SYLLABUS

(WITH EFFECT FROM 2018 -19)

ಪಠ್ಯಕ್ರಮ

(ಶೈಕ್ಷಣಿಕ ವರ್ಷ 2018–19)

VII to VIII Semester

Bachelor Degree

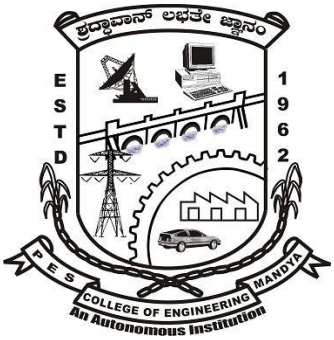
In

COMPUTER SCIENCE & ENGINEERING

OUT COME BASED EDUCATION

WITH

CHOICE BASED CREDIT SYSTEM



P.E.S. College of Engineering

Mandya - 571 401, Karnataka

(An Autonomous Institution Affiliated to VTU, Belagavi)

Grant -in- Aid Institution

(Government of Karnataka)

Accredited by NBA, New Delhi

Approved by AICTE, New Delhi.

ಪಿ.ಇ.ಎಸ್. ತಾಂತ್ರಿಕ ಮಹಾವಿದ್ಯಾಲಯ

ಮಂಡ್ಯ–571 401, ಕರ್ನಾಟಕ

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

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PREFACE

P.E.S. 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 Six Postgraduate programs. It consists of four 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, Personality Development modules and Technical Skills have been added to the existing curriculum of the academic year 2018-19. Internship have been made compulsory to enhance the field experience. In order to enhance creativity and innovation Technical Stills and Skill Oriented Lab are included in all undergraduate programs.

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

Dr. R.Girisha
Dean (Academic)
Professor,
Dept. of CS & 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.

VII – Semester										
Sl. No.	**Course Code**	**Course Title**	**Teaching department**	**Hrs / Week**			**Credits**	**Examination Marks**		
				L	**T**	**P**		**CIE**	**SEE**	**Total**
1	P18CS71	Machine Learning	CSE	4	-	-	4	50	50	100
2	P18CS72	Multicore Architecture & Parallel Programming	CSE	4	-	-	4	50	50	100
3	P18CS73	Cryptography & Network Security	CSE	4	-	-	4	50	50	100
4	P18CS74X	Professional Elective - III	CSE	2	2	-	3	50	50	100
5	P18CSO75X	Open Elective – II	CSE	3	-	-	3	50	50	100
6	P18CSL76	Parallel Programming Laboratory	CSE	-	-	3	1.5	50	50	100
7	P18CSL77	Machine Learning Laboratory	CSE	-	-	3	1.5	50	50	100
8	P18CS78	Project Work Phase – I and Project seminar	CSE	-	-	4	2	100	-	100
Total							23	450	350	800

List of Electives

Professional Elective - III			Open Elective – II		
Sl. No	**Course Code**	**Course title**	**Sl. No.**	**Course Code**	**Course title**
1.	P18CS741	Full Stack Development with MERN	1.	P18CSO751	OOPS With Java
2.	P18CS742	Managing Big Data	2.	P18CSO752	Mobile Application Development
3.	P18CS743	Wireless Sensor Network	3.	P18CSO753	Data Analytics
4.	P18CS744	Cyber Security	4.	P18CSO754	Artificial Intelligence

VIII – Semester										
Sl. No.	**Course Code**	**Course Title**	**Teaching department**	**Hrs / Week**			**Credits**	**Examination Marks**		
				L	**T**	**P**		**CIE**	**SEE**	**Total**
1	P18CS81	Software Project Management	CSE	4	-	-	4	50	50	100
2	P18CS82X	Professional Elective - IV	CSE	2	2	-	3	50	50	100
3	P18CS83	Internship	CSE			-	2	50	50	100
4	P18CS84	Project Work Phase – II	CSE	-	-	-	6	100	100	200
5	P18CS85	Self-study course & Seminar	CSE	-	-	4	2	50	-	50
Total							17	300	250	550

Professional Elective - IV		
Sl. No	**Course Code**	**Course title**
1.	P18CS821	Deep Learning
2.	P18CS822	Network Management System
3.	P18CS823	Business Intelligence & Applications
4.	P18CS824	Agile Technologies

Course Title : Machine Learning			
Course Code : P18CS71	**Semester : VII**	**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 AND CONCEPT LEARNING : Learning Problems – Designing, Learning systems, Perspectives and Issues – Concept Learning –Concept learning task, Concept learning as search, Find-S,Version Spaces and Candidate Elimination Algorithm, Inductive Bias.
Self-study Component: Problems and Case Study on Find –S algorithm

11 Hours

Unit-2

DECISION TREE LEARNING AND ARTIFICIAL NEURAL NETWORK: Representation – Algorithm, appropriate problems for Decision Tree learning, Basic Decision Tree Algorithm, Hypothesis Sapace Search, Artificial Neural Network- Introduction, Neural Network Representation – Problems – Perceptrons
Self-Study Component: Problems on Decision Tree Algorithm

11 Hours

Unit-3

BAYESIAN LEARNING: Bayes Theorem, Concept Learning, Maximum Likelihood, Minimum Description Length Principle, Bayes Optimal Classifier, Gibbs Algorithm, Naïve Bayes Classifier. Problems on Naïve Bayes Classifier
Self-Study Component: Problems on Naïve Bayes Classifier

10 Hours

Unit-4

INSTANT BASED LEARNING: K- Nearest Neighbor Learning –Locally Weighted Regression – Radial Basis Functions –Case- Based Reasoning
Self-Study Component: Problems on K- Nearest Neighbor

10 Hours

Unit-5

LEARNING SET OF RULES: Sequential covering algorithms, Learning Rule Sets, Learning First Order Rules, Learning Sets of First Order Rules, Induction as Inverted Deduction, Inverting Resolution
Self-Study Component: Problems on Sequential covering algorithms

10 Hours

Text book:

1. Tom M. Mitchell, “Machine Learning”, McGraw-Hill Education (INDIAN EDITION), 2013

Reference Books:

1. EthemAlpaydin, “Introduction to Machine Learning”, 2nd Ed., PHI Learning Pvt. Ltd., 2013. 2.
2. T. Hastie, R. Tibshirani, J. H. Friedman, “The Elements of Statistical Learning”, Springer; First edition, 2001

Course Outcomes:

1. Students can Understand the different learning models
2. Students can Analyze the different machine learning algorithm
3. Students can build their own models using machine learning models
4. Students can know the methods and approaches to handle the machine learning algorithm
5. Students can develop various learning methods

CO-PO Mapping

Semester : 7	**Course code : P18CS71**						**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**
CO -1	Students can Understand the different learning models	2	2	2	2	2	2								2
CO-2	Students can Analyze the different machine learning algorithm	2	2	2	1	2	2								2
CO-3	Students can build their own models using machine learning models.	2	2	3	2	2	2	2							2
CO-4	Students can know the methods and approaches to handle the machine learning algorithm	1	2	3	2	2	3	3							2
CO-5	Students can develop various learning methods	1	2	3	2	2	3	3							2

Course Title : Multi-Core Architecture & Parallel Programming			
Course Code : P18CS72	**Semester : VII**	**L:T:P:H : 4:0:0:4**	**Credits: 4**
Contact Period: Lecture: 52 Hrs, Exam: 3 Hrs		**Weightage: CIE: 50%, SEE:50%**	

Prerequisites: Knowledge of Computer Architecture.

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

Self-Study Component: 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, Implementation-dependent Threading Features

Self-Study Component: Flow Control- based Concepts, Fence, Barrier.

