phase, Project management in the Maintenance Phase: Introduction, Activities during Maintenance Phase, management issues during Maintenance Phase, Configuration management during Maintenance Phase, skill sets for people in the maintenance phase, estimating size, effort, and people resources for the maintenance phase, advantages of using geographically distributed teams for the maintenance phase, metrics for the maintenance phase.

10 Hours.

### **Unit -5**

Globalization issues in project management, Impact of the internet on project management, the effect of internet on project management, managing projects for the internet, Effect on the project management activities. People focused process models: Growing emphasis on people centric models, people capability maturity model(P-CMM), other people focused models in the literature.

10 Hours

#### **Text Books:**

1. Ramesh Gopalaswamy: "Managing Global Projects ", Tata McGraw Hill, 2013.

#### **Reference Books:**

1. Watts Humphrey, "Managing the Software Process ", Pearson Education, New Delhi, 2000
2. Pankaj Jalote, "Software Project Management in practice", Pearson Ed., New Delhi, 2002.

#### **Course Outcomes:**

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

1. Evaluate a project to develop the scope of work, provide accurate cost estimates and to plan the various activities
2. Apply risk management analysis techniques that identify the factors that put a project at risk and to quantify the likely effect of risk on project timescales
3. Identify the resources required for a project and to produce a work plan and resource schedule
4. Monitor the progress of a project and to assess the risk of slippage, revising targets counteract drift
5. Use appropriate metrics to manage the software development outcome, develop research methods and techniques appropriate to defining, planning and carrying out a research project within your chosen specialist area within the management of software projects.

### CO-PO Mapping

Semester: 8	Course code : P15CS832							Title : Software Project Planning & Management						
Statement	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS 01	PS 02
Evaluate a project to develop the scope of work, provide accurate cost estimates and to plan the various activities	1	1		2		2			2		3	2	1	
Apply risk management analysis techniques that identify the factors that put a project at risk and to quantify the likely effect of risk on project timescales	1	1						1	2		2	1	1	1
Identify the resources required for a project and to produce a work plan and resource schedule	1	1		1					2	1	2		1	
Monitor the progress of a project and to assess the risk of slippage, revising targets counteract drift				2						2		3	1	
Use appropriate metrics to manage the software development outcome, develop research methods and techniques appropriate to defining, planning and carrying out a research project within your chosen specialist area within the management of software projects.	2			2					2		3			2

Course Title : Agile Technologies			
Course Code : P15CS833	Semester : 8	L :T:P:H : 4:0:0:4	Credits: 3
Contact Period: Lecture: 52 Hr, Exam: 3 Hr		Weightage: CIE:50%, SEE:50%	

### Course Content

#### Unit 1

INTRODUCTION : Software is new product development – Iterative development – Risk (Driven and Client (Driven iterative planning – Time boxed iterative development – During the Iteration, No changes from external stakeholders –Evolutionary and adaptive Development (Evolutionary requirements analysis – Early “Top Ten” high (level requirements and skilful analysis Evolutionary and adaptive planning – Incremental delivery – Evolutionary delivery – The most common mistake – Specific iterative and Evolutionary methods.

12 Hours

### **Unit 2**

AGILE AND ITS SIGNIFICANCE : Agile development – Classification of methods – The agile manifesto and Principles – Agile project management – Embrace communication and feedback – Simple practices and project tools – Empirical Vs defined and prescriptive Process – Principle(based versus Rule(Based – Sustainable discipline: The human touch – Team as a complex adaptive system – Agile hype – Specific agile methods. The facts of change on software projects –Key motivations for iterative Development – Meeting the requirements challenge iteratively – Problems with the Waterfall. Research evidence – Early historical project evidence – Standards (Body evidence – Expert and thought leader evidence – A Business case for iterative development – The historical accident of waterfall validity.

10 Hours

### **Unit 3**

AGILE METHODOLOGY : Method overview – Lifecycle – Work products, Roles and Practices values – Common mistakes and misunderstandings – Sample projects – Process mixtures – Adoption strategies – Fact versus fantasy – Strengths versus “Other” history.

10 Hours

### **Unit 4**

SCRUM : Concepts –deliverable and methods. XP: Concepts –deliverable and methods Unified process: Concepts- deliverable-methods.EVE: Concepts- Methods-deliverable. EVO: Method Overview, Lifecycle, Work Products, Roles and practices, Common mistakes and Misunderstandings, Sample Projects.

