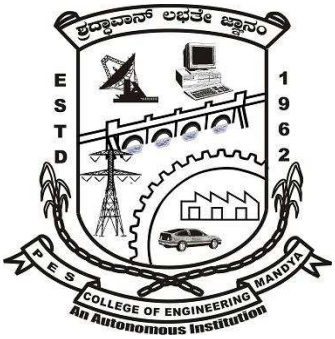
Scheme & Syllabus
of
M.Tech in Computer Science & Engineering
(With effect from 2017-2018 Academic year)

I & II Semester

ಪಠ್ಯಕ್ರಮ

(ಶೈಕ್ಷಣಿಕವರ್ಷ 2017–18)

Out Come Based Education
ಫಲಿತಾಂಶ ಆಧಾರಿತ ಶಿಕ್ಷಣ



P.E.S. College of Engineering, Mandya - 571 401, Karnataka
(An Autonomous Institution under VTU, Belagavi)
Grant -in- Aid Institution
(Government of Karnataka)
Accredited by NBA, New Delhi
Approved by AICTE, New Delhi.

ಪಿ.ಇ.ಎಸ್. ತಾಂತ್ರಿಕಮಹಾವಿದ್ಯಾಲಯ

ಮಂಡ್ಯ–571 401, ಕರ್ನಾಟಕ
(ವಿ.ಟಿ.ಯು, ಬೆಳಗಾವಿ ಅಡಿಯಲ್ಲಿನ ಸ್ವಾಯತ್ತ ಸಂಸ್ಥೆ)

Ph : 08232- 220043, Fax : 08232 – 222075,Web : www.pescemandya.org

P.E.S.COLLEGE OF ENGINEERING,

MANDYA-571401, (KARNATAKA)

(An Autonomous Institution under VTU, Belagavi)

The vision of the Institute is:

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

Institute Mission in pursuance of its vision is:

- Provide state of the art infrastructure, motivate the faculty to be proficient in their field of specialization and adopt best teaching-learning practices.
  (Required to be a leading institution)
- Impart engineering and managerial skills through competent and committed faculty using outcome based educational curriculum.
  (Required to provide quality engineering and management education)
- Inculcate professional ethics, leadership qualities and entrepreneurial skills to meet the societal needs.
  (Required to produce socially responsible professionals)
- Promote research, product development and industry-institution interaction.
  (Required to produce creative professionals)

Quality Policy

"Highly committed in providing quality, concurrent technical education and continuously striving to meet expectations of stake holders".

Core Values

Professionalism

Empathy

Synergy

Commitment

Ethics

Preface

PES College of Engineering, Mandya, started in the year 1962, has become autonomous in the academic year 2008-09. Since, then it has been doing the academic and examination activities successfully. The college is running 8 Postgraduate programs. It consists of 6 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 are among 16 signatories to the international agreement besides 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 Credit 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 is shift in thinking, teaching and learning processes moving towards Students Centric from Teacher Centric education. OBE standards focusing on mathematics, language, science, attitudes, social skills, and moral values.

The key features which may be used to judge if a system has implemented an outcomes-based education systems is mainly Standards-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.

In order to increase the Industry/Corporate readiness, many Soft Skills and Personality Development modules have been added to the existing curriculum of 2015-16. Lab components are added with each course.

(Sri. B.Dinesh Prabhu)
Deputy Dean (Academic)
Associate Professor
Dept. of Automobile Engg.

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

Department of Computer Science & 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 C S & E department is:

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

DM2: Improve Industry-Institute relationship for mutual benefit.

DM3: Inculcate ethical values, communication and entrepreneurial skills.

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

About the Department The Department of Computer Science and Engineering was established in 1983. The department offers B.E. program with an intake of 120 students, M.Tech. in Computer Science and Engineering with 18 students, M.Tech. in Computer Engineering with 24 students and also Ph.D. programme. Currently the strength of teaching faculty is 32 and that of non teaching staff is 14. The teacher - student ratio is 1:16. The department has a research centre under VTU and University of Mysore, with 2 research guides and 8 research students. During the last five years, the department has published 85 technical papers in international/national journals/conferences. So far, the department has organized four international and 8 national conferences. The department is equipped with all the required infrastructure, laboratories, class rooms, departmental library. The departments wish to achieve the mission of developing and nourishing computer science engineers through well-trained, committed and experienced faculty members. Faculty members of the departments are involved in research activities in different fields such as Image Processing, Pattern Recognition, Data Mining, Wireless Networks, Big Data Analytics and Computer Vision.

Short Term Goals:

1. Strengthening of Infrastructure
2. Faculty development programmes
3. Encourage academic excellence
4. Project proposals to raise funded projects

Mid Term Goals:

1. Establishing centre of excellence
2. Conducting international conference
3. Establish industry-institute interaction

Long Term Goals:

1. Patents filing
2. Establishing new laboratories

Credit pattern

Programme: M.Tech Computer Science & Engineering

Core Courses	I Semester	16 credits
	II Semester	12 credits
Elective Course	I Semester	08 credits
	II Semester	12 credits
Seminar	III Semester	02 credits
Lab	I Semester	02 credits
	II Semester	02 credits
Industrial Training	III Semester	06 credits
Pedagogy Training	III Semester	02 credits
Self Study Course	III Semester	04 credits
Project work	III Semester	08 credits
Project work	IV Semester	26 credits
A total of 100 credits for 2 years		

Teaching and Examination for M.Tech. Computer Science & Engineering

I Semester M.Tech. Computer Science & Engineering

Sl.no	Course code	Course	Teaching Dept.	Credit Pattern	Total Credits	Marks Allotted		Total Marks
				L :T: P/S*:H		CIE	SEE	
1	P17MCSE11	Managing Big Data	CSE	3:1:0:5	04	50	50	100
2	P17MCSE12	Advanced Data Structures &Algorithms	CSE	3:1:0:5	04	50	50	100
3	P17MCSE13	Advances in Operating System	CSE	3:0:1:4	04	50	50	100
4	P17MCSE14	Probability & Statistics	CSE	3:1:0:5	04	50	50	100
5	P17MCSE15x	Elective – I	CSE	3:1:0:5	04	50	50	100
6	P17MCSE16x	Elective – II	CSE	3:1:0:5	04	50	50	100
7	P17MCSEL17	Advanced Data Structures &Algorithms Lab	CSE	0:0:4:4	02	50	50	100
Total					26	400	300	700

Electives

Sl.no	Course code	Elective – I	Credit Pattern L:T:P:H
1	P17MCSE151	Web Engineering	3:1:0:5
2	P17MCSE152	Advances in Data Mining	3:1:0:5
Elective – II			
1	P17MCSE161	Cloud Computing	3:1:0:5
2	P17MCSE162	Cyber Crime and Digital Forensic	3:1:0:5

II Semester M.Tech. Computer Science & Engineering

Sl.no	Course code	Course	Teaching Dept.	Credit Pattern	Total Credits	Marks Allotted		Total Marks
				L :T: P/S*:H		CIE	SEE	
1	P17MCSE21	Advances in Computer Networks	CSE	3:1:0:5	04	50	50	100
2	P17MCSE22	Multicore Architecture & Parallel Programming	CSE	4:0:0:4	04	50	50	100
3	P17MCSE23	Machine Learning Techniques	CSE	3:1:0:5	04	50	50	100
4	P17MCSE24x	Elective – III	CSE	3:1:0:5	04	50	50	100
5	P17MCSE25x	Elective – IV	CSE	3:1:0:5	04	50	50	100
6	P17MCSE26x	Elective – V	CSE	3:1:0:5	04	50	50	100
7	P17MCSEL27	Advanced Computer Networks Lab	CSE	0:0:4:4	02	50	50	100
Total					26	400	300	700

Electives

Sl. No	Course code	Elective – III	Credit Pattern L:T:P:H
1	P17MCSE241	Wireless Networks & Mobile Computing	3:1:0:5
2	P17MCSE242	Social Networks & Semantic Web	3:1:0:5
Elective – IV			
1	P17MCSE251	Business Intelligence& its Application	3:1:0:5
2	P17MCSE252	Agile Technologies	3:1:0:5
Elective – V			
1	P17MCSE261	Multimedia Communication	3:1:0:5
2	P17MCSE262	Foundation for Internet of Things	3:1:0:5