11 Hours

Unit-3

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

Self-Study Component: Thread Synchronization, Signaling.

10 Hours

Unit-4

Open MP: A Portable Solution for Threading : Challenges in Threading a Loop, Loop carried 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 Open MP, Compilation, Debugging, performance

Self-Study Component: Open MP Library Functions, Open MP Environment Variables.

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, Groups and Communicators.

Self-Study Component: Collective Communication and Computation Operations.

10 Hours

Text Books:

1. Multicore Programming, Increased Performance through Software Multi-threading by Shameem Akhter and Jason Roberts , Intel Press , 2006
2. Introduction to Parallel Computing (2nd Edition) by Ananth Grama, George Karypis, Vipin Kumar and Anshul Gupta, Pearson Publications, 2007.

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
3. Michael J.Quin "Parallel Programming in C with MPI and Open MP", McGraw Hill, 2004

Course outcomes: The students shall able to:

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

CO-PO Mapping

Semester: 7		Course code : P17CS72					Title : Multi-Core Architecture & Parallel programming								
CO'S	**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	**Analyze** the salient features of different multi-core architectures	2												1	
CO2	**Define** fundamental concepts of parallel programming and its design issues	3	2											2	
CO3	**Compare** the different threading API"S	3	2											2	
CO4	D**emonstrate** the role of OpenMP and programming concept	2	2	3	2	1				2				2	
CO5	**Analyse and Implement** MPI programs	2	3	2										1	

Course Title : Cryptography & Network Security			
Course Code : P18CS73	**Semester : VII**	**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

Computer & Network security Concepts: Computer Security concepts, security attacks, security services, Security Mechanisms **Classical Encryption Techniques** Symmetric Cipher Model, substitution Techniques, Transposition Techniques, Rotor Machine, Steganography, **Block Ciphers and the data encryption standard**: Traditional block Cipher structure, stream Ciphers and block Ciphers, The data encryption standard, A DES example, The strength of DES, Black cipher design Principals,

Self Study Component**:** A model for Network security.

10 Hours

Unit-2

Public-Key Cryptography and RSA: Principles of public-key cryptosystems. The RSA algorithm, description of the algorithm, computational aspects, the security of RSA. **Other Public-Key Cryptosystems**: Diffie-hellman key exchange, Elgalmal Caryptographic System, Elliptic Curve Arithmetic, Psedorandom Number generation Based on asymmetric cipher.

Self Study Component: Elliptic curve Cryptography

11 Hours

Unit-3

Key Management and Distribution: Symmetric key distribution using Symmetric encryption, Symmetric key distribution using Asymmetric encryption, Distribution of Public Keys,X-509 certificates, Public Key Infrastructure, **User Authentication**: Remote user Authentication principles, Remote user Authentication Using Symmetric Encryption, Kerberos, Remote user Authentication using Asymmetric encryption, Federated Identity Management.

Self Study Component: Personal Identity Verification.

10 Hours

Unit-4

Network Access Control & Cloud Security: Network Access Control, Extensaible Authentication Protocol, Cloud Security Risk and Countermeasures, Transport Level Security: Web Security Consideration, Transport Layer security, HTTPS, Secure shell(SSH), Wireless Security, Mobile Device Security, IEEE 802.11 Wireless LAN Overview, IEEE 802.11 Wireless LAN Security.

Self Study Component: Cloud Security as a Service. **10 Hours**

Unit-5

Electronic Mail Security: Internet Mail Architecture, Email Formats, Email threats and Comprehensive Email Security, S/MIME, Pretty Good Privacy, DNSEC. **IP Security**: IP Security overview, IP Security Policy, Encapsulating Security payload, Combining Security Associations, Internet Key Exchange.

Self Study Component: Cartographic Suits.

11 Hours

Textbook:

1. William Stallings: Cryptography and Network Security, Pearson 7th edition, 2014.

Reference Book:

1. V K Pachghare: Cryptography and Information Security, PHI, 2nd Edition.

Course Outcomes:

1. Define cryptography and its principles
2. Explain Cryptography algorithms
3. Illustrate Public and Private key cryptography
4. Understand Key management, distribution and certification
5. Implementation authentication protocols and analyze IPSec

CO-PO Mapping

Semester : 7th	**Course code** : P18CS73						**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**
CO1	Define cryptography and its principles	2				2								2	
CO2	Explain Cryptography algorithms	2	2		2									2	
CO3	Illustrate Public and Private key cryptography	2	2	2	2	2	2							3	
CO4	Understand Key management, distribution and certification	3		2	2	2	2	3						3	
CO5	Implementation authentication protocols and analyze IPSec	3		3	2		3	3						2	

Course Title : Full Stack Development with MERN			
Course Code: P18CS741	**Semester : VII**	**L:T:P:H: 2:2:0:4**	**Credits: 3**
Contact Period : Lecture : 52Hr, Exam: 3Hr		**Weightage : CIE: 50% SEE: 50%**	

Preamble:

MERN Stack: MERN Stack is a Javascript Stack that is used for easier and faster deployment of full-stackweb applications. MERN Stack comprises of 4 technologies namely: MongoDB, Express, React and Node.js. It is designed to make the development process smoother and easier.

Each of these 4 powerful technologies provides an end-to-end framework for the developers to work in and each of these technologies play a big part in the development of web applications.

Prerequisite:

1. Java Programming
2. Database Management System

Course Objectives: Learners are exposed to

1. To design as web page using front end technologies
2. To develop application with server side scripting tools
3. To develop web application with REST APIs and use of framework to communicate client-server applications.
4. To build as responsive web application with managing SQL databases.

Course Outcomes:

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

1. Demonstrate basic concepts of react, node, express and mongodb technologies
2. Design front end application using React and Redux libraries.
3. Develop interactive web applications on server side with NOSQL databases.
4. Build responsive web application communicating with RES API and managing data with NOSQL databases.
5. Build an HTTP server using the core modules in Node.js

Course Content

Unit-1

MERN: MERN components, necessity of MERN: Introduction to React: Welcome to React: Obstacles and Roadblocks, React future, working with the files. Fundamentals of React, Installation, getting started hello world program, Lifecycle of Components

Self Study Component: Understanding Functional & Class Components Passing Data

10 Hours

Unit-2

React Components and Redux : React Props, React state-setting state, Event handling, Designing components-state vs props .An Introduction to Redux- Core Concepts, Reducer, Action, Action Creator, Combining Reducers, Store.

Self Study Component: Data Flow in Redux, Usage with React **10 Hours**

Unit-3

Programming in Node.js : Node.js Installation –getting started, Control flow, asynchronous pattern callback, Sequential functionality, nested callbacks and exception handling, asynchronous patterns and control flow. Routing Traffic, Serving Files and Middleware:
Self Study Component: Building a Simple Static File Server from Scratch, Routers and Proxies

11 Hours

Unit-4

Expressing REST APIs: REST-HTTP Methods as actions, Express-Routing, Handler Functions, The List API-automatic Server Restart, testing, Create API, Error Handling.
Self Study Component: Exercise: The List API, create API & error handling

10 Hours

Unit-5

Introduction to MongoDB: -Installation-Databases, Data Types, Using MongoDB Shell. Creating, Updating, Deleting and Querying Documents: Inserting, removing, and updating the documents. Scheme Initialization,
Self Study Component: Reading and writing to Mongodb.

11 Hours

Text Books:

1. VasanSubramanian , "ProMERN Stack",Apress,2018.
2. Tomasz Dyl Kamil Przeorski, "Mastering Full-Stack React Web Development", 2017 Packt Publishing

Reference Books:

1. Eddy Wilson IriarteKoroliova ,"MERN-Full stack Development", Packt Publishing Ltd.,2018
2. ShamaHoque, "Full stack React Projects", Pack Publishing Ltd., 2018.