10 Hours

### **Unit 5**

AGILE PRACTICING AND TESTING : Project management – Environment – Requirements – Test – The agile alliances – The manifesto – Supporting the values – Agile testing – Nine principles and six concrete practices for testing on agile teams.

10 Hours

### **Course Outcomes**

1. Demonstrate a systematic understanding of current agile techniques and practices used in industry.
2. Apply industry standard agile techniques in develop software in a team.
3. Use group and individual retrospectives to critically evaluate and propose improvements in developing software in a professional context.
4. Apply concepts of XP and EVE in develop a software
5. Managing the changes applying different testing techniques

### **Text Books :**

1. Craig Larman “Agile and Iterative Development–A Manager’s Guide” Pearson Ed. - 2007
2. Elisabeth Hendrickson, “Agile Testing” Quality Tree Software Inc 2008.

### **Reference Book:**

1. Shore,”Art of Agile Development” Shroff Publishers & Distributors, 2007

**CO-PO Mapping**

Semester: 8		Course code : P15CS833					Title : Agile Technologies								
CO	Statement	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO S1	PO S2
CO 706.1	Understand the basic concepts of agile software process	3	2		2									2	
CO 706.2	Gain knowledge in the area of various agile methodologies	3	3	1	3	2				2				2	
CO 706.3	Construct agile software process		2	3	3	2						2		2	
CO 706.4	Apply principles of agile testing			3	2	2				2		2			1
CO 706.5	Assess product quality within an agile project	3	3		2	3				1		2			1
C706		3	2.5	2.3	2.4	2.25				1.66		2		2	1

Course Title : Business Intelligence & Applications			
Course Code : P15CS834	Semester : 8	L :T:P:H : 4:0:0:4	Credits: 3
Contact Period: Lecture: 52 Hr, Exam: 3 Hr		Weightage: CIE:50%, SEE:50%	

**Course Content**

**Unit-1**

**Introduction to Business Intelligence:** Business enterprise organization, Its functions, and core business processes, Key purpose of using IT in business, The connected world: Characteristics of Internet-Ready IT Applications, Enterprise Applications, Introduction to digital data and its types – structured, semi-structured and unstructured.

**Introduction to OLTP and OLAP:**

On-Line Transaction Processing (OLTP) and On-Line Analytical Processing (OLAP): Different, OLAP architectures, OLTP and OLAP, Data models for OLTP and OLAP

10 Hours

**Unit-2**

Role of OLAP tools in the BI architecture, OLAP performance directly on operational databases, A peek into the OLAP operations on multidimensional data, Leveraging ERP data using analytics.

**Getting started with business intelligence:** Using analytical information for decision support, Information sources before dawn of BI, Business intelligence (BI) defined, Evolution of BI and role of DSS, EIS, MIS and digital dashboards, Need for BI at virtually all levels, BI for past, present and future, The BI value chain, Introduction to business analytics.

10 Hours

**Unit-3**

**BI Definitions and concepts:** BI Component framework, Need of BI, BI Users, Business Intelligence applications, BI Roles and responsibilities, Best practices in BI/DW, The complete



BI professional, Popular BI tools.

**Basis of data integration:** Need for data warehouse, Definition of data warehouse, data mart, OSS, Raiph Kimball's approach vs. W.H.Inmon's approach, Goals of a data warehouse, constituents of a data warehouse, Extract, transform, load, data Integration, Data integration technologies, Data quality, Data profiling.

12 Hours

#### Unit-4

**Multidimensional data modeling:** Introduction, Data modeling basis, Types of data model, Data modeling techniques, Fact table, Dimension table, typical dimensional models, Dimensional modeling life-cycle, designing the dimensional model, Step-by-step lab guide to analyze data using MS Excel 2010

**Measures, metrics, KPIs, and Performance management:** Understanding measures and performance, Measurement system terminology, Navigating a business enterprise, role of metrics, and metrics supply chain, "Fact-Based Decision Making" and KPIs

10 Hours

#### Unit-5

KPI Usage in companies, business metrics and KPIs, Connecting the dots: Measures to business decisions and beyond

**Basics of enterprise reporting:** Reporting perspectives common to all levels enterprise, Report standardization and presentation practices, Enterprise reporting characteristics in OLAP world, Balanced scorecard, Dash boards and its creation, Scorecards vs. Dashboards, The buzz behind analysis, Step-by-step lab guide to create enterprise reports using MS Access.