*** L - Lecture T -Tutorial P – Practical S – Seminar H-Hours**

III Semester M.Tech. Computer Science & Engineering

Sl.No	Course code	Course	Teaching Dept.	Credit Pattern	Total Credits	Marks Allotted		Total Marks
				L :T: P/S*:H		CIE	SEE	
1	P17MCSE31	Self Study course	CSE	0:2:2:4	04	50	50	100
2	P17MHSM32	Pedagogy/Research Methodology	HS&M	0:2:2:4	02	100	---	100
3	P17MCSE33	Seminar	CSE	---	02	100	---	100
4	P17MCSE34	Project Phase – I	CSE	---	04	100	---	100
5	P17MCSE35	Project Phase - II	CSE	---	04	100	---	100
6	P17MCSE36	Industrial Training	CSE	---	06	100	---	100
				Total	22	550	50	600

IV Semester M.Tech. Computer Science & Engineering

Sl. No.	Course code	Course	Teaching dept.	Credit Pattern	Total Credits	Marks Allotted		Total Marks
				L :T: P /S* :H		CIE	SEE	
1	P17MCSE41	Project Phase - III	CSE	---	04	100	---	100
2	P17MCSE42	Project Phase - IV Thesis Evaluation	CSE	---	10	100	---	100
3	P17MCSE43	Project Phase - V Project Work Viva Voce	CSE	---	08	---	100	100
4	P17MCSE44	Term Paper	CSE	---	04	---	100	100
			Total		26	200	200	400
* **L - Lecture** **T -Tutorial** **P – Practical** **S - Seminar**								

1 Eight weeks of compulsory Industrial Training to be undergone by the students during their third semester. A report on Industrial Training is to be submitted by the student. The report has to be evaluated by Industrial guide and Institute guide for CIE of 50 marks (industry and supervisor evaluation average marks for 50 each). The student must give seminar based on Industrial Training before a committee constituted by the department for remaining CIE of 50 marks.

2 The Laboratories are CIE with report submission and seminar presentation /Viva Voce of 50 marks each.

3 Pedagogy/Research methodology is CIE with objective type of question for evaluation

4 The seminar (III Semester) shall be of 100 marks CIE. It is based on the current topics presentation along with a report submission for evaluation each of 50 marks.

5 Project work Phase-1, 2 & 3 to be awarded by the Department committee constituted for the purpose

   a) The Project Phase-I evaluation shall be of 100 marks CIE. It is based on Report Submission consisting of Title, Introduction, Literature Survey, Summary of Literature Survey, Objectives and Methodology (50 Marks) and Presentation (50 marks) each.

   b) The Project Phase-II evaluation shall be of 100 marks CIE. It is based on Report Submission consisting of Experimentation, Theoretical analysis approach and results (if completed as a stage work) and Presentation for 50 marks each.

   c) The Project Phase-III evaluation shall be of 100 marks CIE. It is based on Thesis manuscript and presentation for 50 marks each (work completion report).

6 The Project Phase-IV evaluation shall be of 100 marks CIE. It is based on the evaluation done separately by internal and external examiners and average marks of the two examiner shall be consider as final marks

7 The Project Phase-V evaluation shall be of 100 marks SEE. It is based on Thesis presentation and project viva voce has to be conducted jointly by internal and external examiner for a total of 100 marks SEE.

8 The term paper is purely based on the project work he/she chooses.

9 The Term paper shall be for 100 marks SEE. It has to be evaluated by the committee formed by HOD consisting of PG coordinator, guide and subject expert internal/ external for each candidate.

10 The term paper evaluation is based on the publication of an article in peer reviewed conference/ journal (national/ international) and quality of the journal. If the term paper is not published by the candidate or the same is communicated for publication at the end of his/ her tenure, then the committee formed by HOD consisting of PG coordinator, guide and subject expert internal/ external for each candidate will asses.

11 The self study course shall consist of five units with lab component and he/ she must be able to demonstrate the knowledge gained by the candidates. The course content must be tailer made by the department to suit their requirements.

12 The self study course shall be of 100 marks. The course evaluation is based on the lab report submission/ assignment/ viva -voce as CIE 50 marks and SEE for 50 marks.

Course Title: Managing Big Data			
Course Code: P17MCSE11	**Sem: I**	**L-T-P-H: 3:1:0:5**	**Credits - 4**
Contact Period: Lecture: 52 Hrs., Exam: 3 Hrs		**Weightage: CIE:50; SEE:50**	

Course Learning Objectives (CLO's)

The course P17MCSE11 aims to:

1. Define big data and related technologies.
2. Analyze Technologies for Handling Big Data and Hadoop Ecosystem
3. Acquire clear understanding of NoSQL Data Management
4. Acquire a clear understanding of Analytics and Big Data
5. Analyze the various data visualization techniques and relevant case studies related to various industries.

Course Content

Unit-1

Getting an Overview of Big Data and Hadoop Ecosystem

Big Data, History of Data Management – Evolution of Big Data, Structuring Big Data, Types of Data, Elements of Big Data, Volume, Velocity, Variety ,Veracity ,Big Data Analytics ,Advantages of Big Data Analytics ,Careers in Big Data ,Skills Required, Future of Big Data. Business Intelligence, Preventing Fraud Using Big Data Analytics.

Hadoop Ecosystem, Hadoop Distributed File System, HDFS Architecture, Features of HDFS, MapReduce, Features of MapReduce, Hadoop YARN. SLE: HBase, Hive, Pig, Sqoop, Flume.

11 Hours

Unit-2

Understanding MapReduce Fundamentals and HBase

The MapReduce Framework, Exploring the Features of MapReduce, Working of MapReduce, Exploring Map and Reduce Functions, Techniques to Optimize MapReduce Jobs, Hardware/Network Topology, Synchronization, File System, Uses of MapReduce, Role of HBase in Big Data Processing, Characteristics of HBase, Installation of HBase.

9 Hours

Unit -3

NoSQL Data Management

Introduction to NoSQL, Characteristics of NoSQL, Evolution of Databases, Aggregate Data Models, Key Value Data Model, Document Databases, Relationships, Graph Databases, SchemaLess Databases, Materialized Views, Distribution Models, Sharding, MapReduce Partitioning and Combining, Composing MapReduce Calculations,CAP Theorem

10 Hours

Unit-4

Understanding Analytics and Big Data

Comparing Reporting and Analysis, Reporting, Analysis, The Analytic Process, Types of Analytics, Basic Analytics, Advanced Analytics, Operationalized Analytics, Monetized Analytics, Characteristics of Big Data Analysis, Points to Consider during Analysis, Frame the Problem Correctly, Statistical Significance or Business Importance? , Making Inferences versus Computing Statistics, Developing an Analytic Team, Convergence of IT and Analytics, Understanding Text Analytics, Skills required for an Analyst

10 Hours.

Unit -5

Data Visualization

Introducing Data Visualization, Techniques Used for Visual Data Representation, Types of Data Visualization, Applications of Data Visualization, Visualizing Big Data, Deriving Business Solutions, Turning Data into Information, Tools Used in Data Visualization, Proprietary Data Visualization Tools, Open-Source Data Visualization Tools, Analytical Techniques Used in Big Data Visualization, Tableau Products. Relevant Case Studies related to Automation and other Industries : Product Design and Development, Use of Big Data in Preventing Fraudulent Activities, Preventing Fraud Using Big Data Analytics, Use of Big Data in Detecting Fraudulent Activities in Insurance Sector, Fraud Detection Methods, Use of Big Data in Retail Industry, Use of RFID Data in Retail. SLE: Installation of Tableau Public

10 Hours

Textbook:

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

Reference Books:

1. Arvind Sathi, "Big Data Analytics: Disruptive Technologies for Changing the Game", 1st Edition, IBM Corporation, 2012
2. Big Data Analytics with R and Hadoop, VigneshPrajapati, -Packt Publishing 2013
3. Michael Minelli, Michehe Chambers, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business", 1st Edition, AmbigaDhiraj, Wiely CIO Series, 2013.

Course Outcome: On successful completion of the course the students will be able to

1 Analyze Technologies for Handling Big Data and Hadoop Ecosystem
1. Acquire clear understanding of MapReduce Fundamentals and HBase
2. Explain managing of Big data Without SQL
3. Acquire a clear understanding of Analytics and Big Data
4. Analyze the various data visualization techniques and relevant case studies related to various industries.

