

**CURRICULUM  
FOR THE ACADEMIC YEAR 2024-2025**

**DEPARTMENT OF COMPUTER SCIENCE ANDE NGINEERING**

**M.Tech. (Computer Science & Engineering)**

**I SEMESTER Syllabus**



**POOJYA DODDAPPA APPA COLLEGE OF ENGINEERING  
(An autonomous college under VTU)  
KALABURAGI**

## Curriculum for PG(CSE)- 24 Series Syllabus 2024-2045

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**About the institution:** The Hyderabad Karnataka Education (HKE) society founded by Late Shri. Mahadevappa Rampure, a great visionary and educationist. The HKE Society runs 46 educational institutions. Poojya Doddappa Appa College of Engineering, Gulbarga is the first institution established by the society in 1958. The college is celebrating its golden jubilee year, setting new standards in the field of education and achieving greater heights. The college was started with 50% central assistance and 50% state assistance, and a desire to impart quality technical education to this part of Karnataka State. The initial intake was 120 with degree offered in three branches of engineering viz, Civil, Mechanical and Electrical Engineering. Now, it houses 11 undergraduate courses, 10 post Graduate courses and 12 Research centers, established in Civil Engg., Electronics & Communication Engg., Industrial & Production Engg., Mechanical Engg., Electrical Engg., Ceramic Cement Tech., Information Science & Engg., Instrumentation Technology, Automobile Engg., Computer Sc. and Engg., Mathematics and Chemistry All the courses are affiliated to Visveswaraya Technological University, Belgaum. At present the total intake at UG level is 980 and PG level 193.

The college receives grant in aid funds from state government. A number of projects have been approved by MHRD /AICTE, Govt. of India for modernization of laboratories. KSCST, Govt. of Karnataka is providing financial assistance regularly for the student's projects.

The National Board of Accreditation, New Delhi, has accredited the College in the year 2005-08 for 09 UG Courses out of which 08 courses are accredited for three years and 01 course is accredited for five years. And second time accredited for Six Course in the year 2009-2012

Our college is one among the 14 colleges selected under TEQIP, sponsored by World Bank. It has received a grant of Rs 10.454 Crores under this scheme for its development. The institution is selected for TEQIP phase II in year 2011 for four years. Institution is receiving a grant of Rs. 12.50 Crores under TEQIP Phase -II scheme for its development and selected for TEQIP-III as mentoring Institute for BIET Jhansi(UP).

Recognizing the excellent facilities, faculty, progressive outlook, high academic standards and record performance, the VTU Belgaum reposed abundant confidence in the capabilities of the College and the College was conferred Autonomous Status from the academic year 2007-08, to update its own programme and curriculum, to devise and conduct examinations, and to evaluate student's performance based on a system of continuous assessment. The academic programmes are designed and updated by a Board of Studies at the department level and Academic Council at the college level. These statutory bodies are constituted as per the guidelines of the VTU Belgaum. A separate examination section headed by a Controller of Examinations conducts the examinations.

At present the college has acquired the Academic autonomous status for both PG and UG courses from the academic year 2007-08 and it is one among the six colleges in the state of Karnataka to have autonomous status for both UG and PG courses.

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One of the unique features of our college is, it is the first college in Karnataka State to start the Electronics and Communication Engineering branch way back in the year 1967, to join NIT Surathkal and IISc, Bangalore. Also, it is the only college in the state and one among the three colleges across the country, offering a course in Ceramic and Cement Technology. This is the outcome of understanding by faculty and management about the basic need of this region, keeping in view of the available raw material and existing Cement Industries.

Bharatiya Vidya Bhavan National Award for an Engineering College having Best Overall Performance for the year 2017 by ISTE (Indian Society for Technical Education). In the year 2000, the college was awarded as Best College of the year by KSCST, Bangalore in the state level students projects exhibition.

The college campus is spread over 71 acres of land on either side of Mumbai-Chennai railway track and has a sprawling complex with gardens and greenery all around.

**About the department:** The Computer Science and Engineering department was started in the year 1984 with an intake of 40 students for UG. The department has seen phenomenal growth and now the department has increased UG intake to 120 students and offering two Post Graduation programmes: PG (Computer Science and Engineering with an intake of 25 students) and PG(Computer Network and Engineering with an intake of 18 students). The department is offering research program under its recognized research center. Computer Science and Design course was started from 2021 with an intake of 60 students. The department is having state-of-the-art computing facilities with high speed internet facilities and laboratories. The department library provides useful resources like books and journals. The department has well qualified and experienced teaching faculty. The department has been conducting several faculty development programs and student training programs.

### **Vision of the Institution**

To be an institute of excellence in technical education and research to serve the needs of the industry and society at local and global levels.

### **Mission of the Institution**

- To provide a high quality educational experience for students with values and ethics that enables them to become leaders in their chosen professions.
- To explore, create and develop innovations in engineering and science through research and development activities.
- To provide beneficial service to the national and multinational industries and communities through educational, technical, and professional activities

## **Vision of the Department**

- To become a premier department in Computer education, research and to prepare highly competent IT professionals to serve industry and society at local and global levels.

## **Mission of the Department**

- To impart high quality professional education to become a leader in Computer Science and Engineering.
- To achieve excellence in Research for contributing to the development of the society.
- To inculcate professional and ethical behaviour to serve the industry.