10 Hours

#### Text Books:

1. "Fundamentals of Business Analytics" – By R N Prasad and Seema Acharya, Publishers: Wiley India.
2. David Loshin - Business Intelligence: The Savvy Manager's Guide, Publisher: Morgan Kaufmann

#### Reference Books:

1. Larissa T Moss and Shaku Atre – Business Intelligence Roadmap : The Complete Project Lifecycle for Decision Support Applications, Addison Wesley Information Technology Series
2. Brian Larson -Delivering Business Intelligence with Microsoft SQL Server 2005, McGraw Hill

#### Course Outcomes:

1. **Illustrate** role of business intelligence in the IT applications.
2. **Construct** OLAP operations to analyze business intelligence.
3. **Apply** various ETL techniques of data integration.
4. **Identify** data modeling technique to analyze data for a successful business enterprise.
5. **Construct** enterprise reports for various situations of a business enterprise.



**CO-PO Mapping**

Semester: 8		Course code : P15CS834		Title : Business Intelligence & Applications											
CO	Statement	PO 1	PO 2	PO 3	PO 4	P O	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1	To make students exposed with the basic rudiments of business intelligence system.	2	2												3
CO2	To provide knowledge about modeling aspects behind Business Intelligence	2	2												3
CO3	To provide knowledge about the business intelligence life cycle and the techniques used in it.	2	2												3
CO4	To make students be exposed with multidimensional data modeling techniques.				2	2									2
CO5	To provide knowledge about applying business intelligence methods to various situations.		2	2	2	2									2
C101		2	2	2	2	2									2.6

**OPEN ELECTIVE – II**

Course Title : Data Base Management Systems			
Course Code: P15CS841	Semester : 8	L:T:P: H - 4 : 0 : 0 : 4	Credits: 3
Contact Period : Lecture :52 Hr, Exam: 3Hr		Weightage :CIE:50% SEE:50%	

**Course content**

**Unit-1**

**INTRODUCTION :** An example: Characteristics of Database approach; Advantages of using DBMS approach; A brief history of database applications; Data models, schemas and instances; Three-schema architecture and data independence; Database languages and interfaces; The database system environment.

10 Hours

**Unit-2**

**ENTITY-RELATIONSHIP 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; ER Diagrams, Naming Conventions and Design Issues; Relationship types of degree higher than two.

10 Hours

### Unit-3

**RELATIONAL MODEL AND RELATIONAL ALGEBRA:** Relational Model Concepts; Relational Model Constraints and Relational Database Schemas; Update Operations, Transactions and dealing with constraint violations; Unary Relational Operations: SELECT and PROJECT; Relational Algebra Operations from Set Theory; Binary Relational Operations : JOIN and DIVISION; Additional Relational Operations; Examples of Queries in Relational Algebra; Relational Database Design Using ER- to-Relational Mapping.

11 Hours

### Unit-4

**STRUCTURED QUERY LANGUAGE :** SQL Data Definition and Data Types; Specifying basic constraints in SQL; Basic Retrieval Queries in SQL, INSERT, DELETE, and UPDATE Statements in SQL, More complex SQL Retrieval Queries.

11 Hours

### Unit-5

**DATABASE DESIGN:** 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; Multi valued Dependencies and Fourth Normal Form; Join Dependencies and Fifth Normal Form.

10 Hours

#### Text Books:

1. Fundamentals of Database Systems – Elmasri and Navathe, 6<sup>th</sup> Edition, Addison-Wesley, 2011

#### Reference Books:

1. **Data Base System Concepts** – Silberschatz, Korth and Sudharshan, 5<sup>th</sup> Edition, McGrawHill, 2006.
2. **An Introduction to Database Systems** – C.J. Date, A. Kannan, S.Swamynatham, 8<sup>th</sup> Edition, Pearson Education, 2006.
3. **Database Management Systems** – Raghu Ramakrishnan and Johannes Gehrke, 3<sup>rd</sup> Edition, McGraw-Hill, 2003.