CO-PO Mapping

Semester : 7th	**Course code : P18CS741**				**Title : Full Stack Development with MERN**										
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	Demonstrate basic concepts of react, node, express and mongodb technologies		1	2		2						2			2
CO-2	Design front end application using React and Redux libraries.		1	2		2						2			2
CO-3	Develop interactive web applications on server side with NOSQL databases.		1	2		2						2			2
CO-4	Build responsive web application communicating with RES API and managing data with NOSQL databases.		1	2		2						2			2
CO-5	Build an HTTP server using the core modules in Node.js		1	2		2						2			2

Course Title : Managing Big Data			
Course Code : P18CS742	**Semester : VII**	**L:T:P:H: 2:2:0:4**	**Credits: 3**
Contact Period: Lecture: 52 Hr, Exam: 3 Hr		**Weightage: CIE: 50%, SEE: 50%**	

Course Content

Unit-1

UNDERSTANDING BIG DATA: Introduction to Big Data, Data Storage and Analysis, Comparison with Other Systems, Convergence of Key Trends, Unstructured Data, Industry Examples of Big Data: Big Data and Marketing, Fraud and Big Data, Risk and Big Data, Big Data and Algorithmic Trading, Big Data and Healthcare, Big Data in Medicine.
Big Data Technologies: Open Source Technologies, Mobile Business Intelligence (Mobile BI), Crowd Sourcing Analytics, Inter and Trans Firewall Analytics.
Self Study Component: Cloud and Big Data

11 Hours

Unit-2

NOSQL DATA MANAGEMENT: Introduction to NoSQL, Aggregate Data Models: Aggregates, Key-value and Document Data Models, Relationships, Graph Databases, Schemaless Databases, Materialized Views, Distribution Models: Sharding, Version Stamps, Map Reduce, Partitioning and Combining, Composing Map-Reduce Calculations.
Self Study Component**:** Aggregation.

10 Hours

Unit-3

BASICS OF HADOOP: Data Format, Analyzing Data with Hadoop, Scaling Out, Data Flow, Hadoop Streaming, Hadoop Pipes, Design of Hadoop Distributed File System (HDFS), HDFS Concepts: Blocks, Namenodes(NN) and Datanodes(DN), HDFS High-Availability,Hadoop I/O: Data Integrity, Compression, Serialization, File-based data structures.
Self Study Component: Reading Data from a Hadoop URL

10 Hours

Unit-4

MAP-REDUCE APPLICATIONS: Map-Reduce Workflows: Decomposing a Problem into MapReduce Jobs, Job Control, Unit tests with MRUnit: Mappers Testing, Reducers Testing, Integration Testing, Test Data and Local Tests, Anatomy of MapReduce job run, Failures in classic Map-reduce and YARN, Job scheduling, Shuffle And Sort: The Map Side, The Reduce Side, Configuration Tuning, Task Execution: The Task Execution Environment, Speculative Execution, Output Committers, Task JVM Reuse, Skipping Bad Records, MapReduce Types: Input Formats, Output Formats.
Self Study Component :Apache Oozie

11 Hours

Unit-5

HADOOP RELATED TOOLS: HBase: Data Model and Implementations, Hbase Clients, Hbase Examples, Praxis: Versions, HDFS, UI, Metrics, Schema Design, Counters, Bulk Load, Cassandra, Cassandra data model: Cassandra Examples, Cassandra Clients, Hadoop Integration,

Pig: Grunt, Pig Data Model, Pig Latin, Hive Data Types and File Formats: HiveQL Data Definition, HiveQL Data Manipulation, HiveQL Queries.
Self-Study Component: Developing and Testing Pig Latin Scripts

10 Hours

Text Book:

1"Managing Big Data" by: Dr. Chandrakanth Naikodi, Vikas Publishing House, 2015.

Reference Books:

1. Big Data, Black book, DT Editorial Service, Reprint 2017.
2. Hadoop, The Definitive Guide By Tom White, O'Reilly Publication 2016.

Course Outcomes: The students shall able to:

1. Understand basics of Big Data
2. Demonstrate NoSQL data management
3. Analyze HDFS file system
4. Evaluate map-reduce Jobs scheduling
5. Use Hadoop tools for applications.

CO-PO Mapping

Semester : 7th	**Course code : P18CS742**						**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	Understand basics of Big Data	2	2	2	1	1									2
CO-2	Demonstrate NoSQL data management		2		2	2									2
CO-3	Analyze HDFS file system	1	2	3											2
CO-4	Evaluate map-reduce Jobs scheduling	1	2	2	2	2									2
CO-5	Use Hadoop tools for applications	2	3	3	3	3									3

Course Title : Wireless Sensor Network			
Course Code: P18CS743	**Semester :VII**	**L:T:P:H: 2:2:0:4**	**Credits : 3**
Contact Period : Lecture :52 Hr	**Exam: 3 Hrs Weightage :CIE:50% SEE:50%**		

Course Content

Unit-1

Introduction: The Vision of Ambient Intelligence, Application Examples, Types of applications, Challenges for WSNs, Enabling Technologies for wireless sensor networks. **Single-node architecture:** Hardware components, Operating systems: and execution environments: Embedded OS, Programming paradigms and application programming interfaces. **Network Architecture:** Sensor network scenarios, Optimization goals and figures of merit, Design principles for WSNs: Distributed organization, data centricity, Gateway concepts.
Self Study Component: In-network processing

11 Hours

Unit-2

Physical Layer: Introduction, Spread spectrum communications: Packet transmissions and synchronization, quality of wireless channels and measures for improvement. **MAC protocols:** Fundamentals of MAC protocols: Requirements and design constraints for wireless MAC protocols, important classes of MAC protocols. **MAC Protocols for WSNs:** LEACH. IEEE802.15.4 MAC protocol
Self Study Component: SMAC protocol

10 Hours

Unit-3

Routing protocols: The many faces of forwarding and routing, Gossiping and agent based unicast forwarding – Basic idea, Randomized forwarding, Random walks, Energy efficient unicast: Multipath Unicast routing, **broadcast and Multicast:** Overview, Mesh-based Protocols, Mobile nodes.
Self Study Component: Geographic routing

11 Hours

Unit-4

Data-centric and content-based networking: Introduction, Data-centric routing, Data aggregation, Data-centric storage. **Localization and Positioning:** Properties of localization and positioning procedures, possible approaches, Mathematical basics for the lateration problem, Single hop localization.
Self Study Component: Positioning in multi-hop environments, Impact of anchor placement.

10 Hours

Unit-5

Future Trends in Wireless Sensor Networks: Introduction ,Wireless Multimedia Sensor Networks ,Applications of Wireless Multimedia Sensor Networks ,Design of Wireless Multimedia Sensor Networks ,Ultra-Wideband Technology ,Cross-Layer Design, Wireless Sensor and Actor Networks ,Applications of Wireless Sensor and Actor Networks , Sensor and Actor Coordination ,Sensor–Actor Coordination ,Actor–Actor Coordination,Underwater Acoustic Sensor Networks ,Differences from Terrestrial Sensor Networks ,Factors Influencing

the Design of Underwater Protocols ,Communication Architectures ,Wireless Underground Sensor Networks , Experimental Setup, Physical Environment , MicaZ Wireless Sensor Motes, Software Design, Experimental Results.
Self Study Component: Sensor Network Applications in Challenging Environments,

10 Hours

Text Books:

1. Holger Karl, Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks", 2013, Wiley Publications
2. Jun Zheng, Abbas Jamalipour,"WIRELESS SENSOR NETWORKS A Networking Perspective", A JOHN WILEY & SONS, INC., PUBLICATION, ISBN: 978-0-470-16763-2

Reference Books:

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

Course Outcomes:

1. Explain Fundamental Concepts, applications and network architectures of WSN.
2. Describe the physical layer and MAC protocol concepts for communication in WSN.
3. Analyze the different routing protocols and issues.
4. Describe data centric techniques, positioning and localization algorithms.
5. Explain the future trends in WSN.