## **Program Educational Objectives (PEO):**

<b>PEO1:</b>	To prepare graduates with core competencies in mathematical and engineering fundamentals to solve and analyze computer science and engineering problems
<b>PEO2:</b>	To adapt to evolving technologies and tools for serving the society
<b>PEO3:</b>	To perform as team leader, effective communicator and socially responsible computer professional in multidisciplinary fields following ethical values
<b>PEO4:</b>	To encourage students to pursue higher studies, engage in research and to become entrepreneurs

## **Program Outcomes:**

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

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

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

**04. 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.

**05. 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.

**06. 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.

**07. 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.

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

**09. 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 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.

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**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.

**Program Specific Outcomes (PSOs):**

<b>PSO1:</b>	Acquire competency in hardware and software working principles to analyze and solve computing problems.
<b>PSO2:</b>	Design quality software to develop scientific and business applications following Software Engineering practices.
<b>PSO3:</b>	Apply cutting edge technologies using modern tools to find novel solutions ethically to existing problems.

# Curriculum for PG(CSE)- 24 Series Syllabus 2024-2045

## Scheme of Teaching and Examination – 2024-2025

### M.Tech. Computer Science & Engineering

#### Choice Based Credit System (CBCS) & Outcome Based Education System (OBE)

Year: I

Semester: I

POOJYA DODDAPPA APPA COLLEGE OF ENGINEERING, KALABURAGI Scheme of Teaching and Examinations – 2024 <b>M.Tech., Computer Science &amp; Engineering (CSE) (Font 12 Capital, Calibri)</b> Choice Based Credit System (CBCS) and Outcome-Based Education(OBE)												
I SEMESTER												
Sl. No	Course	Course Code	Course Title	Teaching Hours per Week			Examination			Credits		
				Theory	Practical/Seminar	Tutorial/ Skill Development Activities	Duration in hours	CIE Marks	SEE Marks		Total Marks	
				L	P	T/SDA						
1	BSC/PCC	24PCS11	Linear Algebra & Probability Theory	03	00	00	03	50	50	100	3	
2	IPCC/PCC/PBLC	24PCS12	Machine Learning	03	02	00	03	50	50	100	4	
3	PCC	24PCS13	Advanced Database Management System	03	00	02	03	50	50	100	4	
4	PCC	24PCS14	Advanced Data Structures and Algorithms	02	00	02	03	50	50	100	3	
5	PCC	24PCS15	Advanced Computer Networks	02	00	02	03	50	50	100	3	
6	PCCL	24PCSL16	Mobile Application Development Lab	03	00	00	03	50	50	100	2	
7	PCCL	24PCSL17	Data Mining Lab	01	02	00	03	50	50	100	2	
8	PCC	<b>24SEM18</b>	Technical Seminar	00	01	01	03	100	---	100	1	
9	NCMC	24RMI19	Research Methodology and IPR ( <b>Online</b> )	Online courses (online.vtu.ac.in)								PP
				<b>17</b>	<b>05</b>	<b>07</b>	<b>24</b>	<b>450</b>	<b>350</b>	<b>800</b>	<b>22</b>	

Note: **BSC**-Basic Science Courses, **PCC**: Professional core. **IPCC**-Integrated Professional Core Courses, **NCMC**- None Credit Mandatory Course, **PCCL**-Professional Core Course lab  
**AUD/AEC** –Audit Course / Ability Enhancement Course, **L-Lecture, P-Practical, T/SDA-Tutorial / Skill Development Activities**(Hours are for Interaction between faculty and students)**PBLC**: Project Based Learning Course

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**Integrated Professional Core Course (IPCC):** Refers to a Professional Theory Core Course Integrated with practical's of the same course. The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper.

**Project Based Learning Course (PBL):** Project Based Learning Course is a professional core Course only Students have to complete a project out of learning from the course and SEE will be viva voce on project work.

**Skill development activities:** Under **Skill development activities** in a concerning course, the students should

1. Interact with industry (small, medium, and large).
2. Involve in research/testing/projects to understand their problems and help creative and innovative methods to solve the problem.
3. Involve in case studies and field visits/ fieldwork.
4. Accustom to the use of standards/codes etc., to narrow the gap between academia and industry.
5. Handle advanced instruments to enhance technical talent.
6. Gain confidence in modeling of systems and algorithms for transient and steady-state operations, thermal study, etc.
7. Work on different software/s (tools) to simulate, analyse and authenticate the output to interpret and conclude.

All activities should enhance student's abilities to employment and/or self-employment opportunities, management skills, Statistical analysis, fiscal expertise, etc.

Students and the course instructor/s to be involved either individually or in groups to interact together to enhance the learning and application skills of the study they have undertaken. The students with the help of the course teacher can take up relevant technical –activities that will enhance their skills. The prepared report shall be evaluated for CIE marks.

**24RMI19-Research Methodology and IPR-** None Credit Mandatory Course (NMC) if students have not studied this course in their undergraduate program then he /she has to take this course at <http://online.vtu.ac.in> and qualifying in this course is compulsory before completion of the minimum duration of the program (Two years), however, this course will not be considered for vertical progression.

**Technical Seminar:** Students have to finalize the technical topic for the seminar in consultation with a faculty mentor, Preparation of the seminar report, and presentation slides to be presented at the end of the semester.