### Course outcomes

At the end of the course the student should be able to

1. **Explain** the characteristics of data base management system
2. **Design** an ER model for a given example from real world description.
3. **Design** relational models for a given application using schema definition and constraints.
4. **Develop** complex queries using SQL to retrieve the required information from database.
5. **Apply** suitable normal forms to normalize the given database

**CO-PO Mapping**

Semester: 8			Course code P15CS841							Title : DBMS				
Statement	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
<b>Explain</b> the characteristics of data base management system	3	3	3	1					2		2	2		3
<b>Design</b> an ER model for a given example from real world description.	3	2	3	1					2		2	2		3
<b>Design</b> relational models for a given application using schema definition and constraints	3	3	3		2				2		2			3
<b>Develop</b> complex queries using SQL to retrieve the required information from database	2	2	2						2		2			2
<b>Apply</b> suitable normal forms to normalize the given database.	2	1	1											2

Course Title : Advanced Java			
Course Code : P15CS842	Semester : 8	L:T:P:H : 4:0:0:4	Credits: 3
Contact Period: Lecture: 52 Hr, Exam: 3 Hr		Weightage: CIE:50%, SEE:50%	

**Course Content**

**Unit-1**

**SWINGS-I** : Introduction, Hierarchy of Swing Classes, Javax Swing Packages, Swing Components and Classes, Adding Components to a Container, JLabel, JButton JRadioButton, JTextField, Border Classes class BevelBorder class EmptyBorder class MatteBorder Class EtchedBorder class LineBorder MatteBorder, Simple Application Programs.

10 Hours

**Unit-2**

**SWINGS II** : Introduction, Swing Components and Threads, Component Layout Manager Classes, BorderLayout, FlowLayout, GridLayout, CardLayout, BoxLayout , NullLayout, OverlayLayout, JTable, Constructors, Methods of class JTable JScrollBar JScrollPane JList JCheckBox JToolTip JSlider JTree Class adding Components to Multiple Panels Look and Feel of Graphical Components Simple Application Programs

10 Hours

**Unit-3**

**Java Database Connectivity** : Introduction JDBC Architecture Two-tier Architecture for Data Access Three-tier Architecture for Data Access Installing MySQL and MySQL Connector SQL Statements JDBC Environment Setup JDBC Connectivity Model and API Establishing JDBC Database Connections Load and Register the JDBC Driver Defining the Connection URL ResultSet Interface Navigating the ResultSet ResultSetMetaData interface Creating JDBC Application JDBC Batch Processing JDBC Transaction Management simple Application Programs

12 Hours

#### Unit-4

**Java Servlets :** Introduction HTTP Basics Life Cycle of a Servlet Servlet Architecture Setting up Web Server for Servlet Deployment Classes Defined in javax.servlet.http Package Interfaces Defined in javax.servlet.http Package Handling HTTP Request and Response Writing Servlet Reading Servlet Parameters Classes in javax.servlet Package Interfaces Defined in javax.servlet Package Session Tracking and Session Management Session Tracking Techniques Http Redirects in Servlets Securing Servlets Application Program .

10 Hours

#### Unit-5

**Java Beans :** Introduction to Java Beans Attributes of Beans Benefits of Using Beans Properties of a Bean Java Bean API Interfaces Classes of java.bean package (Java SE 8) Exceptions class Beans Class Methods class Property ChangeSupport JAR Files Creating a JAR file Viewing the contents of a JAR File Extracting the Files from JAR File Building Java Beans with NETBEAN IDE Building a Composite Component Bean Changing Properties of Components Adding Events and Event Listeners Source Code Generated by IDE

10 Hours

#### Text Book:

1. Java: One Step Ahead by Anita Seth, B.L.Juneja ,OXFORD University press - I Ed. 2017.

#### Reference Book:

1. Herbert Schildt, Java The Complete Reference, 9<sup>th</sup> Edition, Tata McGraw Hill.

#### Course Outcomes :

- CO1: Understand various swing components
- CO2: Apply layout managers supported by swing
- CO3: Learn java framework for building java beans
- CO4: Learn the concept of Servlet and its life cycle
- CO5: Develop programs using Java Database Connectivity

#### CO-PO Mapping

Semester: 8		Course code : P15CS842					Title : Advanced Java								
CO	Statement	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO -1	Understand various swing components	1	1	1											2
CO -2	Apply layout managers supported by swing	2	2	2		2	2	2							2
CO -3	Learn java framework for building java beans	2	2	2		2	2	2							2
CO- 4	Learn the concept of Servlet and its life cycle	2	2	2			2	2							2
CO -5	Develop programs using Java Database Connectivity	2	2	2		2	2	2							2
		2	2	2		2	2	2							2

Course Title : Unix and Shell Programming			
Course Code : P15CS843	Semester : 8	L:T:P:H : 4:0:0:4	Credits: 3
Contact Period: Lecture: 52 Hr, Exam: 3 Hr		Weightage: CIE:50%, SEE:50%	

