



**JSPM's**  
**RAJARSHI SHAHU COLLEGE OF ENGINEERING**  
**TATHAWADE, PUNE-33**  
(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)



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**Department of Computer Engineering**  
**Structure & Syllabi**  
**T. Y. B. Tech (2019 Pattern)**  
**w.e.f. Academic Year 2022-2023**

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## Department of Computer Engineering

### **Vision**

To create quality computer professional through excellent academic environment.

### **Mission of Department**

To empower students with fundamental of Computer Engineering to be successful profession.

To impart quality education to enable the students for higher studies, research and entrepreneurship.

To cater for the service to society.

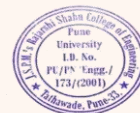


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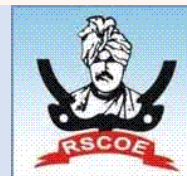
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## Department of Computer Engineering

### Program Outcomes (POs)

Engineering Graduates will be able to:

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

### Department of Computer Engineering

#### Program Specific Outcomes (PSOs)

Upon successful completion of UG course in Computer Engineering Technology, the students will attain following Program Specific Outcomes:

**PSO 1: Professional Skills** - The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, data science, and networking for efficient design of computer-based systems.

**PSO 2: Problem-Solving Skills** - The ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver advanced computing systems.

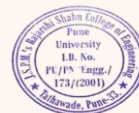
**PSO3: Professional Career and Entrepreneurship** -The ability to employ modern computer languages, operating environments, and platforms in creating innovative career paths to be an entrepreneur.

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## *Highlights of the Syllabus*

Curriculum of UG program for Computer Engineering is designed in association with



Academic  
Experts



Industry/Corporate  
Experts



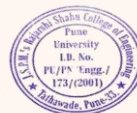
Distinguished  
Alumni

Features of **Computer Engineering** curriculum are designed in association with the **Tata Consultancy Services**.



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## Unique features of the curriculum

### 1. Curriculum centered at Outcome Based Education:

The new Curriculum is based on student-centered instruction models that focus on measuring student performance through outcomes. The outcomes include subject knowledge, industry required skills and attitudes.

### 2. Emphasize on Fundamentals:

The nature of the new curriculum is rigorous and well prescribed so that the students can spend more time on preparation and self-study. The students have to learn core subjects, solve practical based assignments and must attempt periodical quizzes. This will benefit them to grasp and keep a strong hold on fundamentals of Engineering in the most effective way.

### 3. Experiential Learning:

The curriculum emphasizes on hands-on sessions along with theoretical information. The new curriculum considers Problem Based Learning (PBL) as a teaching pedagogy and includes different subjects that encourage the students for hands on learning through virtual labs, mini-projects, etc. Accordingly, the curriculum maintains good balance between theory and laboratory credits.

### 4. Promote Creativity and Innovation:

Along with experiential learning, the curriculum also motivates the students to inculcate creativity and innovation. Apart from conventional lab, the curriculum provides a freedom for students to perform industry assignments, pilot projects, innovative development, etc.

### 5. Inculcating Ethics and Values:

To improvise student's behavior, the curriculum has included systematic courses on ethics and values. The moral principles can help students to make right decisions, lead their professional lives and become ethical citizen.

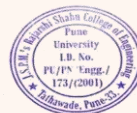
### 6. Blend of Curricular and Noncurricular Activities

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The curriculum also gives importance of different activities like co-curricular, extra-curricular, sports, culture, etc. This will help to do all round development of students in all possible ways.

#### **7. Four Tracks in B-Tech:**

By offering various courses flexibility in choosing mentoring at work in specified field as:

- |                                 |                      |
|---------------------------------|----------------------|
| I. Industry Internship          | III. Entrepreneur    |
| II. Higher Studies and Research | IV. In house Project |

#### **8. Global Competence:**

The curriculum provides a unique opportunity for students to learn and engage in open and effective interaction with people from diverse and interconnected world. The combination of foreign languages (German, Japanese, English) and international internships in the curriculum help the students to build a capacity to examine global and intercultural issues and to propose perspectives and views.

#### **9. Industry Induced Internship Program**

To support ever demanding industry requirements, the curriculum has included an industry internship with an objective to learn technologies pertaining to their discipline and enhance their technical knowledge with a support of the live platform of Industry.

#### **10. Motivation for Self-Learning:**

The curriculum also offers a freedom to students to take the initiatives in their learning needs and set the goals with the help of online learning platforms like MOOCs, NPTEL, Swayam, etc.