# Curriculum for PG(CSE)- 24 Series Syllabus 2024-2045

## M.Tech I SEMESTER2022-2023

<b>Course Title: LINEAR ALGEBRA AND PROBABILITY THEORY</b>		
Subject Code: <b>24PCS11</b>	Credit:3	CIE: 50
Number of Lecture Hours/Week	<b>3:0:0 Hrs</b>	SEE:50
Total Number of Lecture Hours	42	SEEHours:03
<b>Prerequisites:</b> Probability Theory and statistics		
<b>Course Objectives:</b>		
<ul style="list-style-type: none"> <li>• Understand concepts and theorems on probability.</li> <li>• Able to know statistical concepts and Techniques.</li> <li>• Gain Knowledge of Eigen values, Eigen vectors and stochastic matrices.</li> <li>• Study probabilistic behavior of queues.</li> <li>• Study of mathematical model for communication</li> </ul>		
<b>MODULES</b>		<b>Teaching Hours</b>
<b>Module I</b>		
<b>Linear Algebra:</b> System of Linear Algebraic equations by triangularization method , Cholesky method, Partitions method, Gauss Jacobi, Gauss- Seidel's method and Power method for eigen values and eigen vectors.		<b>09 Hrs</b>
<b>Module II</b>		
<b>Vector Spaces:</b> Geometry of system of linear equations, Vector spaces and subspaces, basis and dimension, four fundamental subspaces, Rank – Nullity theorem(without proof),linear transformation. Orthogonal Vectors and subspaces, projections and least squares, orthogonal bases and Gram-Schmidt orthogonalization .		<b>08 Hrs</b>
<b>Module III</b>		
<b>Probability-I:</b> Random variables, probability mass and probability distribution function, Probability distributions: Binomial, Normal and Gaussian distributions & examples.		<b>08 Hrs</b>
<b>Module IV</b>		
<b>Probability-II:</b> Random variables, s, joint probability distribution (discrete and continuous)-Illustrative examples, Probability vectors, stochastic matrices, fixed points, regular stochastic matrices.		<b>09 Hrs</b>
<b>Module V</b>		
<b>Sampling Theory:</b> Testing of hypothesis: t-distribution test, Chi square test and F-test. Analysis of Variance (ANOVA):one way classification		<b>08 Hrs</b>
<b>Question paper pattern:</b>		
The question paper will have ten questions.		
There will be 2 questions from each module, covering all the topics from a module.		
The students will have to answer 5 full questions, selecting one full question from each module.		

## Curriculum for PG(CSE)- 24 Series Syllabus 2024-2045

### Reference Books:

- 1.S.S .Shastry, Introductory Methods of Numerical Analysis , PHI, 2005.
- 2.David C. Lay, “Linear Algebra and its applications”, 3<sup>rd</sup> Edition , Pearson Education, 2002.
- 3.H.K. Dash , Er. Rajnish Verma, “Higher Engineering Mathematics”, S.Chand Publishers, 3<sup>rd</sup> Edition,2014
- 4.Kenneth Hoffman and Ray Kunze, “Linear Algebra”, 2<sup>nd</sup> Edition, PHI, 2011
- 5.B.S. Grewal, “Numerical Methods in Engineering & Science”, Khanna Publishers, 2015.
- 6.R.D. Sharma, “Theory and problems of Linear Algebra”,I.K. International Publishing House Pvt. Ltd, 2010

### Course outcomes:

**On completion of the course, the student will have the ability to:**

Course Code	CO#	Course Outcome (CO)
24PCS11	CO1	Acquire the idea of significant figures, types of errors during numerical computation and Solve system of linear equations using direct and iterative methods.
	CO2	Estimate orthogonality of vector spaces, Cumulative distribution function and characteristic function. Recognize problems which involve these concepts in Engineering applications.
	CO3	Describe the basic notions of discrete and continuous probability distributions.
	CO4	Describe the basic notions of discrete and continuous joint probability distributions.
	CO5	Understand statistical and probabilistic concepts required to test the hypothesis

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Course Title: <b>MACHINE LEARNING</b>		
Subject Code: <b>24PCS12</b>	<b>Credit:4</b>	CIE:50
Number of Lecture Hours/Week	<b>3 Hrs (Th) + 2 Hrs (Practical)</b>	SEE:50
Total Number of Lecture Hours	42	SEE Hours: 03
<b>Pre-requisite:</b> Mathematical Foundation of Computer Networks, Analysis and Design of Algorithm		
<b>Course Objectives:</b> <ul style="list-style-type: none"> <li>• Understand types, concepts of learning</li> <li>• Design a system using various types of learning.</li> </ul>		
<b>MODULES</b>		<b>Teaching Hours</b>
<b>Module –I</b>		<b>08 Hrs</b>
<p><b>Introduction, Concept Learning And Decision Trees :</b> 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.</p> <ol style="list-style-type: none"> <li>1. Implement and demonstrate the <b>FIND-S algorithm</b> for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.</li> <li>2. Write a program to demonstrate the working of the decision tree based <b>ID3 algorithm</b>. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.</li> </ol>		
<b>Module-II</b>		<b>08 Hrs</b>
<p><b>Neural Networks And Genetic Algorithms:</b> 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.</p> <ol style="list-style-type: none"> <li>1. For a given set of training data examples stored in a .CSV file, implement and demonstrate the <b>Candidate-Elimination algorithm</b> to output a description of the set of all hypotheses consistent with the training examples</li> <li>2. Build an Artificial Neural Network by implementing the <b>Back propagation algorithm</b> and test the same using appropriate data sets.</li> </ol>		