### Course Content

#### **Unit-1**

**Background and Basic Commands :** Brief history, Salient features of a UNIX System, The UNIX Architecture. Introduction to Linux Operating System, Internal and External Commands, Introduction to system administration, man: Browsing and Manual Pages On-line, cal: The Calendar, date: Displaying and System Date, echo: Displaying a Message, printf: An Alternative to echo, bc: The Calculator, script: Recording Your Session, passwd: Changing Your Password, who, uname: Knowing Your Machine's Characteristics, tty: Knowing Your Terminal, stty: Displaying and Setting Terminal Characteristics

10 Hours

#### **Unit-2**

**The FILE System and FILE handling Commands :** The File, The Parent-Child Relationship, The HOME Variable: The Home Directory, pwd: Checking Your Current Directory, cd: Changing the Current Directory, mkdir: Making Directories, rmdir: Removing Directories, Absolute Pathnames, Relative Pathnames, ls: Listing Directory Contents, The UNIX File System. cat: Displaying and Creating Files, cp: Copying a File, rm: Deleting Files, mv: Renaming Files, more: Paging Output, The lp Subsystem: Printing a File, file: Knowing the File Types, wc: Counting Lines, Words and Characters, od: Displaying Data in Octal, The spell and ispell, cmp: Comparing Two Files

10 Hours

#### **Unit-3**

**FILE Attributes :** ls -l: Listing File Attributes, The d Option: Listing Directory Attributes, File Ownership, File Permissions, chmod: Changing File Permissions, Directory Permissions, Changing File Ownership. File Systems and Inodes, Hard Links, Symbolic Links and ln, The Directory, umask: Default File and Directory Permissions, Modification and Access Times, find: Locating Files, Converting One File to Other, dos2unix and unix2dos: Converting between DOS and UNIX, Compressing Files, gzip, gunzip, zip and unzip commands, tar command

10 Hours

#### **Unit-4**

**The Process :** Process Basics, ps: Process Status, System Processes, Mechanism of Process Creation, Internal and External Commands, Running Jobs in Background, nice: Job Execution With Low Priority, Killing Processes with Signals, Job Control, at and batch: Execute Later, cron: Running Jobs Periodically, time: Timing Processes

**Simple Filters :** The Sample Database, pr: Paginating Files, head: Displaying the Beginning of a File, tail: Displaying the End of a File, cut: Slitting a File Vertically, paste: Pasting Files, sort: Ordering a File, uniq: Locate Repeated and Non repeated Lines, tr: Translating Characters, An Example: Displaying a Word-count List

10 Hours

#### **Unit-5**

**SHELL Programming :** The Shell's Interpretive Cycle, Pattern Matching The Wild-cards,

Escaping and Quoting, Redirection: The Three Standard Files, /dev/null and /dev/tty: Two Special Files, Pipes, tee: Creating a Tee, Command Substitution, Shell Variables, Environment Variables, Aliases (bash and ksh), Command History (bash and ksh). Shell Scripts, read and read-only commands, Using Command Line Arguments, exit and Exit Status of Command, The Logical Operators && and || -Conditional Execution, The if Conditional, Using test and [ ] to Evaluate Expressions, The case Conditional, expr: Computation and String Handling, \$?: Calling a Script by Different names, while: Looping, for: Looping with a List, set and shift: Manipulating the Positional Parameters, The here Document (<<), trap: Interrupting a Program, Debugging Shell Scripts with set -x, export: Exporting Shell Variables, eval: Evaluating Twice, The exec Statement. Development of simple shell scripts to demonstrate the integer and real arithmetic operations, handling of positional parameters, the use of branching and looping constructs in the shell, handling of signals using the trap etc.

12 Hours

**Text Book:**

1. UNIX Concepts and Applications by Sumitabha Das, 4 edition, Tata McGraw Hill, 01-May-2006.

**Reference Books:**

1. Terrence Chan: UNIX System Programming Using C++, First edition, Prentice Hall India, 2011.
2. W. Richard Stevens: Advanced Programming in the UNIX Environment, Second Edition, Pearson education, 2011

**Course Outcomes**

1. **Apply** the commands on files and directories to manage UNIX file system
2. **Demonstrate** the commands to apply filters using regular expressions for text processing.
3. **Develop** shell scripts for simple applications.
4. **Compare** different types of file supported by UNIX operating system.
5. **Analyze** process control, daemon characteristics, job control.