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H.O.D, Computer



Dr. R B. Joshi  
Dean Academics



Dr. R. K. Jain  
Director RSCOE, Pune



**T. Y. B. Tech (Computer Engineering)**  
**Academic Year – 2022-2023 Semester -V Structure**

Course Code	Course	Teaching Scheme			Examination Schemes						Credits
		TH	Tut	Lab	Theory			Practical		Total	Total
					ISE (15)	MSE (25)	ESE (60)	TW	Lab		
CS3101	Artificial Intelligence	3	-	2	15	25	60	-	25	125	4
CS3102	Computer Networks	3	-	2	15	25	60	-	25	125	4
CS3103	Design and Analysis of Algorithms	3	-	0	15	25	60	-	-	100	3
CS3104	Elective-I	3	-	2	15	25	60	-	25	125	4
HS3102/ HS3111	Elective-II(Fundamentals of Management and Strategy Formulation) / Fundamentals of Management	3	-	0	15	25	60	-	-	100	3
HS3104	Business Communication & Value Science - IV	-	-	2	-	-	-	-	50	50	1
CS3106	Design Thinking		1		-	-	-	25	-	25	1
CS3107	Engineering Design & Innovation III	-	1	2	-	-	-	25	25	50	2
HS3106	Audit Course III	Non Credit									
<b>Total</b>		<b>15</b>	<b>2</b>	<b>10</b>	<b>75</b>	<b>125</b>	<b>300</b>	<b>50</b>	<b>150</b>	<b>700</b>	<b>22</b>

Elective I		
Course Code	Specialization Track	Course Name
CS3104A	ML-DL	Machine Learning
CS3104B	Security	Cryptology and Network Security
CS3104C	Machine Vision	Image Processing and Pattern Recognition
Elective II		
Course Code	Specialization Track	Course Name

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<b>HS3102</b>	<b>Management</b>	Fundamentals of Management and Strategy Formulation
<b>HS3101B</b>		Computational Finance & Modeling
<b>HS3101C</b>		Financial & Cost Accounting

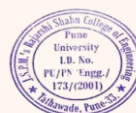
<b>Audit Course</b>	
<b>Code</b>	<b>Name of Course</b>
<b>HS3106</b>	Essence of Indian Knowledge Tradition -I
<b>HS3108</b>	Cultural Studies
<b>CE3113</b>	Urbanization and environment

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**T. Y. B. Tech (Computer Engineering)**  
**Academic Year – 2022-2023 Semester -VI Structure**

Course Code	Course	Teaching Scheme			Examination Schemes					Credits	
		TH	Tut	Lab	Theory			Practical		Total	Total
					ISE (15)	MSE (25)	ESE (60)	TW	Lab		
CS3105	Cloud Microservices & Application	3	-	-	15	25	60	-	-	100	3
CS3113	Internet of Things	3	-	-	15	25	60	-	-	100	3
CS3109	Compiler Design	3	0	2	15	25	60	-	50	150	4
CS3110	Elective III	3	0	2	15	25	60	-	50	150	4
HS/ CS3111 B	Elective-IV/Modern Web Application	3	0	-	15	25	60	-	-	100	3
CS3114	Lab Practice	-	-	4	-	-	-	-	50	50	2
CS3112	Engineering Design & Innovation IV	0	-	2	-	-	-	-	50	50	1
HS3107	Audit Course IV	Non Credit									
<b>Total</b>		<b>15</b>	<b>0</b>	<b>10</b>	<b>75</b>	<b>125</b>	<b>300</b>	<b>-</b>	<b>200</b>	<b>700</b>	<b>20</b>

**Elective III**

Course Code	Specialization Track	Course Name
CS3110A	ML-DL	Data Mining
CS3110B	Security	Information Security
CS3110C	Machine Vision	Industrial Robotics

**Elective IV**

Course Code	Specialization Track	Course Name
HS3103A	Management	Industrial Psychology
CS3111A	General	Enterprise Systems
CS3111B		Modern Web Application

**Audit**

Code	Name of Course
HS3107	Essence of Indian Knowledge Tradition -II
HS3109	Introduction to Human Factors and Ergonomics
HS3110	Mind Education

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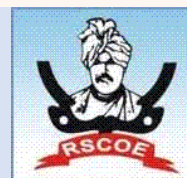


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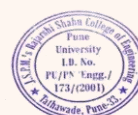


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**Academic Year – 2022-2023**