CO-PO Mapping

Semester: 7th	**Course code : P18CS743**						**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**
CO1	Explain Fundamental Concepts, applications and network architectures of WSN.	2	1	2									1	2	
CO2	Describe the physical layer and MAC protocol concepts for communication in WSN	2	2	1									1	2	
CO3	Analyze the different routing protocols and issues	2	2	1									1	2	
CO4	Describe data centric techniques, positioning and localization algorithms	2	2	1									1	2	
CO5	Explain the future trends in WSN	2	2	1									1	2	
		2	**1.8**	**1.2**									**1**	**2**	

Course Title : Cyber Security			
Course Code: P18CS744	**Semester : VII**	**L:T:P:H: 2:2:0:4**	**Credits: 3**
Contact Period : Lecture :52 Hr, Exam: 3Hr		**Weightage :CIE:50% SEE:50%**	

Prerequisites:

1. Basic fundamental knowledge of computers, Internet and network.
2. Information and network security

Relevance of the course:

1. Cyber security course covers the fundamental concepts underlying the construction of secure systems from hardware to software to the human-computer interface with the use of cryptography to secure interactions.
2. Students will develop a way of thinking i.e security- oriented better understanding how to think about adversaries and how to build systems that defend against them

Course Content

Unit-1

INTRODUCTION TO CYBERCRIME : Introduction, Cybercrime definition and origins of the word, Cybercrime and information security, who are Cybercriminals, Classifications of cybercrimes, Cybercrime: The legal perspectives, Cybercrimes: An Indian perspective, Cybercrime and the Indian ITA 2000.

CYBEROFFENSES: HOW CRIMINALS PLAN THEM : Introduction**,** How criminal plan the attacks, Social Engineering, Cyber stalking, Cybercafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack vector.

Self Study Component **:** Cloud computing

10 Hours

Unit-2

CYBERCRIME : MOBILE AND WIRELESS DEVICES : Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication Service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile Devices-Related Security Issues.

TOOLS AND METHODS USED IN CYBERCRIME : Introduction**,** Proxy Servers and Anonymizers, Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow.

Self Study Component : Attacks on Wireless Networks.

11 Hours

Unit-3

PHISHING AND IDENTITY THEFT: Introduction, Phishing, Identity Theft (ID Theft).
CYBERCRIMES AND CYBERSECURITY: THE LEGAL PERSPECTIVES: Introduction, Why do we need Cyber law: The Indian Context, The Indian IT Act, Challenges to Indian Law and cybercrime scenario in India, Digital Signature and the Indian IT Act, Amendments to the Indian IT Act, Cybercrime and Punishment, Cyber law.
Self-Study Component: Technology and Students: Indian Scenario

10 Hours

Unit-4

UNDERSTANDING COMPUTER FORENSICS: Historical Background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber forensics and Digital Evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Chain of Custody Concept, Network Forensics, Approaching a Computer Forensics. Investigation, Setting of a Computer Forensics Laboratory: Understanding the Requirements, Computer Forensics and Steganography, Relevance of the OSI 7 Layer Model to the Computer Forensics and Social Networking Sites: The Security/Privacy Threats.
Self Study Component : Forensics Auditing

10 Hours

Unit-5

FORENSICS OF HAND HELD DEVICES : Introduction, Understanding cell phone working characteristics, Hand-held devices and digital forensics, Toolkits for handheld device forensics, forensics of iPods and digital music devices, Techno legal challenges with evidence from handheld devices, Organizational guidelines on cell phone forensics.
CYBERSECURITY: ORGANIZATIONAL IMPLICATIONS : Cost of Cybercrimes and IPR Issues: Lesson for Organizations, Web Treats for Organizations: The Evils and Perils, Security and Privacy Implications from Cloud Computing, Protecting People's Privacy in the Organization, Organizational Guidelines for Internet Usage
Self Study Component : Safe Computing Guidelines and Computer Usage Policy.

11 Hours

Text Book:

1. Nina Godbole, Sunit Belapure, Cyber Security, Wiley India, 2014.

Reference Books:

1. Nina Godbole, Information Systems Security, Wiley India, New Delhi.
2. Kennetch J. Knapp, Cyber Security & Global Information Assurance Information Science Publishing
3. William Stallings, Cryptography and Network Security, Pearson Publication.

Course Objectives:

1. To identify and describe the major types of cybercrime
2. Applying knowledge in the field of cyber security to analyze real world problems..
3. Understand the legal perspectives in cyber security and challenges to Indian law
4. Describe the cybercrime vulnerabilities, exploitations of the Internet & appropriate responses to cybercriminal activity

5. Effectively integrating knowledge in the field of cyber security to propose solutions to real world problems.

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

Course Title: Object Oriented Programming with Java			
Course Code: P18CSO751	**Semester: VII**	**L:T:P:H : 3:0:0:3**	**Credit : 3**
Contact Period: Lecture: 52 Hrs, Exam: 3 Hrs		**Weightage: CIE:50%, SEE: 50%**	

Course Content

Unit–1

Getting Started with Java: The First Java Program, Program Components, Edit-Compile-Run Cycle, Sample Java Standard Classes.

Numerical Data: Variables, Arithmetic Expressions, Constants, Displaying Numerical Values, Getting Numerical Input, the **Math** Class, Random Number Generation, Sample Development.

Defining Your Own Classes - Part 1 : First Example: Defining and Using a Class, Second Example: Defining and Using Multiple Classes, Matching Arguments and Parameters, Passing Objects to a Method, Constructors, Information Hiding and Visibility Modifiers, Class Constants, Local Variables.

Self-Study Component: Calling Methods of the Same Class, Changing Any Class to a Main Class.

10 Hours

Unit–2

Selection Statements : The **if** Statement, Nested **if** Statements, Boolean Expressions and Variables, Comparing Objects, The **switch** Statement, Drawing Graphics, Enumerated Constants, Sample Development.

Repetition Statements: The **while** Statement, The **do–while** Statement, Loop-and-a-Half Repetition Control, the **for** Statement, Nested **for** Statement.

Defining Your Own Classes - Part 2: Returning an Object from a Method, the Reserved Word **this,** Overloaded Methods and Constructors, Class Variables and Methods, Call-by-Value Parameter Passing.

Self-Study Component: Using Javadoc Comments for Class Documentation

11 Hours

Unit–3

Exceptions: Catching Exceptions, Throwing Exceptions and Multiple **catch** Blocks, Propagating Exceptions, Types of Exceptions, Programmer-Defined Exceptions, Sample Development.

Arrays: Array Basics, Arrays of Objects, the For-Each Loop, Passing Arrays to Methods.

Self-Study Component: Two-Dimensional Arrays

10 Hours

Unit–4

Inheritance : Introduction, Process of Inheritance, Types of Inheritances, Universal Super Class-Object class, Inhibiting Inheritance of Class Using Final, Access Control and Inheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding.

Interfaces: Introduction, Declaration of Interface, Implementation of Interface, Multiple Interfaces.

Packages and Java Library: Introduction, Defining Package, Importing Packages and Classes into Programs.

Self-Study Component: Abstract Classes, Interfaces and Inheritance.