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<b>Module-III</b>	
<p><b>Bayesian And Computational Learning:</b> 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.</p> <ol style="list-style-type: none"> <li>1. Write a program to implement the <b>naïve Bayesian classifier</b> for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets</li> <li>2. Write a program to construct a <b>Bayesian network</b> considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.</li> <li>3. 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.</li> </ol>	<b>09 Hrs</b>
<b>Module- IV</b>	
<p><b>Instant Based Learning And Learning Set Of Rules:</b> K- Nearest Neighbor Learning – Locally Weighted Regression – Radial Basis Functions – Case- Based Reasoning – Sequential Covering Algorithms – Learning Rule Sets – Learning First Order Rules – Learning Sets of First Order Rules – Induction as Inverted Deduction – Inverting Resolution.</p> <ol style="list-style-type: none"> <li>1. Write a program to implement <b>k-Nearest Neighbour algorithm</b> to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.</li> <li>2. Implement the non-parametric <b>Locally Weighted Regression algorithm</b> in order to fit data points. Select appropriate data set for your experiment and draw graphs.</li> </ol>	<b>09 hrs</b>
<b>Module – V</b>	
<p><b>Analytical Learning And Reinforced Learning:</b> Perfect Domain Theories –Explanation Based Learning – Inductive-Analytical Approaches - FOCL Algorithm – Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning.</p>	<b>08 Hrs</b>
<p><b>Question paper pattern:</b>          The question paper will have ten questions.          There will be 2 questions from each module, covering all the topics from a module.          The students will have to answer 5 full questions, selecting one full question from each module.</p>	
<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. Tom M. Mitchell, “Machine Learning”, McGraw-Hill Education(INDIAN EDITION),2013.</li> </ol>	

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**Reference Books:**

1. Ethem Alpaydin, “ Introduction to Machine Learning”,2<sup>nd</sup> Ed., PHI Learning Pvt. Ltd.,2013.
2. T. Hastie,R. Tibshirani, J.H .Friedman, “The Elements of Statistical Learning”,Springer;1<sup>st</sup> edition,2001.

**Course outcomes:**

**On completion of the course, the student will have the ability to:**

Course Code	CO#	Course Outcome(CO)
<b>24PCS12</b>	<b>CO1</b>	Choose the learning techniques with this basic knowledge.
	<b>CO2</b>	Apply effectively neural networks and genetic algorithms for designing an application.
	<b>CO3</b>	Illustrate bayesian techniques and derive effectively learning rules.
	<b>CO4</b>	Describe instant based learning and rule sets.
	<b>CO5</b>	Choose and differentiate in forcement and analytical learning techniques

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Course Title: <b>ADVANCED DATABASE MANAGEMENT SYSTEM</b>		
Subject Code: <b>24PCS13</b>	Credit: 4	CIE:50
Number of Lecture Hours/Week	3:0:2 Hrs	SEE:50
Total Number of Lecture Hours	42	SEE Hours:03
<b>Pre requisites:</b> Database Management Systems		
<b>Course Objectives:</b> <ul style="list-style-type: none"> <li>• Understand Relational data model and Object Oriented Database.</li> <li>• Gain Knowledge about parallel Database, Data mining and Data warehouse</li> <li>• Compare advanced applications of the Database.</li> </ul>		
<b>MODULES</b>		<b>Teaching Hours</b>
<p style="text-align: center;"><b>Module-I</b></p> <p><b>Review of Relational Data Model and Relational Database Constraints:</b> Relational model concepts, Relational model constraints and relational data base schemas; Update operations, transactions and dealing with constraint violations. Object and Object-Relational Databases: Overview of Object-Oriented Concepts–Objects, Encapsulation, Type and class hierarchies.</p>		<b>08 Hrs</b>
<p style="text-align: center;"><b>Module-II</b></p> <p><b>Complex objects;</b> Object model of ODMG, Object definition Language ODL; Object Query Language OQL; Overview of C++ language binding; Conceptual design of Object data base. Overview of object relational features of SQL; Object-relational features of Oracle; Implementation and related issues for Extended type systems, the nested relational model.</p>		<b>09 Hrs</b>
<p style="text-align: center;"><b>Module-III</b></p> <p><b>Enhanced Data Models for Some Advanced Applications:</b> Active database concepts and triggers; Temporal, Spatial and Deductive Databases–Basic concepts, Parallel and Distributed Databases: Architectures for parallel databases; Parallel query evaluation; Parallelizing individual operations; Parallel query optimizations.</p>		<b>08 Hrs</b>
<p style="text-align: center;"><b>Module-IV</b></p> <p>Introduction to distributed databases: Distributed DBMS architectures; Storing data in a Distributed DBMS; Distributed catalog management; Distributed Query processing; Updating distributed data; Distributed transactions; Distributed Concurrency control and Recovery. Data Warehousing, Decision Support and Data Mining: Introduction to decision support; OLAP, multidimensional model; Window queries in SQL; Finding answers quickly; Implementation techniques for OLAP; Data Warehousing; Views and Decision support; View materialization; Maintaining materialized views.</p>		<b>09 Hrs</b>