Course Title: Advanced Data Structures & Algorithms			
Course Code: P17MCSE12	**Sem: I**	**L-T-P-H: 3:1:0:5**	**Credits - 4**
Contact Period: Lecture: 52 Hrs., Exam: 3 Hrs		**Weightage: CIE:50; SEE:50**	

Course Learning Objectives (CLO's)

The course P17MCSE12 aims to:

1. Understand the different asymptotic notations.
2. Design dynamic-programming and graph algorithms.
3. Understand multithreaded and number theoretic algorithms, understand the operations of heap.
4. Understand string matching algorithms and operations on tries.
5. Explain NP-complete problem and approximation algorithm.

Course Content

Unit -1

Review of Analysis Techniques: Growth of Functions: Asymptotic notations; Standard notations and common functions;

Recurrences -The substitution method, recursion-tree method, the master method. ***10 Hours***

Unit -2

Dynamic Programming - Matrix-Chain multiplication**,** Elements of dynamic programming**,** longest common subsequences.

Graph algorithms: Bellman - Ford Algorithm; Single source shortest paths in a DAG; Johnson's Algorithm for sparse graphs; Flow networks and Ford-Fulkerson method.

10 Hours

Unit -3

Multithreaded algorithms-Basics of dynamic multithreaded algorithm; Multithreaded merge sort.

Number -Theoretic Algorithms: Elementary notions; GCD; Modular Arithmetic; Solving modular linear equations; The Chinese remainder theorem

Heaps: Binary, Binomial, Fibonacci**, leftist, Skew.**

11 Hours

Unit -4

Advanced data structures: Tries (prefix trees) – insert ,delete ,search operations, K-d trees.

String-Matching Algorithms:

Naïve string Matching; Rabin - Karp algorithm; String matching with finite automata; Knuth-Morris-Pratt algorithm.

10 Hours

Unit -5

NP-Completeness: Polynomial time, Polynomial time verification, NP-Completeness and reducibility, NP-Complete problems.

Approximation Algorithms: vertex cover problem, the set – covering problem, randomization and linear programming, the subset – sum problem**.**

11 Hours

Text Books:

1. T. H Cormen, C E Leiserson, R L Rivest and C Stein: Introduction to Algorithms, 3rd Edition, PrenticeHall of India, 2012.
2. Mark Allan Weiss, Data Structures and Algorithms Analysis in C++, 4th Edition, Pearson, 2014, ISBN-13: 9780132847377 (Java, 3rd Edition, 2012, ISBN:0-132-57627-9 / 9780132576277)
3. Aho, Hopcroft and Ullman, Data structures and algorithms, 1st edition, Pearson Education.

Reference Books:

1. Ellis Horowitz, Sartaj Sahni, S.Rajasekharan: Fundamentals of Computer Algorithms, 2nd Edition, Universities press, 2007.

Course outcomes:

1. Analyze worst case, best case and average case running time of algorithms using asymptotic notation.
2. Design and analyze algorithms to optimization problems and apply graphs to model engineering problems when appropriate.
3. Implement multithread algorithm and use theory of congruence in application.
4. Apply appropriate string matching algorithm according to the application.
5. Choose appropriate approximation algorithms for NP complete problems.

Course Title: Advances in Operating System			
Course Code: P17MCSE13	**Sem: I**	**L-T-P-H: 3:0:1:4**	**Credits - 4**
Contact Period: Lecture: 52 Hrs., Exam: 3 Hrs		**Weightage: CIE:50; SEE:50**	

Course Learning Objectives (CLO's)

The course P17MCSE13 aims to:

1. Define the fundamentals of Operating Systems.
2. Explain distributed operating system concepts that includes architecture, Mutual exclusion algorithms, Deadlock detection algorithms and agreement protocols
3. Illustrate distributed resource management components viz. the algorithms for implementation of distributed shared memory, recovery and commit protocols
4. Identify the components and management aspects of Real time, Mobile operating Systems

Course Content

Unit -1

Operating System Overview, Process description & Control: Operating System Objectives and Functions, The Evolution of Operating Systems, Major Achievements, Developments Leading to Modern Operating Systems, Microsoft Windows Overview, Traditional UNIX Systems, Modern UNIX Systems, What is a Process?, Process States, Process Description, Process Control, Execution of the Operating System, Security Issues.

10 Hours

Unit-2

Threads, SMP, and Microkernel, Virtual Memory: Processes and Threads, Symmetric Multiprocessing (SMP), Micro Kernels, Windows Vista Thread and SMP Hours Management, Linux Process and Thread Management. Hardware and Control Structures, Operating System Software, UNIX Memory Management, Windows Vista Memory Management, Summary

10 Hours

Unit-3

Multiprocessor and Real-Time Scheduling: Multiprocessor Scheduling, Real-Time Scheduling, Linux Scheduling, UNIX PreclsSl) Scheduling, Windows Vista Hours Scheduling, Process Migration, Distributed Global States, Distributed Mutual Exclusion, Distributed Deadlock 10 Hours

Unit-4

Embedded Operating Systems: Embedded Systems, Characteristics of Embedded Operating Systems, eCOS, TinyOS, Computer Security Concepts, Threats, Attacks, and Assets, Intruders, Malicious Software Overview, Viruses, Worms, and Bots, Rootkits.

10 Hours

Unit-5

Kernel Organization: Using Kernel Services, Daemons, Starting the Kernel, Control in the Machine , Modules and Device Management, MODULE Organization, MODULE Installation and Removal, Process and Resource Management, Running Process Manager, Creating a new Task , IPC and Synchronization, The Scheduler , Memory Manager , The Virtual Address Space, The Page Fault Handler , File Management. The windows NT/2000/XP kernel: Introduction, The NT kernel, Objects , Threads, Multiplication Synchronization,Traps,Interrupts and Exceptions, The NT executive , Object Manager, Process and Thread Manager , Virtual Memory Manager, I/o Manager, The cache Manager Kernel local procedure calls and IPC, The native API, subsystems.

10 Hours

Text Books:

1. William Stallings: Operating Systems: Internals and Design Principles, 6th Edition, Prentice Hall, 2013.
2. Gary Nutt: Operating Systems, 3rd Edition, Pearson, 2014.

Reference Books:

1. Silberschatz, Galvin, Gagne: Operating System Concepts, 8th Edition, Wiley, 2008
2. Andrew S. Tanenbaum, Albert S. Woodhull: Operating Systems, Design and Implementation, 3rd Edition, Prentice Hall, 2006.
3. Pradeep K Sinha: Distribute Operating Systems, Concept and Design, PHI, 2007

Course outcomes: The students shall able to:

1. **Discuss t**he fundamental concepts of Operating System.
2. **Describe** SMP and threads.
3. **Demonstrate** the Mutual exclusion, Deadlock detection and agreement protocols of Distributed operating system
4. **Identify** the different features of Embedded Operating Systems
5. **Modify** existing open source kernels in terms of functionality or features used

Course Title: Probability & Statistics			
Course Code: P17MCSE14	**Sem: I**	**L-T-P-H: 4:0:0:4**	**Credits - 4**
Contact Period: Lecture: 52 Hrs., Exam: 3 Hrs		**Weightage: CIE:50; SEE:50**	

Course Learning Objectives (CLO's)

The course P17MCSE14 aims to:

1. Learn the basic concepts of probability and its applications.
2. Identify the different types of distributions.
3. Learn the fundamentals of stochastic process.
4. Analyze the probabilistic analysis of algorithms.
5. Understand the fundamentals of statistical inference and regression

Course Content

Unit -1

Introduction-Probability axioms, combinatorial problems, conditional probability ,Bayes' rule, Bernolli trials. **Discrete Random Variables-**Introduction, Random Variables and their Event spaces, The probability Mass, Function, Distribution Functions, Special Discrete Distribution.

10 Hours

Unit -2

Continuous Random variables-The exponential distribution, Some important distributions – Normal or Gaussian Distribution, Functions of a random variable Jointly distributed Random variables **Expectation-**Moments, Expectation of functions of more than one random variable, Transform methods, Moments and Transforms of Some important Distributions. computation of mean time failure, Inequalities and limit theorems(without proofs).

11 Hours

Unit -3

Conditional Distribution and conditional expectation –Definitions, Mixture distributions conditional expectation. Imperfect fault coveage and reliability, Random sums. **Stochastic**

Processes-Introduction, Classification , Bernoulli, Poisson Renewal processes. Availability analysis, Random Incidence.