11 Hours

Unit–5

Generic Programming : Introduction, Generics and Primitive Types, Declaration of Generic Class and Constructor, Use of Object Class vs Generic Class, Generic Class with Multiple Type Parameters, Generic Method, Generic Method Overloading.

String Handling in Java : Introduction, Class String, Methods for Extracting Characters from Strings, Methods for Comparison of Strings, Methods for Modifying Strings, Methods for Searching Strings.

Self-Study Component: Generic Interface, Overriding Methods in Generics Class.

10 Hours

Text Books:

1. C.Thomas Wu, An Introductoion to object oriented programming with Java, 5th Edition, Tata McGraw Hill.
2. Java: One Step Ahead by Anita Seth , B.L. Juneja, OXFORD University press – First Edition 2017.

Reference Book:

1. Herbert Schildt, Java The Complete Reference, 9th Edition, Tata McGraw Hill.

Course Outcomes

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

1. Explain the fundamentals of object-oriented programming in Java, including defining classes, objects, invoking methods etc.
2. Write programs using conditional and repetitive statements etc.
3. Solve the inter-disciplinary applications using the concept of inheritance and exception handling mechanisms.
4. Develop applications using generics and Strings.

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

Course Title: Mobile Application Development			
Course Code: P18CSO752	**Semester: VII**	**L:T:P:H : 3:0:0:3**	**Credit : 3**
Contact Period: Lecture: 52 Hrs, Exam: 3 Hrs		**Weightage: CIE:50%, SEE: 50%**	

Prerequisites: Java, XML.

Course Objectives : This course aims to

1. Define basic concepts of Mobile App development and marketing and identify the various mobile App Frameworks for implementing the App.
2. Implementing one of the mobile app using any one of the framework and explain the challenges in mobile application design and development.
3. Write mobile application for small devices and explain different techniques for developing applications for mobile devices.
4. Design an application for mobile devices and implement an application for a mobile device using current technologies.
5. Identify the challenges that mobile programming has in providing an effective user interface and apply Software Engineering techniques in practice.

Course Content

Unit-1

Preliminary considerations: Introduction, Cost of development, Importance of mobile strategies, Mobile development difficulty, Mobile development today, Mobile Myths, Third party Frameworks. Diving into mobile: app or website, Mobile Web Presence, Mobile Applications, Marketing Creating consumable web services for mobile devices: Web Service, Web Services Languages (Formats), Creating an Example Web Service, Debugging Web Services.

Self-Study Component: Third party Frameworks, Marketing.

12 Hours

Unit-2

Mobile user interface design: Effective Use of Screen Real Estate, Understanding Mobile Application Users, understanding Mobile Information Design, Understanding Mobile Platforms, Using the Tools of Mobile Interface Design Mobile websites: Choosing a Mobile Web Option, Adaptive Mobile Websites, Dedicated Mobile Websites, Mobile Web Apps with HTML5.

Self-Study Component : Using the Tools of Mobile Interface Design, Mobile Web Apps with HTML5.

10 Hours

Unit-3

Getting started with android: Introduction to Target Android, Android Support, Android as Competition to Itself, Getting the Tools You Need, Connecting to the Google Play, Android Development Practices, Building the Derby App in Android.

Self-Study Component: Building the Calculator App in Android

10 Hours

Unit-4

Signing and Publishing your Application: Test your application, Attach and end user License Agreement if desired, Create and attach an Icon and Label, clean Up for Release, Version Your

Application, Obtaining a signing Certificate and API Key, Signing Your Application, Retesting your Application, publishing on Android Market, signing up As an Android Developer.
Self-Study Component: Signing and Publishing Calculator App.

10 Hours

Unit-5

Location and Mapping: Location-Based services, Mapping, The Google Maps Activity, The Map view and Map Activity, Working with Map views, Location without Maps. Building a View Android GUI Architecture, Assembling a graphical Interface, Wiring up the Controller.
Self-Study Component: The Menu

10 Hours

Text Books:

1. Jeff McWherter, Scott Gowell, Professional Mobile Application Development, WROX, 2012
2. Rogers, Android Application Development, Shroff/O'Reilly Publications, 2009 (chapter 7, 8, 9 and 10)

Reference Book:

1. Neuburg, Programming iOS8, 5th edition, Shroff/O'Reilly Publications, 2014.

Course Outcomes

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

1. Develop simple consumable web services for mobile devices
2. Design user interfaces for mobile application.
3. Develop mobile app by using ANDROID mobile development framework.
4. Apply the number of steps that any application developer has to go through in order to prepare and submit an application to Android Market.
5. Develop views, Location-based services and mapping for a given problem.

CO-PO Mapping

Semester : 7	**Course code : P18CSO752**	**Title : Mobile Application Development**												
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	Develop simple consumable web services for mobile devices	2		2		1			1					1	
CO2	Design user interfaces for mobile application.	1		1		1									
CO3	Develop mobile app by using ANDROID mobile development framework.	2		2		1			1					1	
CO4	Apply the number of steps that any application developer has to go through in order to prepare and submit an application to Android market.	1		1		1			1						
CO5	Develop views, Location-based services and mapping for a given problem.	2		2		1			1					1	

Course Title: Data Analytics			
Course Code: P18CSO753	**Semester: VII**	**L:T:P:H : 3:0:0:3**	**Credit: 3**
Contact Period: Lecture: 52 Hrs, Exam: 3 Hrs		**Weightage: CIE:50%, SEE: 50%**	

Course Content

Unit-1

Introduction to Data Analytics: About Data. A Short Taxonomy of Data Analytics, Examples of Data Use, Breast Cancer in Wisconsin, Polish Company Insolvency Data, A Project on Data Analytics, The KDD Process, The CRISP-DM Methodology **Descriptive Statistics:** Scale Types, Descriptive Univariate Analysis, Descriptive bivariate Analysis.
Self-study Component: Examples of Data Use

11 Hours

Unit-2

Data Quality and Pre-processing: Data Quality, Missing Values, Redundant Data, Inconsistent Data, Noisy Data Outliers, Converting to a Different Scale Type, Converting to a Different Scale, Data Transformation, Dimensionality Reduction: Attribute Aggregation: Principal Component Analysis. Attribute selection: filters, wrappers.
Self Study Component: Search Strategies

10 Hours

Unit-3

Clustering : Distance Measures, Difference between Values of Common Attribute Types, Distance Measures for Objects with Quantitative Attributes, Distance Measures for Non-conventional Attributes, Clustering Validation, Clustering Techniques, K-means, Centroids and Distance Measures, How K-means Works, Density-based spatial clustering of applications with Noise (DBSCAN).
Frequent Pattern Mining: Frequent Item sets, setting the min_sup Threshold, Apriori – a Join-based Method, Eclat, FP-Growth, Maximal and Closed Frequent Itemsets.
Self-Study Component: Advantages and disadvantages of agglomerative hierarchical clustering

11 Hours

Unit-4

Regression: Predictive Performance Estimation, Generalization, Model Validation, Predictive Performance Measures for Regression, Finding the Parameters of the Model, Linear Regression, **Classification:** Binary Classification, Predictive Performance Measures for Classification, Distance-based Learning Algorithms, K-nearest Neighbor Algorithms.
Self Study Component: Technique and Model Selection

10 Hours

Unit-5

Additional Predictive Methods: Search-based Algorithms, Decision Tree Induction Algorithms, Decision Trees for Regression.
Optimization-based Algorithms: Support Vector Machines**.**
Applications for Text, Web and Social Media: Working with Texts, Recommender Systems.
Self-Study Component: Working with Texts - Sentiment Analysis, Web Mining.