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<b>Module-V</b>		<b>8 Hrs</b>
Introduction to Data Mining: Counting co-occurrences; Mining for rules; Tree- structured rules; Clustering; Similarity search over sequences; Incremental mining and data streams; Additional data mining tasks. More Recent Applications: Mobile databases; Multimedia databases; Geographical Information Systems; Genome data management.		
<b>Question paper pattern:</b>		
The question paper will have ten questions. There will be 2 questions from each module, covering all the topics from a module. The students will have to answer 5 full questions, selecting one full question from each module.		
<b>Text Books:</b>		
1. Elmasri and Navathe, <i>Fundamentals of Database Systems</i> , Pearson Education, 2007. 2. Raghu Ramakrishnan and Johannes Gehrke, <i>Database Management Systems</i> , 3 <sup>rd</sup> Edition, McGraw-Hill,2003.		
<b>Reference Books:</b>		
1. Abraham Silberschatz, Henry F. Korth, S.Sudarshan, <i>Database System Concepts</i> , 6 <sup>th</sup> Edition, McGraw Hill,2010. 2. Connolly and Begg, <i>Database Systems</i> , 4 <sup>th</sup> Edition, PearsonPublications,2005.		
<b>Course outcomes:</b>		
<b>On completion of the course, the student will have the ability to:</b>		
<b>Course Code</b>	<b>Course Code</b>	<b>Course Code</b>
<b>24PCS13</b>	<b>CO1</b>	Demonstrate Relational Data Model and Relational Database Constraints
	<b>CO2</b>	Design ODBMS using Object Query Language
	<b>CO3</b>	Develop Data models using active Database and Parallel and Distributed Databases
	<b>CO4</b>	Demonstrate Data ware housing concepts
	<b>CO5</b>	Discuss Rules and Applications on Data mining

## Curriculum for PG(CSE)- 24 Series Syllabus 2024-2045

Course Title: ADVANCED DATA STRUCTURES AND ALGORITHMS		
Subject Code: <b>24PCS14</b>	Credits:3	CIE:50
Number of Lecture Hours/Week	2:0:2 Hrs	SEE:50
Total Number of Lecture Hours	42	SEE Hours:03
<b>Pre-requisites:</b> Object Oriented Programming Language		
<b>Course objectives</b> <ul style="list-style-type: none"> <li>• Perform analysis of an algorithms</li> <li>• Impart concepts of data structures like stacks, queues, list, trees, heaps etc.</li> <li>• Learn to solve problems using Graph and other algorithm design techniques.</li> </ul>		
<b>MODULES</b>		<b>Teaching Hours</b>
<p style="text-align: center;"><b>Module- I</b></p> <p><b>Algorithm Analysis:</b> Mathematical Background, Model, What to Analyze, Running Time Calculations.</p> <p><b>List, Stacks and Queues:</b> Abstract Data Types (ADTs), The List ADT, Vector and List in the STL, Implementation of Vector, Implementation of List, The Stack ADT, The Queue ADT.</p>		<b>09 Hrs</b>
<p style="text-align: center;"><b>Module-II</b></p> <p><b>Trees:</b> Preliminaries, Binary Trees, The Search Tree ADT–Binary Search Trees.</p> <p><b>Hashing:</b> General Idea, Hash Function, Separate Chaining, Hash Tables Without Linked Lists, Rehashing, Hash Tables in the Standard Library.</p>		<b>08 Hrs</b>
<p style="text-align: center;"><b>Module- III</b></p> <p><b>Priority Queues (Heaps):</b> Model, Simple Implementation, Binary Heap, Applications of Priority Queues, Priority Queues in the standard Library.</p> <p><b>Sorting:</b> Preliminaries, Insertion Sort, Merge sort, Quick sort.</p>		<b>08 Hrs</b>
<p style="text-align: center;"><b>Module- IV</b></p> <p><b>Graph Algorithms :</b> Definitions, Topological Sort, Shortest-Path Algorithms, Minimum Spanning Tree, Applications of Depth-First Search approaches.</p>		<b>08 Hrs</b>
<p style="text-align: center;"><b>Module-V</b></p> <p><b>Algorithm Design Techniques:</b> Greedy Algorithms, Divide and Conquer, Dynamic Programming, Back tracking Algorithms.</p>		<b>09 Hrs</b>
<p><b>Question paper pattern:</b></p> <p>The question paper will have ten questions.</p> <p>There will be 2 questions from each module, covering all the topics from a module.</p> <p>The students will have to answer 5 full questions, selecting one full question from each module.</p>		
<p><b>TEXT BOOKS:</b></p> <p>1. Mark Allen Weiss: Data Structures and Algorithm Analysis in C++,3<sup>rd</sup> Edition, Pearson,2007.</p>		
<p><b>REFERENCE BOOKS:</b></p> <p>1.Yedidyah, Augenstein, Tannenbaum: Data Structures Using C and C++,2ndEdition,Pearson Education,2003.</p> <p>2.Sartaj Sahni: Data Structures, Algorithms and Applications in C++,2<sup>nd</sup> Edition, Universities Press</p>		



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<b>Course outcomes:</b> <b>On completion of the course, the student will have the ability to:</b>		
<b>Course Code</b>	<b>CO#</b>	<b>Course Outcome(CO)</b>
<b>24PCS14</b>	<b>CO1</b>	Analyze asymptotic performance of an algorithm and describe List, Stacks and Queues in data structures.
	<b>CO2</b>	Solve problems using trees Hashing.
	<b>CO3</b>	Implement priority queues and demonstrate sorting techniques.
	<b>CO4</b>	Solve problems using graph algorithm and other techniques.
	<b>CO5</b>	Apply various Algorithm Design techniques for problem solving.