10 Hours

Unit -4

Discrete –parameter Markov chains-computation of n-step transition probabilities, State Classification and Limiting distributions, Distribution of times be a Birth –Death Model. Non-Birth Death Process. Markov Chains with absorbing states. **Networks of queues-** Introduction, Open Queuing Networks, Closed Queuing Networks , Non-exponential Service –Time Distributions and Multiple Job Types, Non-Product-Form Networks.

11 Hours

Unit -5

Descriptive statistics- Introduction, Frequency tables , Histograms, Measures of Central Tendency, Measures of Dispersion, Bivariate Data, correlation Coefficients Methods of Least Squares, Regression Line curve fitting.

Chi-square distribution-Introduction, Goodness of Fit,Null Hypothesis, critical values, Goodness of Fit for all type of distributions-Binomial ,Normal, Uniform and Prior Distribution, Chi-square test for Independence.

10 Hours

Text Book:

1.TRIVEDI, KISHOR S. 2002, Probability and Statistics with Reliability, Queueing and Computer Science Applications, Second Edition, John Wiley and Sons, New York.
2.Probability (Second edition) schaum's outlines by Seymour Lipschutz, Marc Lars Lipson.

Reference Books:

1. Walpole, myers, Myers: Probability and statistics for Engineers and Scientists.
2. Miller and Freund's Probability and statistics for Engineers Fifth edition –Richard

Course Outcome

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

1. Discuss the fundamental concepts of probability and its applications.
2. Identify the different types of distributions with their applications.
3. Solve the practical stochastic modeling problems..
4. Identify and analyze the probabilistic analysis of algorithms.
5. Learn to solve the problems of statistical inference and regression.

Course Title: Web Engineering			
Course Code: P17MCSE151	**Sem: I**	**L-T-P-H: 3:1:0:5**	**Credits - 4**
Contact Period: Lecture: 52 Hrs., Exam: 3 Hrs		**Weightage: CIE:50; SEE:50**	

Course Learning Objectives (CLO's)

The course P17MCSE151 aims to:

1. Understand the concepts, principles and methods of Web engineering.
2. Apply the concepts, principles, and methods of Web engineering to Web applications development.
3. Be familiar with current Web technologies, Web application development software tools and environments currently available on the market.

4. Understand the technologies, business models and societal issues of Web 2.0 and Semantic Web.

Course Content

Unit-1

WEB-BASED SYSTEMS, WEB ENGINEERING AND ITS PROCESS, PLANNING

Web-Based Systems: The Web, Web Applications, WebApps—A Philosophical View

Web Engineering: What Is Web Engineering? The Components of Web Engineering, Web Engineering Best Practices

A Web Engineering Process: Defining the Framework, Incremental Process Flow, Generic Actions and Tasks for the WebE Framework, Umbrella Activities

Planning: Understanding Scope, Refining Framework Activities, Building a WebE Team, Managing Risk, Developing a Schedule, Managing Quality, Managing Change, Tracking the Project, Outsourcing WebE Work

11 Hours

Unit-2

MODELING ACTIVITY, ANALYSIS MODELING, WEBAPP DESIGN

The Modeling Activity: Modeling as a Concept, The Models We Create, Modeling Frameworks, Modeling Languages, Existing Modeling Approaches

Analysis Modeling for WebApps: Understanding Analysis in the Context of WebE, Analysis Modeling for WebApps, Understanding the Users, The Content Model, The Interaction Model, The Functional Model, The Configuration Model, Relationship-Navigation Analysis

WebApp Design: Design for WebApps, Design Goals, Design and WebApp Quality, The Design Process, Initial Design of the Conceptual Architecture, Initial Design of the Technical Architecture

11 Hours.

Unit-3

INTERACTION AND INFORMATION DESIGN

Interaction Design: Interface Design Principles and Guidelines, Interface Design Workflow, Interface Design Preliminaries, Interface Design Steps, Aesthetic Design, Usability, Design Issues

Information Design: Information Architecture, Organizing Content, Structuring the Information Space, Blueprints: Adding Detail to a Structure, Accessing Information, Wireframe Models, Navigation Design: Creating the Detailed Structure, Summarizing the Design Process

10 Hours.

Unit-4

FUNCTIONAL DESIGN, CONSTRUCTION AND DEPLOYMENT, DESIGN PATTERNS, TECHNOLOGIES AND TOOLS

Functional Design: WebApp Functionality, The Nature of WebApp Functionality, Functional Design in the Design Process, Functional Architecture, Detailed Functional Design, State Modeling

Construction and Deployment: Construction and Deployment within the WebE Process, Construction, Construction Principles and Concepts, Deployment, Construction and the Use of Components, Component-Level Design Guidelines, Component Design Steps

Design Patterns: Patterns: Understanding the Concept, WebApp Patterns - Design Focus and Granularity, Pattern Repositories, Example Patterns

Technologies and Tools: General Issues, Implementation Tools and Technologies, Development Tools and Technologies

10 Hours.

Unit-5

TESTING WEBAPPS, CHANGE AND CONTENT MANAGEMENT

Testing WebApps: Testing Concepts, The Testing Process—An Overview, Content Testing, User Interface Testing, Usability Testing, Compatibility Testing, Component-Level Testing, Navigation Testing, Configuration Testing, Security and Performance Testing

Change and Content Management: Change, Change Management for Web Engineering, Content Management, Criteria for Implementing a CMS

Future Directions: The Changing Nature of the Web and WebApps, Evolving Web Technologies and Web 2.0, One View of the Future, The Changing Nature of Web Engineering.

10 Hours.

Textbook:

1. Web Engineering: A Practitioner's Approach by Roger Pressman and David Lowe, Tata McGraw-Hill, 2008

Reference Books:

1. Web Engineering by Gerti Kappel, Brigit Proll, Siegfried Reich, Werner Retschitzegger, Wiley, 2009
2. Head First Design Patterns by Bert Bates, Kathy Sierra, Eric Freeman, Elisabeth Robson, O'Reilly, 2009

Course outcomes:

On Completion of the course, the students will be able to

1. Understand web engineering and its process.
2. Apply various modeling technique for web applications.
3. Discuss design issues involved in web application development
4. Apply design patterns, technologies and tools in constrution and deployment of web application.
5. Use testing process specific to Webapps

Course Title: Advances in Data Mining			
Course Code: P17MCSE152	**Sem: I**	**L-T-P-H: 3:1:0:5**	**Credits - 4**
Contact Period: Lecture: 52 Hrs., Exam: 3 Hrs		**Weightage: CIE:50; SEE:50**	

Course Learning Objectives (CLO's)

The course P17MCSE152 aims to:

1. Explain Data mining principles, Data warehousing Architecture &its Implementation.
2. Interpret association rule mining for handling large data &Classification for the retrieval purposes
3. Explain clustering techniques in details for better organization and retrieval of data
4. Focuses on the mining of stream data, time-series data, sequence data.
5. Expose Mining Object, Spatial, Multimedia, Text, and Web Data

Course Content

Unit - 1

Introduction : Data Mining, Kinds of Data, Data Mining Functionalities, Classification of Data Mining Systems, Primitives, Major Issues in Data Mining.

Data Warehouse and OLAP Technology: What is Data Warehouse, A Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, From Data Warehouse to Data Mining.

10 Hours

Unit - 2

Mining Frequent Patterns and Associations: Basic Concepts, Efficient and Scalable Frequent Item set Mining Methods, Mining Various Kinds of Association Rules.

Classification and Prediction: Issues regarding classification and prediction, classification by decision tree induction, Bayesian classification, Rule based classification, Prediction, Accuracy and Error Measures.

10 Hours

Unit - 3

Cluster Analysis: Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, Density based Methods, Grid based methods, model based clustering methods, Clustering high dimensional data, Outlier analysis.

10 Hours

Unit - 4

Mining Stream, Time-Series, and Sequence Data: Mining Data Streams, Mining Time-Series Data, Mining Sequence Patterns in Biological Data,

Graph Mining: Methods for Mining Frequent Sub-graphs, Mining Variant and Constrained Substructure Patterns, Applications: Graph Indexing, Similarity Search, Classification, and Clustering .

12 Hours

Unit – 5

Mining Object, Spatial, Multimedia, Text, and Web Data: Multidimensional Analysis and Descriptive Mining of Complex Data Objects, Spatial Data Mining, Multimedia Data Mining, Text Mining, Mining the World Wide Web.