10 Hours

Textbook:

1. A General Introduction to Data Analytics, João Mendes Moreira, André C.P.L.F. deCarvalho, © 2019 John Wiley & Sons, Inc

Reference Books:

1. Big Data and Data Analytics by Seema Acharya & Subhashini Chellappan by Wiley India Pvt Ltd.
2. Data Science & Big Data Analytics , Discovering, Analyzing, Visualizing and Presenting Data, Published by John Wiley & Sons, Inc.

Course Outcomes: Students can able to

1. Understanding the Data Analytics Taxonomy and Descriptive Statistics:
2. Apply data processing methods
3. Analyze clustering and Frequent Pattern Mining algorithms
4. Analyze regression and classification algorithms
5. Design and Implement real time applications in data analytics

CO-PO Mapping

Semester : 7	**Course code : P18CSO753**						**Title : Data Analytics**								
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	Understanding the Data Analytics Taxonomy and Descriptive Statistics:	2	2												2
CO2	Apply data processing methods	1	1	1	1	2									2
CO3	Analyze clustering and Frequent Pattern Mining algorithms	1	1	1	1	1	1								2
CO4	Analyze regression and classification algorithms	1	1	1	1	1	1								2
CO5	Design and Implement real time applications in data analytics	2	2	2	2	2	2								2

Course Title : Artificial Intelligence			
Course Code : P18CSO754	**Semester : VII**	**L :T:P:H : 3:0:0:3**	**Credits: 3**
Contact Period: Lecture: 52 Hr, Exam: 3 Hr		**Weightage: CIE:50%, SEE:50%**	

Course Objectives: To make the students to understand the concepts of intelligence, modeling, simulation, knowledge representation, reasoning, issues, expert and fuzzy systems.

Course Content

Unit-1

INTRODUCTION TO ARTIFICIAL INTELLIGENCE : Artificial Intelligence: Definitions, Programming Methods, Techniques; Intelligent Systems; Predicate Calculus; Rule-Based Knowledge Representation; Symbolic Reasoning Under Uncertainty; Basic Knowledge Representation Issues.

Self Study Component: Artificial Intelligence Importance

11 Hours

Unit-2

HEURISTIC SEARCH AND STATE SPACE SEARCH : Heuristic Search; Techniques for Heuristic Search; Heuristic Classification; Intelligent Agents State Space Search; Strategies for State Space Search; Learning.

Self Study Component: Applications of Search Techniques in Game Playing and Planning

10 Hours

Unit-3

EXPERT SYSTEMS : Expert Systems; Stages in the development of an Expert Systems; Probability based Expert Systems; Expert System Tools; Applications of Expert Systems.

Self Study Component: Expert System – Applications of Expert System

10 Hours

Unit-4

FUZZY SYSTEMS : Introduction to fuzzy systems; Foundation of fuzzy Systems; Linguistic Description and their Analytical Forms; Defuzzification Methods; Fuzzy logic in Control and Decision-making Applications.

Self Study Component**:** Fuzzy Systems –Fuzzy Relations, Arithmetic Operation of Fuzzy Numbers. **10 Hours**

Unit-5

ADVANCED INTELLIGENT SYSTEM CONCEPTS :

Introduction to Genetic Algorithms; Genetic Algorithms; Procedures of Genetic Algorithms; The working of Genetic Algorithms; Logic behind Genetic Algorithms. Swarm Intelligent Systems Ant Colony Systems; Development of Ant Colony Systems; Applications of Ant Colony Intelligence

Self Study Component: Swarm Intelligent System – Background of Ant Intelligent systems, Importance of the Ant Colony Paradigm.

11 Hours

Text Book :

1. N.P.Padhy:Artificial Intelligence and Intelligent Systems, Oxford University Press, 2017.

Reference Book :

1. Efraim Turban, Jay E. Aronson, Ting-Peng Liang**:** Decision Support Systems and Intelligent Systems, VII Edition, Prentice-Hall of India.

Course Outcomes:

After successful completion of the course, students will be able to,

1. Understand how Artificial Intelligence& Intelligence Systems enables capabilities that are beyond conventional technology.
2. Analyze how a heuristic state – space search algorithms are used to solve complex problem.
3. Analyze and design a rule-based expert system with tools.
4. Design *fuzzy-logic* based controllers and explores their unique characteristics.
5. Understanding of genetic algorithm and an outlook on the applications of genetic algorithm.

CO-PO Mapping

Course Title & Code: ARTIFICIAL NTELLIGENCE														
CO	**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	3	2			2									2
CO-2	3	2		2	2									2
CO-3	3	2		2		2								2
CO-4	3	2	2	2		2								2
CO-5	3	2				2								2

Course Title : Parallel Programming Laboratory			
Course Code : P18CSL76	**Semester : VII**	**L:T:P:H : 0:0:3:3**	**Credits: 1.5**
Contact Period: 3 Hours/week, Exam: 3 Hr		**Weightage: CIE:50%, SEE:50%**	

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 Title : Machine Learning Laboratory			
Course Code : P18CSL77	**Semester : VII**	**L:T:P:H : 0:0:3:3**	**Credits: 1.5**
Contact Period: 3 Hours/week, Exam: 3 Hr		**Weightage: CIE:50%, SEE:50%**	

Course Content

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 backpropagation algorithm and test the same using appropriate datasets.

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 datasets.

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.

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 neighbour 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.

Able to

CO1: Implement various algorithm on machine learning

CO2: Develop programs to test the capabilities of various algorithms for different data set

CO3: Implement various operations and applications using iris, kaggle and plot

Semester: 7		**Course code :P18CSL77** **Title : Machine Learning Laboratory**													
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**	**PSO1**	**PSO2**
CO1	**Implement** various algorithm on machine learning	1	2	2	1	1							1	1	1
CO2	**Develop** programs to to test the capabilities of various algorithms for different data set	2	2	1	1	1							1	1	1
CO3	**Implement** various operations and applications using using iris, kaggle and plot	2	1	2	1	1							1	1	1

Course Title: Project Work Phase – I and Project Seminar			
Course Code: P18CS78	**Semester: VII**	**L:T:P:H: 0:0:0:4**	**Credits :02**
Weight age: CIE:100			

Project Work: The Project Work (Phase I + Phase II) carries 8 credits (2 credits+6 credits) and spreads over TWO semesters, i.e. during 7th and 8th semesters.

I. Project Phase – I and Project seminar Comprises of Literature Survey, Problem identification, Objectives and Methodology. CIE marks shall be based on the report covering Literature Survey, Problem identification, Objectives and Methodology and seminar presentation skill.

II. The Assessment marks (CIE) in the case of Project Work - Phase I, shall be based on the evaluation at the end of the 7th semester by a committee consisting of Head of the concerned department, two senior faculty members of the department, one of them may be the internal guide. The work may be evaluated by the committee for award of Assessment marks (CIE) based on a Report [comprising of synopsis, Introduction, Literature survey, Objective and Methodology], presentation and viva voce.

III. The project work shall be carried out by candidate(s) independently/in a group (maximum of four) during the seventh and eighth semester under the guidance of one of the faculty members of the Department of study. If the project work is of inter-disciplinary nature, a co-guide shall be taken from the same or any other relevant Department. If a project work has to be carried out in any industry / factory / organization, outside the campus, the permission for the same and the name of co-guide at any of these organizations shall be intimated to the authorities at the beginning of seventh semester by the Head of the Department.

Course Title : Software Project Management			
Course Code : P18CS81	**Semester : VIII**	**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

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,

Self Study Component : software configuration management tools and automation.

11 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.

Self Study Component : 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 install ability, inter-operability design, challenges during design and development phases, skill sets for design and development, metrics for design and development phases.