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<b>Course Title: ADVANCED COMPUTER NETWORKS</b>		
SubjectCode: <b>24PCS15</b>	Credit: <b>3</b>	CIE: 50
Number of Lecture Hours/Week	2:0:2 Hrs	SEE:50
Total Number of Lecture Hours	<b>42</b>	SEE Hours:03
<b>Prerequisites:</b> Computer Networks.		
<b>Course Objectives:</b> <ul style="list-style-type: none"> <li>• Review the underlying concepts of data communication and computer network</li> <li>• Gain knowledge about functions of data link layer and related protocols and describe working of simple LAN with hubs, bridges and switches</li> <li>• Learn Internetworking with emphasis on routing protocols, architectures and implementation issues</li> <li>• Learn functions of transport layer, study congestion control mechanisms and build network applications using TCP/IP model.</li> </ul>		
<b>MODULES</b>		<b>Teaching Hours</b>
<p style="text-align: center;"><b>Module I</b></p> <p><b>Review of Basic Concepts&amp; Direct Link Networks:</b> Building a Network; Requirements- Connectivity, Cost-Effective Resource Sharing support for Common Services; Network Architecture-Layering and Protocols, OSI Architecture, Internet Architecture; Performance-Band width and Latency, Delay × Bandwidth Product, High-Speed Networks. Hardware Building Blocks-nodes, links; Encoding (NRZ, NRZI, Manchester, 4B / 5B), Framing, Error Detection -Two-Dimensional Parity, Internet checksum Algorithm, cyclic Redundancy Check; reliable Transmission Stop-and-Wait, Sliding Window, Concurrent Logical Channels; Ethernet (802.3), Rings(802.5,FDDI)–Token Ring Media Access Control, Token Ring Maintenance, FDDI.</p> <p><b>Implement the following using C/C++/Java or equivalent with LINUX/ Windows environment.</b></p> <ul style="list-style-type: none"> <li>• Implement internet checksum and CRC algorithm</li> <li>• Implement sliding window Protocol</li> </ul>		<b>09 Hrs</b>
<p style="text-align: center;"><b>Module II</b></p> <p><b>Packet Switching:</b> Switching and forwarding – Datagrams, Virtual Circuit Switching, Source Routing; Bridges and LAN Switches–Learning Bridges, Spanning Tree Algorithm, Broadcast and Multicast, Limitations of Bridges; cell switching (ATM) – Cells, Segmentation and Reassembly, Virtual Paths, Physical Layers for ATM. Simple internetworking (IP)-What is an Internet work? Service Model, Global Address, Datagram Forwarding in IP.</p> <ul style="list-style-type: none"> <li>• Demonstrate IP datagram forwarding algorithm.</li> <li>• Implement Spanning tree algorithm</li> </ul>		<b>08 Hrs</b>
<p style="text-align: center;"><b>Module III</b></p> <p><b>Internetworking:</b> Address Translation(ARP), Host configuration(DHCP),Error Reporting (ICMP), Virtual Networks and Tunnels, Network as a Graph, distance Vector (RIP), Link State (OSPF), Metrics, Routing for Mobile Hosts, Global Internet–Subnetting, Classless Routing(CIDR), Interdomain Routing</p>		<b>08 Hrs</b>

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(BGP), Routing Areas, IP Version 6(IPv6); Multiprotocol Label Switching (MPLS). <ul style="list-style-type: none"> <li>Configuring RIP</li> <li>Configuring a Cisco Router as a DHCP server</li> </ul>		
<p style="text-align: center;"><b>Module IV</b></p> <p><b>End-to-End Protocols &amp; Resource Allocation:</b> Simple demultiplexer (UDP); Reliable byte stream (TCP)–End-to-End Issues, Segment Format, Connection Establishment and Termination, Sliding Window Revisited, Triggering Transmission, Adaptive Retransmission, record Boundaries, TCP Extensions, Alternative Design Choices, Issues in resource allocation–Network Model, Taxonomy, Evaluation Criteria; Queuing disciplines.</p> <ul style="list-style-type: none"> <li>Implement queuing Disciplines</li> </ul>	<b>08 Hrs</b>	
<p style="text-align: center;"><b>Module V</b></p> <p><b>Congestion Control &amp; Application:</b> TCP Congestion Control–Additive Increase/ Multiplicative Decrease, Slow Start, Fast Retransmit and Fast Recovery; Congestion-Avoidance mechanisms–DEC bit, Random Early Detection (RED), Source-Based Congestion Control. Traditional applications– Electronic Mail (SMTP, MIME, IMAP),World Wide Web(HTTP), Name Service(DNS), Network management(SNMP); Web services–Custom APPLICATION Protocols (WSDL, SOAP),A Generic application Protocol (REST).</p> <ul style="list-style-type: none"> <li>Configure SMTP ,DNS using Cisco packet tracer</li> </ul>	<b>09 Hrs</b>	
<p><b>Question paper pattern:</b>                  The question paper will have ten questions.                  There will be 2 questions from each module, covering all the topics from a module.                  The students will have to answer 5 full questions, selecting one full question from each module.</p>		
<p><b>TEXTBOOKS:</b>                  1. Larry L. Peterson and Bruce S. Davie: Computer Networks–A Systems Approach, 4<sup>th</sup> Edition, Elsevier,2007.</p>		
<p><b>REFERENCEBOOKS:</b>                  1. Behrouz A. Forouzan: Data CommunicationsandNetworking,4<sup>th</sup> Edition, Tata McGrawHill,2006.                  2. William Stallings: Data and ComputerCommunication,8<sup>th</sup> Edition, Pearson Education,2007.                  3. Alberto Leon- Garcia and Indra Widjaja: Communication Networks-Fundamental Concepts and KeyArchitectures,2<sup>nd</sup> Edition TataMcGraw-Hill,2004.</p>		
<p><b>Course outcomes:</b>  <b>On completion of the course, the student will have the ability to:</b></p>		
<b>Course Code</b>	<b>CO#</b>	<b>Course Outcome(CO)</b>
<b>24PCS15</b>	<b>CO1</b>	Explain architectural concepts of layering, error on troll techniques and analyze data link protocols their analysis
	<b>CO2</b>	Describe the working of LAN, bridges and switches
	<b>CO3</b>	Describe principles of internetworking and illustrate internet routing protocols
	<b>CO4</b>	Explain working of transport layer protocols and resource allocation
	<b>CO5</b>	Explain TCP congestion control techniques and application layer protocols