10 Hours.

Text Books:

1. Jiawei Han, Micheline Kamber, Jian Pei: Data Mining Concepts and Techniques, ELSEVIER(MK) 3rd edition 2012.

Reference Books:

1. Margaret H Dunham, Data Mining Introductory and Advanced Topics, Pearson Education, 2e, 2006.
2. Amitesh Sinha, Data Warehousing, Thomson Learning, 2007

Course Outcomes:

The students should be able to:

1. Demonstrate the concept of data mining principles, data warehousing Architecture &its Implementation
2. Apply the association rules, design and deploy appropriate classification techniques for mining the data.
3. Cluster the high dimensional data for better organization of the data.
4. Learn to stream mining, Time-Series and sequence data in high dimensional system.
5. Understand the concept of Mining Object, Spatial, Multimedia, Text, and Web Data

Course Title: Cloud Computing			
Course Code: P17MCSE161	**Sem: I**	**L-T-P-H: 3:1:0:5**	**Credits - 4**
Contact Period: Lecture: 52 Hrs., Exam: 3 Hrs		**Weightage: CIE:50; SEE:50**	

Course Learning Objectives (CLO's)

The course P17MCSE161 aims to:

1. To describe how to use Cloud Services.
2. To implement Virtualization
3. To implement Task Scheduling algorithms.
4. Apply Map-Reduce concept to applications.
5. To build Private Cloud.

Course Content

Unit-1

Introduction, Cloud Infrastructure

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

10 Hours

Unit-2

Cloud Computing: Application Paradigms.

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

10 Hours

Unit-3

Cloud Resource Virtualization.

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

10 Hours

Unit-4

Cloud Resource Management and Scheduling.

Policies and mechanisms for resource management, Application of control theory to task scheduling on a cloud, Stability of a two-level resource allocation architecture, Feedback control based on dynamic thresholds, Coordination of specialized autonomic performance managers, A utility-based model for cloud-based Web services, Resourcing bundling: Combinatorial auctions for cloud resources, Scheduling algorithms for computing clouds, Fair queuing, Start-time fair queuing, Borrowed virtual time, Cloud scheduling subject to deadlines, Scheduling Map Reduce applications subject to deadlines, Resource management and dynamic scaling,

10 Hours

Unit-5

Cloud Security, Cloud Application Development.

Cloud security risks, Security: The top concern for cloud users, Privacy and privacy impact assessment, Trust, Operating system security, Virtual machine Security, Securityof virtualization, Security risks posed by shared images, Security risks posed by a management OS, A trusted virtual machine monitor, Amazon web services: EC2 instances, Connecting clients to cloud instances through firewalls, Security rules for application and transport layer protocols in EC2, How to launch an EC2 Linux instance and connect to it, How to use S3in java, Cloud-based simulation of a distributed trust algorithm, A trust management service, A cloud service for adaptive data streaming, Cloud based optimal FPGA synthesis.

10 Hours

Text Book:

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

References:

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

Course outcomes:

The students shall able to:

1. To describe how to use Cloud Services.
2. To implement Virtualization
3. To implement Task Scheduling algorithms.
4. Apply Map-Reduce concept to applications.
5. To build Private Cloud.

Course Title: Cyber Crime and Digital Forensic			
Course Code: P17MCSE162	**Sem: I**	**L-T-P-H: 3:1:0:5**	**Credits - 4**
Contact Period: Lecture: 52 Hrs., Exam: 3 Hrs		**Weightage: CIE:50; SEE:50**	

Course Learning Objectives (CLO's)

The course P17MCSE162 aims to:

1. Discuss computer forensics fundamentals, provides an overview of computer forensics, types of computer forensics technology, services.
2. To provide knowledge about vendor and computer forensics services, data recovery relates to computer forensics.
3. Discuss about Evidence collection and data seizure, duplication and preservation of digital Evidence.
4. To discuss about computer image verification and authentication, discovery of electronic evidence, identification of data.
5. To provide knowledge about Reconstructing Past events, solution to the dilemma network forensics.

Course Content

Unit – 1

Computer forensics fundamentals Introduction: what is computer forensics?, Use of computer forensics in law enforcement, Computer forensics assistance to human resources /employment proceedings, Computer forensics services, Benefits of professional forensics methodology SLC: Steps taken by computer forensics specialists, who can use computer forensic evidence? Types of computer forensics technology, Types of military computer forensic technology, Types of law enforcement, Computer forensic technology, Types of business computer forensic technology.

10 Hours

Unit –2

Occurrence of cybercrime, Cyber detectives, fighting cyber crime with risk –management techniques, Computer forensics investigative services SLC: Forensic process improvement. Introduction of Data recovery, Data back-up and recovery, the role of back-up in data recovery, The data-recovery solution.

10 Hours

Unit –3

Evidence collection and data seizure Why collect evidence?, Collection options, Obstacles, Types of evidence, The rules of evidence, Volatile evidence, General procedure, Collection and archiving, Methods of collection, Artifacts, Collection steps, Preserving the digital crime scene,

Computer evidence processing scene, Legal aspects of collecting SLC: preserving computer forensic evidence.

11 Hours

Unit –4

Computer image verification and authentication Special needs of evidential authentication, Practical consideration, Practical implementation, Electronic document discovery: a powerful new litigation tool, Time travel, SLC: Forensics identification and analysis of technical surveillance devices.

10 Hours

Unit – 5

Reconstruction past events How to become a digital detective, Useable file formats, Unusable file formats, Converting files, Network forensics scenario, A technical approach, Destruction of e-mail, Damaging computer evidence, Documenting the intrusion on destruction of data SLC: System testing.

11 Hours

Text Books:

1. Computer Forensics computer crime scene investigation by **John R VACCA** , Firewall Media ,2009 edition Reprint 2012.

Reference Books:

1. Guide to computer forensics and investigations by Bill Nelson, Amelia Phillips, Christopher Stuart, Cengage Learning publications, 4th edition 2013.
2. Computer Forensics by David Cowen -CISSP , Mc GrawHill education , Indian edition 2013.

Course Outcomes:

On Successful completion of the course, the students will be able to

1. Identify and need for computer forensics
2. Analyze the computer forensic technology
3. Describe the process of data recovery
4. Explain legal aspects of collecting and preserving computer evidence
5. How to recover electronic documents
6. Distinguish between usable and unusable file formats

Course Title: Advanced Data Structures & Algorithms Lab			
Course Code: P17MCSEL17	**Sem: I**	**L-T-P-H: 0:0:4:4**	**Credits - 2**
Contact Period: Lecture: 52 Hrs., Exam: 3 Hrs		**Weightage: CIE:50; SEE:50**	

Course Learning Objectives (CLO's)

The course P17MCSEL17 aims to:

1. Apply the algorithms and design techniques to solve problems.
2. Prove the correctness of the running time of the algorithms in various domains.
3. Model real problems using the language of graphs and flows.
4. To implement various designing paradigms of algorithms for solving problems in different domains.

Design, develop and execute the following algorithms and determine their performance.

1. Bellman-Ford algorithm.
2. Johnson's algorithm.
3. Ford-Fulkerson algorithm.
4. Chinese remainder algorithm to solve system of linear congruence.
5. Rabin - Karp algorithm
6. String matching algorithm with finite automata.
7. Knuth-Morris-Pratt algorithm.
8. Operations on tries.
9. Operations on heap.
10. Approximation Algorithms.

Course Outcome

1. Compare the performance of different algorithms for the same problem.
2. Solve problems by reducing to other problems whose solution is known and show that problems are hard by reducing from other problems.
3. Make intelligent decisions about alternative data structures and algorithmic techniques in the context of software problems, choosing from existing data structures and algorithms or design own when necessary.
4. Develop the efficient algorithms for the problem with suitable techniques.

Course Title: Advances in Computer Networks			
Course Code: P17MCSE21	**Sem: II**	**L-T-P-H: 3:1:0:5**	**Credits - 4**
Contact Period: Lecture: 52 Hrs., Exam: 3 Hrs		**Weightage: CIE:50; SEE:50**	

Course Learning Objectives (CLO's)

The course P17MCSE21 aims to:

1. Understand the TCP/IP protocol suite and the working of the Internet.
2. Form an understanding of the principles upon which the global Internet was designed.
3. Understand basic terminology so that students can understand networking research papers.
4. Understand the UDP,TCP and RPC
5. Understand how to conduct networking research and develop innovative ideas.