Self Study Component : design for maintainability

11 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,

Self Study Component : 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, other people focused models in the literature.

Self Study Component: people capability maturity model (P-CMM),

10 Hours

Text Book :

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: 8th	**Course Code : P18CS81**							**Title : Software Project 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	1	1						1	2		2	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 : Deep Learning			
Course Code : P18CS821	**Semester : VIII**	**L:T:P:H: 2:2:0:4**	**Credits: 3**
Contact Period: Lecture: 52 Hr, Exam: 3 Hr		**Weightage: CIE:50%, SEE:50%**	

Course Objectives:

1. Student need to understand the concept of Deep Learning.
2. Student need to analyze Deep Networks
3. Student need to implement optimization of Deep Learning models
4. Student need to compare the Sequences of Deep Learning
5. Student Need to understand Practical importance of deep learning in social life

Course Content

Unit-1

Machine Learning Basics: Learning Algorithms, Capacity, Overfitting and Underfitting, Hyperparameters and Validation Sets, Estimator, Bias and Variance, Maximum Likelihood Estimation, Bayesian Statistics, Supervised Learning Algorithms, Unsupervised Learning Algorithms, Stochastic Gradient Decent, building a Machine Learning Algorithm,
Self-Study Component: Challenges Motivating Deep Learning.

11 Hours

Unit-2

Deep Feed forward Networks: Gradient-Based Learning, Hidden Units, Architecture Design, Back-Propagation. **Regularization:** Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised Learning, Multi-Task Learning, Early Stopping, Parameter Tying and Parameter Sharing, Sparse Representations.
Self-Study Component: Bagging, Dropout.

10 Hours

Unit-3

Optimization for Training Deep Models: How Learning Differs from Pure Optimization, Challenges in Neural Network Optimization, Basic Algorithms. Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates. **Convolutional Networks:** The Convolution Operation, Motivation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data Types, Efficient Convolution Algorithms.
Self-Study Component: Random or Unsupervised Features.

11 Hours

Unit-4

Sequence Modelling: Recurrent and Recursive Nets: Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks.
Self-Study Component: Long short-term memory

10 Hours

Unit-5

Practical Methodology: Performance Metrics, Default Baseline Models, Determining Whether to Gather More Data, Selecting Hyper parameters, Debugging Strategies, Example: Multi-Digit Number Recognition.

Self-Study Component: Applications: Vision, NLP, Speech.

10 Hours

Textbook:

1. Ian Good fellow, Yoshua Bengio and Aaron Courville, "**Deep Learning**", MIT Press, 2016

Reference Book:

1. "Neural Networks: Asystematic Introduction", By Raúl Rojas, 1996.

Course Outcomes:

1. Understand the Basics of Machine Learning Concept.
2. Apply approaches on data classification.
3. Analyze the training modules.
4. Evaluate sequence Modeling.
5. Generate Practical Methodology

CO-PO Mapping

Semester : 8th	**Course code : P18CS821**						**Title : Deep 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**
CO-1	Basics of Machine Learning Concept	2													2
CO-2	Understand approaches on data classification	2	1	2	2		2								2
CO-3	Analyze the training modules		2	2	2	2	2								2
CO-4	Evaluate sequence Modeling	2	3		2	2		2							2
CO-5	Implement Practical Methodology				2			2							3
		2	2	2	2	2	2	2							

Course Title : Network Management Systems			
Course Code : P18CS822	**Semester : VIII**	**L:T:P:H: 2:2:0:4**	**Credits: 3**
Contact Period: Lecture: 52 Hr, Exam: 3 Hr		**Weightage: CIE: 50%, SEE: 50%**	

Prerequisites: Computer Networks

Course Content

Unit-1

Data Communications And Network Management Overview : Data and Telecommunication Network, Challenges of IT Managers, Network Management: Goals, Organization, and Functions, Network Management Architecture and Organization, Network Management Perspectives, NMS Platform.

Basic Foundations: Standards, Models and Language: Network Management Standards, Network Management Models, Organization Model, Information Model, Communication Model, Encoding Structure, Macros, Functional Model.

Self-Study Component: Abstract Syntax Notation One: ASN.1

11 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, The Information Model.

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

Self-Study Component: 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.

Self-Study Component: ATM Remote Monitoring, A Case Study of Internet Traffic Using RMON.

10 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.

Self-Study Component: 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,Passive Optical Network, PON Management.
Advanced Management Topics: Early Web-Based Development.
Self-Study Component: XML-Based NM Technology.

10 Hours

Text Book:

1. Mani Subramanian: Network Management- Principles and Practice, 2nd Ed. , PearsonEd, 2012

Reference Book:

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

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

1. **Analyze** and **Apply** the standards, protocols and the principles of network management to manage complex networks.
2. **Apply** SNMPv3 over SNMPv2 to achieve better security system.
3. **Analyze** and **Apply** remote network monitoring methods to monitor network traffic.
4. **Simulate** network by managing configurations, identify faults and improve network performance.
5. **Analyze and Apply** the various broad band access networks and its technologies for current and future network management.

CO-PO Mapping

Semester:8	**Course code:P18CS822**	**Title: Network Management Systems**													
CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	**Analyze** and **Apply** the standards, protocols and the principles of network management to manage complex networks.	1	1	2		2								2	-
CO2	**Apply** SNMPv3 over SNMPv2 to achieve better security system.		2	2		2								2	-
CO3	**Analyze** and **Apply** remote network monitoring methods to monitor network traffic.	1	1	2		2								2	-
CO4	**Simulate** network by managing configurations, identify faults and improve network performance.	2	1	2		2								2	-
CO5	**Analyze and Apply** the various broad band access networks and its technologies for current and future network management.	1	1	2		2								2	-
		1.25	1.2	2		2								2	-

Course Title : Business Intelligence & Applications			
Course Code : P18CS823	**Semester : VIII**	**L:T:P:H: 2:2:0:4**	**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, 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.

Self Study Component*:* OLTP and OLAP for a Nationalized Banking system.

12 Hours

Unit–2

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.

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.

Self Study Component*:* Contribution of business intelligence in the growth of Banking system.

10 Hours

Unit–3

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.

Self Study Component*:* Construct a data warehouse for a company and apply ETL techniques.

10 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

Self Study Component*:* Construct a KPI for a company. **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 Acess.

Self Study Component: Construct balanced scorecard and dashboard for a company.

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 : P18CS823**			**Title : Business Intelligence & Applications**											
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	**Illustrate** role of business intelligence in the IT applications.	2	2												2
CO2	**Construct** OLAP operations to analyze business intelligence	2	2												2
CO3	**Apply** various ETL techniques of data integration	2	2												2
CO4	**Identify** data modeling technique to analyze data for a successful business enterprise.	2	2												
CO5	**Construct** enterprise reports for various situations of a business enterprise	2	3												2

Course Title :Agile Technologies			
Course Code: P18CS824	**Semester : VIII**	**L:T:P:H: 2:2:0:4**	**Credits: 3**
Contact Period : Lecture : 52 Hr, Exam: 3Hr		**Weightage :CIE: 50% SEE: 50%**	

Prerequisites

1. Software Engineering

Course Objectives

This course aims to:

1. To understand the basic concepts of Agile Software Process.
2. To gain knowledge in the area of various Agile Methodologies.
3. To develop Agile Software Process
4. To know the principles of Agile Testing
5. Assess product quality risks within an Agile project

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.

Self-Study Component: 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.

Self-Study Component: 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.

Self-Study Component: 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.

Self-Study Component: 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.

Self-Study Component: Multiteam/Multisite early development.

10 Hours

Text Books :

1. Craig Larman "Agile and Iterative Development – A Manager's Guide" Pearson Education – 2004.
2. Elisabeth Hendrickson, "Agile Testing" Quality Tree Software Inc 2008.