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<b>Course Title: MOBILE APPLICATION DEVELOPMENT LABORATORY</b>		
Subject Code : <b>24PCSL16</b>	Credit :02	CIE: 50
Number of Lecture Hours/Week	1:2:0 Hrs	SEE: 50
		SEE Hours: 03
<b>Prerequisites: Programming language – C++, Java</b>		
<b>Course Objectives:</b>		
<ul style="list-style-type: none"><li>• Write simple GUI applications, use built-in widgets and components, work with the database to store data locally</li><li>• Design, develop, and deploy mobile apps on Android devices</li></ul>		
<b>PROGRAMS</b>		
<ol style="list-style-type: none"><li>1. Create an application that takes the name from a text box and shows hello message along with the name entered in text box, when the user clicks the OK button.</li><li>2. Create an application that takes the text from the text box and shows using Toast.</li><li>3. Create an Android application to implement simple arithmetic calculator. Use Buttons for each arithmetic operation.</li><li>4. Create a screen with linear layout that has input boxes for User Name, Password, Address, Gender (radio buttons), Age (numeric), State (Spinner) and a Submit button. On clicking the submit button, print all the data as Toast.</li><li>5. Create an application to show details of students on selecting a name from student list with help native database – SQLite.</li><li>6. Create a user registration application that stores the user details in a database table using native database-SQLite.</li><li>7. Develop an application that uses a menu with 3 options for dialing a number, opening a website and to send an SMS. On selecting an option, the appropriate action should be invoked using intents.</li><li>8. Develop an application for handling notifications.</li><li>9. Develop an application that shows all contacts of the phone along with details like name, phone number, mobile number etc. Create an application that saves user information like name, age, gender etc. in shared preference and retrieves them when the program restarts.</li><li>10. Create an alarm that rings every Sunday at 8:00 AM. Modify it to use a time picker to set alarm time.</li></ol>		
Note: Every exercise should be demonstrated on android handset.		

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<b>Question paper pattern: For SEE , two programs from the Exercise programs list will be asked.</b>		
<b>Course outcomes:</b> <b>On completion of the course, the student will have the ability to:</b>		
<b>Course Code</b>	<b>CO #</b>	<b>Course Outcome (CO)</b>
<b>24PCSL16</b>	<b>CO1</b>	Demonstrate understanding of android application development concepts
	<b>CO2</b>	Exhibit expertise and proficiency in using android services and mechanisms for developing android applications.
	<b>CO3</b>	Exhibit the skills of writing programs related to Android programming in order to generate and deploy the application on android handsets following the ethical standards.
	<b>CO4</b>	Demonstrate the skill of oral communication to present his /her views on Android programming concepts.
	<b>CO5</b>	Prepare report covering details about various APIs used in the experiments.

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<b>Course Title: DATA MINING LAB</b>		
Subject Code : <b>24PCSL17</b>	Credit :03	CIE: 50
Number of Lecture Hours/Week	1:2:0 Hrs	SEE: 50
		SEE Hours: 03
Prerequisites: Database Management, python, matlab		
<b>Course Objectives:</b>		
<ul style="list-style-type: none"> <li>• Be familiar with mathematical foundations of data mining tools...</li> <li>• Understand and implement classical models and algorithms in data warehouses and data mining.</li> <li>• Characterize the kinds of patterns that can be discovered by association rule mining, classification and clustering.</li> <li>• Develop skill in selecting the appropriate data mining algorithm for solving practical problems.</li> </ul>		
<b>PROGRAMS</b>		
<ol style="list-style-type: none"> <li>1. Demonstration of preprocessing on dataset student.arff.</li> <li>2. Demonstration of preprocessing on dataset labor.arff</li> <li>3. Demonstration of Association rule Process on dataset contactlenses.arff using apriori algorithm.</li> <li>4. Demonstration of Association rule process on datasettest.arff using apriori Algorithm.</li> <li>5. Demonstration of Classification rule Process on dataset student.arff using j48 Algorithm</li> <li>6. Demonstration of Classification rule Process on dataset employee.arff using j48 algorithm.</li> <li>7. Demonstration of Classification rule Process on dataset employee.arff using id3 algorithm.</li> <li>8. Demonstration of Classification rule Process on dataset employee.arff using naïve bayes algorithm.</li> <li>9. Demonstration of clustering rule Process on data set iris.arff using simple k-means.</li> <li>10. Demonstration of clustering rule process on dataset student.arff using simple k- means.</li> </ol>		
<b>Question paper pattern: For SEE , two programs from the Exercise programs list will be asked.</b>		
<b>Course outcomes:</b>		
<b>On completion of the course, the student will have the ability to:</b>		
Course Code	CO #	Course Outcome (CO)
<b>24PCSL17</b>	<b>CO1</b>	Demonstration of Association rule Process on dataset contactlenses.arff using apriori algorithm.
	<b>CO2</b>	Classification rule Process on dataset student.arff using j48 Algorithm
	<b>CO3</b>	Classification rule Process on dataset employee.arff using naïve bayes algorithm.
	<b>CO4</b>	Demonstration of clustering rule Process on data setiris.arff using simple k-means
	<b>CO5</b>	Develop mini project to solve real time problems