Course Content

Unit -1

Foundation and Review of basic concepts: Applications; Requirements; Network Architecture; Implementing Network software; performance; perspectives on connecting;

Encoding; Framing; Error Detection; Reliable Transmission;

11 Hours

Unit -2

Internetworking: Switching and Bridging; Basic Internetworking (IP); Routing; Implementation and performance;

11Hours

Unit -3

Advanced Internetworking: The Global Internet; Multicast; Multiprotocol label switching (MPLS); Routing among mobile devices;

10 Hours

Unit -4

End-to-End Protocols: Simple Demultiplexer (UDP); Reliable byte stream(TCP) ;Remote Procedure Call(RPC) ;Transport for Real time Application;

10 Hours

Unit -5

Congestion Control and Resource Allocation: Issues in Resource Allocation; Queuing Disciplines; TCP Congestion Control; Congestion-Avoidance Mechanisms; Integrated services(RSVP);

10 Hours

Text Books:

1. Larry L. Peterson and Bruces S. Davie : Computer Networks – a systems Approach, Fifth Edition,Elsevier,2013

Reference Books:

1. Behrouz A. Forouzan: Data Communication and networking, Fourth Edition, Tata McGraw Hill, 2011

2. Alberto Leon Garcia and Indra Widjaja: Communication Networks-Fundamental Concepts and key Architecture, Second Edition, Tata McGraw Hill, 2004

Course Outcomes:

1. Defining the different protocols, software, framing and network architectures.
2. Recognize the different internetworking devices and their functions
3. Design ,calculate and apply subnet masks and addresses to fulfill networking requirements
4. Explain Simple De multiplexer(UDP); Reliable byte stream(TCP) ;Remote Procedure Call(RPC) ;Transport for Real time Application
5. Explain Issues in Resource Allocation; Queuing Disciplines; TCP Congestion Control; Congestion-Avoidance Mechanisms.

Course Title: Multicore Architecture & parallel Programming			
Course Code: P17MCSE22	Sem: II	L-T-P-H: 3:0:1:4	Credits - 4
Contact Period: Lecture: 52 Hrs., Exam: 3 Hrs		Weightage: CIE:50; SEE:50	

Course Learning Objectives (CLO's)

The course P17MCSE22 aims to:

1. Define technologies of multicore architecture and performance measures
2. Demonstrate problems related to multiprocessing
3. Illustrate windows threading, posix threads, openmp programming
4. Analyze the common problems in parallel programming

Course Content

Unit-1

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

10 Hours

Unit-2

Fundamental Concepts of Parallel Programming :Designing for Threads, Task Decomposition, Data Decomposition, Data Flow Decomposition, Implications of Different Decompositions, Challenges You'll Face, Parallel Programming Patterns, A Motivating Problem: Error Diffusion, Analysis of the Error Diffusion Algorithm, An Alternate Approach: Parallel Error Diffusion, Other Alternatives. Threading and Parallel Programming Constructs: Synchronization, Critical Sections, Deadlock, Synchronization Primitives, Semaphores, Locks, Condition Variables, Messages, Flow Control- based Concepts, Fence, Barrier, Implementation-dependent Threading Features

10 Hours

Unit-3

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

10 Hours

Unit-4

OpenMP: A Portable Solution for Threading : Challenges in Threading a Loop, 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 OpenMP, OpenMP Library Functions, OpenMP Environment Variables, Compilation, Debugging, performance

10 Hours

Unit-5

Solutions to Common Parallel Programming Problems : Too Many Threads, Data Races, Deadlocks, and Live Locks, Deadlock, Heavily Contended Locks, Priority Inversion, Solutions for Heavily Contended Locks, Non-blocking Algorithms, ABA Problem, Cache Line Ping-ponging, Memory Reclamation Problem, Recommendations, Thread-safe Functions and Libraries, Memory Issues, Bandwidth, Working in the Cache, Memory Contention, Cache-related Issues, False Sharing, Memory Consistency, Current IA-32 Architecture, Itanium Architecture, High-level Languages, Avoiding Pipeline Stalls on IA-32,Data Organization for High Performance.

10 Hours

Text Books:

1. Multicore Programming , Increased Performance through Software Multi-threading by Shameem Akhter and Jason Roberts , Intel Press , 2006

Course outcomes:

The students shall able to:

1. **Point out** the salient features of different multicore architectures and how they exploit parallelism.
2. **Define** fundamental concepts of parallel programming and its design issues
3. **Compare** the different threading API‟S.
4. **Demonstrate** the role of OpenMP and programming concept
5. **Explain** the concepts of deadlocks, data races & Design a Nonblocking Algorithms.

Course Title: Machine Learning Techniques			
Course Code: P17MCSE23	**Sem: II**	**L-T-P-H: 3:1:0:5**	**Credits - 4**
Contact Period: Lecture: 52 Hrs., Exam: 3 Hrs		**Weightage: CIE:50; SEE:50**	

Course Learning Objectives (CLO's)

The course P17MCSE23 aims to:

This course will enable students to

1. Explain basic concepts of learning and decision trees.
2. Compare and contrast neural networks and genetic algorithms
3. Apply the Bayesian techniques and instant based learning
4. Examine analytical learning and reinforced learning

Course Content

Unit-1

INTRODUCTION, CONCEPT LEARNING AND DECISION TREES

Learning Problems – Designing Learning systems, Perspectives and Issues – Concept Learning – Version Spaces and Candidate Elimination Algorithm – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search

10 Hours

Unit-2

NEURAL NETWORKS AND GENETIC ALGORITHMS

Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evolution and Learning.

10 Hours.

Unit-3

BAYESIAN AND COMPUTATIONAL LEARNING

Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes. Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier– Bayesian Belief Network – EM Algorithm – Probably Learning – Sample Complexity for Finite and Infinite Hypothesis Spaces – Mistake Bound Model.

10 Hours.

Unit-4

INSTANT BASED LEARNING AND LEARNING SET OF RULES

K- Nearest Neighbor Learning – Locally Weighted Regression – Radial Basis Functions – CaseBased Reasoning – Sequential Covering Algorithms – Learning Rule Sets – Learning First Order Rules – Learning Sets of First Order Rules – Induction as Inverted Deduction – Inverting Resolution

10 Hours.

Unit-5

ANALYTICAL LEARNING AND REINFORCED LEARNING

Perfect Domain Theories – Explanation Based Learning – Inductive-Analytical Approaches - FOCL Algorithm – Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning

10 Hours.

Textbook:

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. T. Hastie, R. Tibshirani, J. H. Friedman, "The Elements of Statistical Learning", Springer; 1st edition, 2001.

Course outcomes:

On Completion of the course, the students will be able to

1. Choose the learning techniques with this basic knowledge.
2. Apply effectively neural networks and genetic algorithms for appropriate applications.
3. Apply Bayesian techniques and derive effectively learning rules.
4. Explain the different machine learning techniques.
5. Choose and differentiate reinforcement and analytical learning techniques

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Course Title: Wireless Networks & Mobile Computing			
Course Code: P17MCSE241	**Sem: II**	**L-T-P-H: 3:1:0:5**	**Credits - 4**
Contact Period: Lecture: 52 Hrs., Exam: 3 Hrs		**Weightage: CIE:50; SEE:50**	

Course Learning Objectives (CLO's)

The course P17MCSE141 aims to:

This course will enable students to

1. Define concepts of wireless communication.
2. Compare and contrast propagation methods, Channel models, capacity calculations multiple antennas and multiple user techniques used in the mobile communication.
3. Explain CDMA, GSM. Mobile IP, WImax and Different Mobile OS
4. Illustrate various Markup Languages CDC, CLDC, MIDP; Programming for CLDC, MIDlet model and security concerns

Course Content

Unit -1

Mobile Computing Architecture: Architecture for Mobile Computing, 3-tier Architecture, Design Considerations for Mobile Computing. Wireless Networks : Global Systems for Mobile Communication (GSM and Short Service Messages (SMS): GSM Architecture, Entities, Call routing in GSM, PLMN Interface, GSM Addresses and Identities, Network Aspects in GSM, Mobility Management, GSM Frequency allocation. Introduction to SMS, SMS Architecture, SM MT, SM MO, SMS as Information bearer, applications, GPRS and Packet Data Network, GPRS Network Architecture, GPRS Network Operations, Data Services in GPRS, Applications for GPRS, Billing and Charging in GPRS, Spread Spectrum technology, IS-95, CDMA versus GSM, Wireless Data, Third Generation Networks, Applications on 3G, Introduction to WiMAX.