Reference Book :

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

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

CO-PO Mapping

Semester : 8th	**Course code : P18CS824**						**Course 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**	**PS O1**	**PS O2**
CO-1	Demonstrate a systematic understanding of current agile techniques and practices used in industry.	2	2			1	2	2	1	2		2			2
CO-2	Apply industry standard agile techniques in develop software in a team.	1	2	3	2	2		3	2	2		1	1		2

CO -3	Use group and individual retrospectives to critically evaluate and propose improvements in developing software in a professional context.		2	2	3	2	2	2	1	1		2			2
CO-4	Apply concepts of XP and EVE in develop a software	1	2	2	2	1		2				1	1		2
CO-5	Managing the changes applying different testing techniques	1	2		2	1	2	2		1		2	1		2
		1	2	1.4	1.8	1.4	1.2	2.2	0.8	1.2		1.6	0.6		2

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Course Title: Internship		
Course Code: P18CS83	**Semester: VIII**	**Credits :02**
Exam Hours : 03 Hr	**Weight age: CIE:50; SEE:50**	

Guidelines for Internship:

I. Internship is of minimum eight weeks duration and to be completed between the vacation period of VI & VII semester and VII & VIII semester.

II. The internship can be carried out in any industry/ R & D Organization/ Research/ Institute/ Educational institute of repute/ Internshala (ACITE MoU Internship).

III. The Department/college shall nominate staff member/s to facilitate, guide and supervise students under internship.

IV. The Internal Guide has to visit place of internship at least once during the student's internship.

V. The students shall report the progress of the internship to the guide in regular intervals and seek his/her advice.

VI. After the completion of Internship, students shall submit a report with completion and attendance certificates to the Head of the Department with the approval of both internal and external guides.

VII. There will be 50 marks CIE (Seminar: 25, Internship report: 25) and 50 marks for Viva Voce conducted during Semester End Examination (SEE) of VIII Semester. For the conduction of Internship Semester End Examination following instructions are issued:

a. The Semester End Examination (SEE) for 50 marks shall be conducted similar to final semester project work / lab examination.
b. Internal & External Examiners shall be appointed by the BoE – Chairperson in consultation with HoD and approval of the same by the Principal & Controller of Examination.
c. External Examiner may be from the Industry. If the external examiner from the industry is not available, alternative arrangement shall be made by the BoE - Chairperson by appointing a faculty from out of the available faculty in the department, wherein the student is studying.

VIII. The students are permitted to carry out the internship anywhere in India or abroad. The Institution will not provide any kind of financial assistance to any student for carrying out the Internship.

IX. Failing to undergo Internship: Internship is one of the head for obtaining degree, therefore completion of internship is mandatory.

Course Title: Project Work Phase – II		
Course Code: P18CS84	**Semester: VIII**	**Credits :06**
Weight age: CIE:100 SEE:100		

Project Work: The Project Work (Phase I + Phase II) carries 8 credits (2 credits+6 credits) and spreads over TWO semesters, i.e. during 7th and 8th semesters.

I. Project Phase – I and Project seminar Comprises of Literature Survey, Problem identification, Objectives and Methodology. CIE marks shall be based on the report covering Literature Survey, Problem identification, Objectives and Methodology and seminar presentation skill.

II. The Assessment marks (CIE) in the case of Project Work - Phase I, shall be based on the evaluation at the end of the 7th semester by a committee consisting of Head of the concerned department, two senior faculty members of the department, one of them may be the internal guide. The work may be evaluated by the committee for award of Assessment marks (CIE) based on a Report [comprising of synopsis, Introduction, Literature survey, Objective and Methodology], presentation and viva voce.

III. The project work shall be carried out by candidate(s) independently/in a group (maximum of four) during the seventh and eighth semester under the guidance of one of the faculty members of the Department of study. If the project work is of inter-disciplinary nature, a co-guide shall be taken from the same or any other relevant Department. If a project work has to be carried out in any industry / factory / organization, outside the campus, the permission for the same and the name of co-guide at any of these organizations shall be intimated to the authorities at the beginning of seventh semester by the Head of the Department.

IV. The weekly progress of the Project work shall be monitored and reviewed by the Project Guide assigned by DUGC. The method of evaluation, including intermediate assessment shall be evolved by the pertinent DUGC.

V. A candidate shall submit N+3 (No. of candidates+3) copies of the Report of the Project Work to Head, DUGC on or before the specified date. The report shall be in the format prescribed by the Institute. The candidate shall submit a report of the project work (dissertation) duly approved by the guide and co-guide. The project report shall be countersigned by the guide, co-guide (if any) and the Head of the Department

VI. The last date for the submission of Report shall be Two weeks before the closure of the semester in which the project work credits have been registered for and is expected to be completed or as announced by the COE. The date of submission of the dissertation may be extended up to a maximum of eight academic years, from the date of commencement of the first semester in which the candidate has taken admission to the course.

VII. The final evaluation (CIE & SEE) for Project Work - Phase II is done by a Project Work Evaluation Committee (PWEC) constituted by the pertinent DUGC. There shall be an open seminar followed by a viva – voce examination as part of the final evaluation. After the final evaluation, appropriate letter grade is awarded.

VIII. If in the opinion of the PWEC, the Project Report is acceptable with minor modifications for the minimum passing grade 'E' (Fair) in the case of project, the PWEC shall value and instruct the candidate suitably to incorporate the necessary modifications and to resubmit it to the Chairman, PWEC. After such resubmission, the Chairman, PWEC will certify that the necessary modification has been incorporated.

IX. The Assessment marks in case of Project Work - Phase II and seminar shall be based on the evaluation, as per the guidelines, at the end of the 8th semester by a committee consisting of Head of the concerned department, two senior faculty members of the department (one of them may be the internal guide).

X. The Assessment marks sheet shall bear the signature of all those concerned, along with the date and seal of the Principal.

Course Title: Self-Study Course & Seminar			
Course Code: P18CS85	**Semester: VIII**	**L:T:P:H: 0:0:4:4**	**Credits :02**
Weight age: CIE: 50			

In the Self-Study course & Seminar, the student has to choose & study the courses related to the program discipline with her/his own efforts under the guidance of a Course Instructor/Project guide, using study materials available in open sources i.e. Massive Open Online Course (MOOC) NPTEL Courses. The intention of the course is to encourage the habit of self-learning.

Further, in addition to the above, the department has to release the pool of courses from the list of available 8 weeks NPTEL online courses. The student has to register for the course from the available pool during VII / VIII Semester and the same will be reflected in the Grade Card of the VIII Semester. The 50 marks CIE assessment is based on the final NPTEL score (i.e. Online assignments: 25% + Proctored exam: 75%). The NPTEL score will be mapped directly to the CIE marks as per the calculation below only if he /she has completed the NPTEL course (i.e. Certification).

CIE = (NPTEL Score X 1.5) / 2 = [Maximum CIE should be 50 Marks]

[Ex. – 1: If NPTEL Score is 60 then the CIE will be = (60 X 1.5)/2 = 45

Ex. – 2: If NPTEL Score is 80 then the CIE will be = (80 X 1.5)/2 = 50 (Max. CIE should be 50 Marks)]

If the student fails to complete the NPTEL course at the end of the VIII Semester, then the department has to constitute a committee consisting of the Head of the department, two senior faculty members of the department, one of them may be the internal guide. The evaluation is based on a Report, Presentation, and Viva-Voce and the assessment is a relative evaluation in context to the student completed NPTEL course Certification (i.e. the CIE Score should be less than the score of the student cleared NPTEL Course).