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<b>Course Title: RESEARCH METHODOLOGY AND IPR (ONLINE)</b>		
Subject Code: <b>24RMI19</b>	<b>Credits:</b>	CIE:50
Number of Lecture Hours/Week		SEE:50
Total Number of Lecture Hours		SEE Hours: 03
<b>Prerequisite:</b> Working on Discrete mathematics, Programming ability and exposure to probability.		
<b>Course Objectives:</b>		
<b>MODULES</b>		<b>Teaching Hours</b>
<p style="text-align: center;"><b>Module I</b></p> <p>Research Methodology: Introduction, Meaning of Research, Objectives of Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Research Process, Criteria of Good Research, Problems Encountered by Researchers in India. Defining the Research Problem: Research Problem, Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem, An Illustration.</p>		<b>08 Hrs</b>
<p style="text-align: center;"><b>Module II</b></p> <p>Reviewing the literature: Place of the literature review in research, bringing clarity and focus to research problem, improving research methodology, broadening knowledge base in research area, Enabling contextual findings, Review of the literature, searching the existing literature, reviewing the selected literature, Developing a theoretical framework, Developing a conceptual framework, Writing about the literature reviewed. Research Design: Meaning of Research Design, Need for Research Design, Features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs, Basic Principles of Experimental Designs, Important Experimental Designs.</p>		<b>09 Hrs</b>
<p style="text-align: center;"><b>Module III</b></p> <p>Design of Sample Surveys: Design of Sampling: Introduction, Sample Design, Sampling and Non-Sampling Errors, Sample Survey versus Census Survey, Types of Sampling Designs. Measurement and Scaling: Qualitative and Quantitative Data, Classifications of Measurement Scales, Goodness of Measurement Scales, Sources of Error in Measurement, Techniques of Developing Measurement Tools, Scaling, Scale Classification Bases, Scaling Technics, Multi dimensional Scaling, Deciding the Scale. Data Collection: Introduction, Experimental and Surveys, Collection of Primary Data, Collection of Secondary Data, Selection of Appropriate Method for Data Collection.</p>		<b>09 Hrs</b>

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<b>Module IV</b>		<b>09 Hrs</b>
<p>Testing of Hypotheses: Hypothesis, Basic Concepts Concerning Testing of Hypotheses, Testing of Hypothesis, Test Statistics and Critical Region, Critical Value and Decision Rule, Procedure for Hypothesis Testing, Hypothesis Testing for Mean, Proportion, Variance, for Difference of Two Mean, for Difference of Two Proportions, for Difference of Two Variances, P-Value approach, Power of Test, Limitations of the Tests of Hypothesis. Chi-square Test: Test of Difference of more than Two Proportions, Test of Independence of Attributes, Test of Goodness of Fit, Cautions in Using Chi-square Tests, Ztest, Ttest, Ftest, ANOVA, Factor Analysis and Report Writing; Bibliography. Interpretation and Report Writing: Meaning of Interpretation, Technique of Interpretation, Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Reports. Analysis of variance and covariance.</p>		
<b>Module V</b>		<b>07 Hrs</b>
<p>Intellectual Property: The Concept, Intellectual Property System in India, World Intellectual Property Organization (WIPO), Protection of Intellectual Property under TRIPS, Patents Act - Meaning of a Patent – Characteristics/Features. Patentable and Non-Patentable Invention. Types of Patent applications in India. Procedure for obtaining Patent. The Designs Act- Introduction to Industrial Designs. Essential requirements of Registration. Designs which are not registrable, Procedure for Registration of Designs, Copyright Act, 1957 and Related Rights - Meaning of Copy Right, Characteristics of Copyright, various rights of owner of Copyright. Procedure for registration, Publication and term of copyright Infringement of Copyright and Its remedies. Trade Mark Act, 1999, The Geographical Indications of Goods (Registration and Protection) Act 1999.</p>		
<b>Question paper pattern:</b>		
The question paper will have ten questions.		
There will be 2 questions from each module, covering all the topics from a module.		
The students will have to answer 5 full questions, selecting one full question from each module.		
<b>TEXT BOOKS.</b>		
<ol style="list-style-type: none"> <li>1. Research Methodology: Methods and Techniques C.R.Kothari, Gaurav Garg New Age International 4<sup>th</sup> Edition, 2018.</li> <li>2. Research Methodology a step-by-step guide for beginners. (For the topic Reviewing the literature under module 2) Ranjit Kumar SAGE Publications Ltd 3<sup>rd</sup> Edition, 2011.</li> <li>3. Study Material (For the topic Intellectual Property under module 5) Professional Programmed Intellectual Property Rights, Law and Practice, The Institute of Company Secretaries of India, Statutory Body Under an Act of Parliament, September 2013.</li> </ol>		
<b>REFERENCE BOOKS:</b>		
1. Research Methods: The concise knowledge base Trochim Atomic Dog Publishing 2005.		
<b>Course Code</b>	<b>CO#</b>	<b>Course Outcome (CO)</b>
<b>24RMI19</b>	<b>CO1</b>	Discuss research methodology and the technique of defining a search problem
	<b>CO2</b>	Explain the functions of the literature review in research, carrying out a literature search, developing theoretical and conceptual frameworks and writing a review.
	<b>CO3</b>	Explain various research designs and their characteristics.
	<b>CO4</b>	Explain the art of interpretation and the art of writing research reports