10 Hours

Unit -2

Mobile Client: Moving beyond desktop, Mobile handset overview, Mobile phones and their features, PDA, Design Constraints in applications for handheld devices. Mobile IP: Introduction, discovery, Registration, Tunneling, Cellular IP, Mobile IP with IPv6.

10 Hours

Unit-3

Mobile OS and Computing Environment : Smart Client Architecture, The Client: User Interface, Data Storage, Performance, Data Synchronization, Messaging. The Server: Data Synchronization, Enterprise Data Source, Messaging. Mobile Operating Systems: WinCE, Palm OS, Symbian OS, Linux, Proprietary OS Client Development: The development process, Need analysis phase, Design phase, Implementation and Testing phase, Deployment phase, Development Tools, Device Emulators.

10 Hours

Unit-4

Building, Mobile Internet Applications: Thin client: Architecture, the client, Middleware, messaging Servers, Processing a Wireless request, Wireless Applications Protocol (WAP) Overview, Wireless Languages: Markup Languages, HDML, WML, HTML, cHTML, XHTML, VoiceXML.

10 Hours

Unit-5

J2ME: Introduction, CDC, CLDC, MIDP; Programming for CLDC, MIDlet model, Provisioning, MIDlet life-cycle, Creating new application, MIDlet event handling, GUI in MIDP, Low level GUI Components, Multimedia APIs; Communication in MIDP, Security Considerations in MIDP.

10 Hours

Textbook:

1. Ashok Talukder, RoopaYavagal, Hasan Ahmed: Mobile Computing, Technology, Applications and Service Creation, 2nd Edition, Tata McGraw Hill, 2010.
2. Martyn Mallik: Mobile and Wireless Design Essentials, Wiley India, 2003

Reference Books:

1. Raj kamal: Mobile Computing, Oxford University Press, 2007.
2. ItiSahaMisra: Wireless Communications and Networks, 3G and Beyond, Tata McGraw Hill, 2009.

Course outcomes:

1. On Completion of the course, the students will be able to
2. Explain state of art techniques in wireless communication.
3. Compare and contrast propagation methods, Channel models, capacity calculations multiple antennas and multiple user techniques used in the mobile communication.
4. Explain CDMA, GSM. Mobile IP, WImax and Different Mobile OS
5. Illustrate various Markup Languages CDC, CLDC, MIDP
6. Develops Programming ability for CLDC, MIDlet model and security concerns

Course Title: Social Networks and Semantic Web			
Course Code: P17MCSE242	**Sem: II**	**L-T-P-H: 3:1:0:5**	**Credits - 4**
Contact Period: Lecture: 52 Hrs., Exam: 3 Hrs		**Weightage: CIE:50; SEE:50**	

Course Learning Objectives (CLO's)

The course P17MCSE242 aims to:

1. To explain the analysis of the social Web and the design of a new class of applications that combine human intelligence with machine processing.
2. To describe how the Semantic Web provides the key in aggregating information across heterogeneous sources.
3. To understand the benefits of Semantic Web by incorporating user-generated metadata and other clues left behind by users.

Course Content

Unit-1

Introduction to the Semantic Web and Social Networks: The Semantic Web- Limitations of the current Web, The semantic solution, Development of the Semantic Web, The emergence of the social web. Social Network Analysis- What is network analysis, Development of Social Network Analysis, Key concepts and measures in network analysis

10 Hours

. **Unit-2**

Web data, Semantics and Knowledge Representation on the Semantic Web: Electronic sources for network analysis- Electronic discussion networks, Blogs and online communities, Web-based networks. Knowledge Representation on the Semantic Web- Ontologies and their role in the Semantic Web, Ontology languages for the Semantic Web (RDF, OWL).

10 Hours

Unit-3

Modeling and aggregating social network data: State-of-the-art in network data representation, Ontological representation of social individuals, Ontological representation of social relationships, Aggregating and reasoning with social network data.

12 Hours

Unit-4

Developing social-semantic applications: Building Semantic Web applications with social network features, Flink: the social networks of the Semantic Web community, open academia: distributed, semantic-based publication management.

10 Hours

Unit-5

Evaluation of web-based social network extraction and Ontologies are us: Differences between survey methods and electronic data extraction, Context of the empirical study, Data

collection, Preparing the data, Optimizing goodness of fit, Comparison across methods and networks, Predicting the goodness of fit, Evaluation through analysis. Ontologies are us: A tripartite model of ontologies, Case studies, Evaluation.

10 Hours

Text Books:

1. Social Networks and the Semantic Web, Peter Mika, Springer, 2007.
2. Semantic Web Technologies, Trends and Research in Ontology Based Systems, J.Davies, R.Studer, P.Warren, John Wiley & Sons.

Reference Books:

1. Semantic Web and Semantic Web Services -Liyang Lu Chapman and Hall/CRC Publishers, (Taylor & Francis Group)
2. Information Sharing on the semantic Web - HeinerStuckenschmidt; Frank Van Harmelen, Springer Publications.

Course Outcomes:

Students will be able to

1. Explore the significance of Semantic Web and Social Networks.
2. Understand Electronic sources for network analysis and different Ontology languages.
3. Determine/Provide ontological representation of social network data.
4. Develop social-semantic applications.
5. Evaluate Web- based social network and Ontology.

Course Title: Business Intelligence & its Application			
Course Code: P17MCSE251	**Sem: II**	**L-T-P-H: 3:1:0:5**	**Credits - 4**
Contact Period: Lecture: 52 Hrs., Exam: 3 Hrs		**Weightage: CIE:50; SEE:50**	

Course Learning Objectives (CLO's)

The course P17MCSE251 aims to:

1. To make students exposed with the basic rudiments of business intelligence system.
2. To provide knowledge about modeling aspects behind Business Intelligence.
3. To provide knowledge about the business intelligence life cycle and the techniques used in it.
4. To make students be exposed with different data analysis tools and techniques.
5. To provide knowledge about applying business intelligence methods to various situations.

Course Content

Unit -1

Introduction to Business Intelligence:

Introduction to digital data and its types – structured, semi-structured and unstructured, Introduction to OLTP and OLAP (MOLAP, ROLAP, HOLAP), BI Definitions & Concepts, BI Framework, Data Warehousing concepts and its role in BI, BI Infrastructure Components – BI Process, BI Technology, BI Roles & Responsibilities, Business Applications of BI, BI best practices. 10 Hours

Unit -2

Basics of Data Integration (Extraction Transformation Loading): Concepts of data integration, needs and advantages of using data integration, introduction to common data integration approaches, Meta data - types and sources, Introduction to data quality, data

profiling concepts and applications, introduction to ETL using Pentaho data Integration (formerly Kettle) 10 Hours

Unit -3

Introduction to Multi-Dimensional Data Modelling: Introduction to data and dimension modeling, multidimensional data model, ER Modeling vs. multi dimensional modeling, concepts of dimensions, facts, cubes, attribute, hierarchies, star and snowflake schema, Step-by-step lab guide to analyze data using MS Excel 12 Hours

Unit -4

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, KPI Usage in companies, business metrics and KPIs, Connecting the dots: Measures to business decisions and beyond. 10 Hours

Unit -5

Basics of enterprise reporting: A typical enterprise, Reporting perspectives common to all levels enterprise, Report standardization and presentation practices, Enterprise reporting characteristics in OLAP world, Malcolm Baldrige - quality performance framework, balanced scorecard, enterprise dashboard, balanced scorecard vs. enterprise dashboard, enterprise reporting using MS Access / MS Excel, best practices in the design of enterprise dashboards. 10 Hours

Text Books:

1 "Fundamentals of Business Analytics" – By R N Prasad and Seema Acharya, Publishers: Wiley India Pvt. Ltd, 2011.
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, Mc Graw Hill.

Course Outcomes:

1. **Differentiate** between Transaction Processing and Analytical applications and **describe** the need for Business Intelligence
2. **Demonstrate** understanding of technology and processes associated with Business Intelligence framework for data integration.
3. **Demonstrate** understanding of Multi-Dimensional Data Modelling implementation methodology and **apply** suitable data modeling method for a given business scenario.
4. **Identify** the metrics, indicators and make recommendations to achieve the business goal for a given a business scenario.
5. **Design** an enterprise dashboard that depicts the key performance indicators which helps in decision making.