**CO-PO mapping**

Semester: 8		Course code : P15CS843		Title : Unix and Shell Programming											
CO	Statement	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO-1	Apply the commands on files and directories to manage UNIX file	3	3	2	2	2				2			2	2	3
CO-2	Demonstrate the commands to apply filters using regular expressions for text processing	2	2	2										2	3
CO-3	Develop shell scripts for simple applications	2	2	3	2					2				2	3
CO-4	Compare different types of file supported by UNIX operating system	3	2											2	2
CO-5	Analyze process control, daemon characteristics, job control.	3	2											2	2
		2.6	2.2	2.3	2	2				2			2	2	2.6

Course Title : Foundations to Information Technology			
Course Code : P15CS844	Semester : 8	L :T:P:H : 4:0:0:4	Credits: 3
Contact Period: Lecture: 52 Hr, Exam: 3 Hr		Weightage: CIE:50%, SEE:50%	

### Course Content

#### **Unit-1**

**Introduction to Data structures :** Definition, Classification of Data Structures

**Stacks :** Representing stack in C, Implementation of push, pop and display operations using arrays, Infix, Postfix, Prefix expressions

**Ordinary Queue :** Representing queues in C, Implementation of basic operations on ordinary queue

**Singly Linked List :** Basic operations on SLL: Insert front & rear; delete front & rear; display  
10 Hours

#### **Unit-2**

**Relational Database Management System :** Database: Introduction, An example, Relational model concepts: Domains, Attributes, Tuples, and Relations, Characteristics of Relations, Relational Model Notation; Relational Databases and Relational Database Schemas, Integrity, Referential Integrity, and Foreign Keys, Insert Operation, Delete Operation, Update Operation, Transaction Concept  
10 Hours

#### **Unit-3**

**Structured Query Language (SQL) :** SQL Data Definition and Data Types, Specifying Constraints in SQL, Basic Retrieval Queries in SQL, INSERT, DELETE, and UPDATE Statements in SQL  
11 Hours

#### **Unit-4**

**Software Engineering Fundamentals :** Software Engineering definition, software process models, process activities, coping with change, the rational unified process, agile methods, plan-driven and agile development  
10 Hours

#### **Unit-5**

**Object Oriented modelling with UML :**

**Introduction:** Object Orientation, OO development, OO themes

**Modelling Concepts:** Modelling, abstraction, the three models

**Class Modelling:** Object and class concepts, Link and associations concepts, Generalization and Inheritance, A sample class model

**Advanced Class Modelling:** Advanced object and class concepts, Association ends, N-ary associations, Aggregation

**State Modelling:** Events, States, Transitions and Conditions, State diagrams, State diagram behaviour

**Interaction Modelling:** Use case models, Sequence models, Activity models.  
11 Hours



**Text Books :**

1. Data Structures using C and C++ by Yedidyah Langsam and Moshe J. Augenstein and Aaron M. Tenenbaum, PHI, 2<sup>nd</sup> Edition.
2. Fundamentals of Database Systems – Elmasri and Navathe, 6th Edition, Addison-Wesley, 2011
3. Software Engineering – Ian Sommerville, 10th Edition, 2016, Pearson
4. Michael Blaha, James Rumbaugh: Object-Oriented Modeling and Design with UML, 2nd Edition, Pearson Education, 2005.

**Reference Books :**

1. Fundamentals of Data Structures in C - Horowitz, Sahani, Anderson-Freed, Second Edition, University Press, 2<sup>nd</sup> Edition. Understand primitive and derived data structure.
2. Database Management Systems – Raghu Ramakrishnan and Johannes Gehrke – 3rd Edition, McGraw-Hill, 2003.
3. Software Engineering: A Practitioners Approach - Roger S. Pressman, 7th Edition, McGraw-Hill, 2007.

**Course Outcomes**

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

1. Design and implement data structures like stack, queues and singly linked lists
2. Design relational models for a given application using schema definition and constraints.
3. Develop queries using SQL to retrieve the required information from database.
4. Explain the various types of software process models.
5. Apply object oriented modelling with UML for developing applications.

**IO-PO Mapping**

Semester: 8		Course code : P15CS844			Title : Foundations to Information Technology											
CO	Statement	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	
CO1	Design and implement data structures like stack, queues and singly linked lists	2														
CO2	Design relational models for a given application using schema definition and constraints.	2	1												1	
CO3	Develop queries using SQL to retrieve the required information from database.	1	2												1	
CO4	Explain the various types of software process models.	1														
CO5	Apply object oriented modelling with UML for developing applications.	1				1										
CO		1.4	1.5			1									1	