Course Title: Agile Technologies			
Course Code: P17MCSE252	**Sem: II**	**L-T-P-H: 3:1:0:5**	**Credits - 4**
Contact Period: Lecture: 52 Hrs., Exam: 3 Hrs		**Weightage: CIE:50; SEE:50**	

Course Learning Objectives (CLO's)

The course P17MCSE252 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 – The most common mistake – Specific iterative and Evolutionary methods.

12 Hours

Unit -2

AGILE AND ITS SIGNIFICANCE

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

10 Hours

Unit -3

AGILE METHODOLOGY

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

10 Hours

Unit -4

SCRUM

Concepts –deliverable and methods. XP: Concepts –deliverable and methods

Unified process: Concepts- deliverable-methods.EVE: Concepts- Methods-deliverable.

EVO: Method Overview, Lifecycle, Work Products, Roles and practices, Common mistakes and Misunderstandings, Sample Projects.

10 Hours

Unit -5

AGILE PRACTICING AND TESTING

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

10 Hours

Text Book

1.Craig Larman "Agile and Iterative Development – A Manager's Guide" Pearson Education – 2004.

2. Elisabeth Hendrickson, "Agile Testing" Quality Tree Software Inc 2008.

Referances:

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

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Course Title: Multimedia communication			
Course Code: P17MCSE261	**Sem: II**	**L-T-P-H: 3:1:0:5**	**Credits - 4**
Contact Period: Lecture: 52 Hrs., Exam: 3 Hrs		**Weightage: CIE:50; SEE:50**	

Course Learning Objectives (CLO's)

The course P17MCSE261 aims to:

1. Define the Multimedia Communication Models
2. Explain Multimedia Transport in Wireless Networks
3. Solve the Security issues in multimedia networks
4. Illustrate real-time multimedia network applications.
5. Explain different network layer based application.

Course Content

Unit - 1

Introduction, multimedia information representation, multimedia networks, multimedia applications, Application and networking terminology, network QoS and application QoS, Digitization principles,. Text, images, audio and video.

11 Hours

Unit - 2

Text and image compression,, compression principles, text compression- Runlength, Huffman, LZW, Document Image compression using T2 and T3 coding, image compression- GIF, TIFF and JPEG. **- 11 Hrs**

Unit - 3

Audio and video compression, audio compression – principles, DPCM, ADPCM, Adaptive and Linear predictive coding, Code-Excited LPC, Perceptual coding, MPEG and Dolby coders video compression, video compression principles.

10 Hours

Unit - 4

Video compression standards: H.261, H.263, MPEG, MPEG 1, MPEG 2, MPEG-4 and Reversible VLCs, MPEG 7 standardization process of multimedia content description, MPEG 21 multimedia framework.

10 Hours

Unit - 5

Notion of synchronization, presentation requirements, reference model for synchronization, Introduction to SMIL, Multimedia operating systems, Resource management, process management techniques.

10 Hours

Text Books:

1. Fred Halsall, "Multimedia Communications", Pearson education, 2001.
2. Raif Steinmetz, Klara Nahrstedt, "Multimedia: Computing, Communications and Applications", Pearson education, 2002.

Reference Books:

1. K. R. Rao, Zoran S. Bojkovic, Dragorad A. Milovanovic, "Multimedia Communication Systems", Pearson education, 2004.
2. John Billamil, Louis Molina, "Multimedia : An Introduction", PHI, 2002.

Course Outcomes:

The students should be able to:

- Deploy the right multimedia communication models.
- Apply QoS to multimedia network applications with efficient routing techniques.
- Solve the security threats in the multimedia networks.
- Develop the real-time multimedia network applications
- Explain the notion of synchronization.

Course Title: Foundation for Internet of Things			
Course Code: P17MCSE262	**Sem: II**	**L-T-P-H: 3:1:0:5**	**Credits - 4**
Contact Period: Lecture: 52 Hrs., Exam: 3 Hrs		**Weightage: CIE:50; SEE:50**	

Course Learning Objectives (CLO's)

The course P17MCSE262 aims to:

Course Content

Unit -1

Introduction to Internet of Things, Definition and Characteristics of IoT, Physical Design of IoT, IoT Protocols, IoT communication models, IoT Communication APIs, IoT enabled Technologies, Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Templates, Domain Specific IoTs: Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health and Lifestyle, **IoT and M2M: Introduction, M2M , Difference between IoT and M2M**

11 Hours

Unit-2

Key IoT Technologies: Device Intelligence, Communication Capabilities, Mobility Support, Device power, Sensor technology, RFID technology, IoT Physical Devices and Endpoints, Introduction to Raspberry PI, Interfaces (serial, SPI, I2C), Programming: Python program with Raspberry PI with focus of interfacing external gadgets, controlling output, reading input from pins

10 Hours

Unit -3

IoT communication reference architecture: Wireless Communication Technology for IoT,Wi-Fi (IEEE 802.11), Bluetooth, ZigBee, UWB (IEEE 802.15.4), NFC, 6LoWPAN. IoT Application Protocol: Constrained Application Protocol, MQ Telemetry Transport (MQTT).

10 Hours

Unit-4

IoT Physical Servers and Cloud Offerings: Introduction to Cloud Storage models and communication APIs Web server, Web server for IoT, Cloud fo IoT, Python web application framework designing a RESTful web API, Amazon Web services for IoT

10 Hours

Unit-5

Introduction to Arduino:

Arduino board – Architecture, setting up the board, Introduction to sensors and actuators, implementing simple program by interfacing with sensors and actuators

Case Studies Illustrating IoT Design

Introduction , Home Automation : Smart Lighting , Home Intrusion Detection **,** Cities : Smart Parking , Environment :, Weather Monitoring System , Air Pollution Monitoring **,** Forest Fire Detection , Agriculture **:** Smart Irrigation

11 Hours

Text book:

1. A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Internet of Things, Universities Press, 2015.
2. Matt Richardson & Shawn Wallace, Getting Started with Raspberry Pi, O'Reilly (SPD), 2014.
3. Daniel Minoli, Building the Internet of Things with IPv6 and MIPv6:The Evolving World of M2M Communications, Wiley, 2013
4. Michael McRoberts "Beginning Arduino" , Technology in action 2nd edition.

Reference

1. Michael Miller, The Internet of Things, First Edition, Pearson, 2015.
2. Claire Rowland, Elizabeth Goodman et.al., Designing Connected Products, First Edition, O'Reilly, 2015

Course Outcomes (COs):

On Completion of the course, the students will be able to

1. Analyze the characteristics of IoT Enabling Technologies and applications
2. Apply design issues of key IOT technologies and prototype with Raspberry Pi
3. Analyze reference architecture of IOT communication protocols.
4. Develop IoT applications using Arduino ,sensors and Raspberry Pi.
5. Apply cloud services for IOT objects and implement cloud service integrated with IOT applications.

Course Title: Advanced Computer Networks lab			
Course Code: P17MCSEL27	**Sem: II**	**L-T-P-H: 0:0:4:4**	**Credits - 2**
Contact Period: Lecture: 52 Hrs., Exam: 3 Hrs		**Weightage: CIE:50; SEE:50**	

Course Learning Objectives (CLO's)

The course P17MCSEL27 aims to:

1. This laboratory course is intended for the students of First semester M.Tech (CSE) so as to enhance their programming skills in networks lab. The lab exercises covers different techniques of PC to PC communication using Serial and parallel Communication, Implementation of routing protocol , Understand the implementation of Interworking. UDP, TCP and RPC
2. These exercises will enhance their knowledge in the context of network and make them learn how to implement the concepts learnt as theory in particular and will increase their curiosity to learn the how to conduct networking research and develop innovative ideas.

Program Set:

PC to PC Communication a) Serial Communication b) parallel Communication.

1. Implementation of Stop and wait protocol.
2. Implementation and study of go back n protocol.
3. Implementation and study of selective repeat protocol.
4. Implementation of CSMA/CD protocol.
5. Socket Programming a. TCP Sockets b. UDP Sockets c. Applications using Sockets.
6. Implementation of DOMAIN NAME SERVER.
7. Implementation of RPC.
8. Implementation of distance vector routing algorithm.
9. Implementation of link state routing algorithm.