Course Code	Course	Page No
<b>THIRD YEAR B. TECH.SEMESTER – V</b>		
CS3101	Artificial Intelligence	11
CS3102	Computer Networks	13
CS3103	Design and Analysis of Algorithms	15
CS3104A	Machine Learning	17
CS3104B	Cryptology and Network Security	20
CS3104C	Image Processing and Pattern Recognition	23
HS3102	Fundamentals of Management and Strategy Formulation	26
HS3101B	Computational Finance & Modeling	28
HS3101C	Financial & Cost Accounting	31
CS3111	Fundamentals of Management	33
HS3104	Business Communication & Value Science - IV	35
CS3106	Design Thinking	37
CS3107	Engineering Design & Innovation III	39
<b>THIRD YEAR B. TECH. SEMESTER – VI</b>		
CS3105	Cloud Microservices and application	43
CS3113	Internet of Things	45
CS3109	Compiler Design	47
CS3110A	Data Mining	50
CS3110B	Information Security	53
CS3110C	Industrial Robotics	55
HS3103A	Industrial Psychology	57
CS3111A	Enterprise Systems	59
CS3111B	Modern Web Application	61
CS3114	Lab Practice	64
CS3112	Engineering Design & Innovation IV	66

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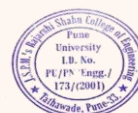


**T. Y. B. Tech (Computer Engineering)**  
**Academic Year – 2022-2023 Semester -V**  
**[CS3101]: Artificial Intelligence**

<b>Teaching Scheme:</b> <b>TH: 3 Hours/Week</b> <b>PR: 2 Hours/Week</b>	<b>Credit</b> <b>TH:3</b> <b>PR: 1</b>	<b>Examination Scheme:</b> <b>In Sem. Evaluation:15 Marks</b> <b>Mid Sem. Exam : 25 Marks</b> <b>End Sem. Exam : 60 Marks</b> <b>Lab Evaluation : 25 Marks</b>
<b>Course Prerequisites :</b> Discrete Mathematics [ES1108], Data Structure and Algorithms [CS1104]		
<b>Course Objective:</b> <ul style="list-style-type: none"> <li>To provide a strong foundation of fundamental concepts in Artificial Intelligence.</li> <li>To identify the type of an AI problem</li> <li>To acquire knowledge on intelligent systems and agents, formalization of knowledge and reasoning</li> </ul>		
<b>Course Outcome:</b> <b>After successful completion of the course, students will able to:</b> <b>CO1:</b> Demonstrate knowledge of the building blocks of AI as presented in terms of intelligent agents. <b>CO2:</b> Analyze and formalize the problem as a state space search. <b>CO3:</b> To describe the strengths and limitations of various state-space search algorithms, and choose the appropriate algorithm <b>CO4:</b> Develop intelligent algorithms for constraint satisfaction problems <b>CO5:</b> Ability to apply knowledge representation and use this to perform inference or planning. <b>CO6:</b> Formulate and solve problems with uncertain information using Bayesian approaches.		
<b>Course Contents</b>		
<b>UNIT-I</b>	<b>Introduction</b>	<b>07 Hours</b>
Introduction, Overview of Artificial intelligence: Problems of AI, AI technique, Tic - Tac - Toe problem. Intelligent Agents, Agents & environment, nature of environment, structure of agents, goal based agents, utility based agents, learning agents.		
<b>UNIT-II</b>	<b>Problem Solving</b>	<b>07 Hours</b>
Defining the problem as state space search, production system, problem characteristics, issues in the design of search programs.		
<b>UNIT-III</b>	<b>Search techniques</b>	<b>07 Hours</b>
searching for solutions; uniform search strategies: breadth first search, depth first search, depth limited search, bidirectional search, comparing uniform search strategies. Heuristic search strategies Greedy best-first search, A* search, AO* search, memory bounded heuristic search: local search algorithms & optimization problems: Hill climbing search, simulated annealing search, local beam search		
<b>UNIT-IV</b>	<b>Constraint satisfaction problems</b>	<b>07 Hours</b>

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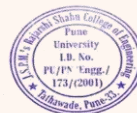
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Constraint satisfaction problems: Local search for constraint satisfaction problems. Adversarial search, Games, optimal decisions & strategies in games, the minimax search procedure, alpha-beta pruning, additional refinements, iterative deepening.		
UNIT-V	Knowledge & Reasoning	07 Hours
Knowledge & reasoning: Knowledge representation issues, representation & mapping, approaches to knowledge representation. Using predicate logic, representing simple facts in logic, representing instant & ISA relationship, computable functions & predicates, resolution, natural deduction. Representing knowledge using rules, Procedural versus declarative knowledge, logic programming, forward versus backward reasoning, matching, control knowledge.		
UNIT-VI	Probabilistic Reasoning	07 Hours
Probabilistic reasoning: Representing knowledge in an uncertain domain, the semantics of Bayesian networks, Dempster-Shafer theory, Planning Overview, components of a planning system, Goal stack planning, Hierarchical planning, other planning techniques.		
Expert Systems: Representing and using domain knowledge, expert system shells, and knowledge acquisition.		
Lab Contents		
Guidelines for Assessment		
1) Continuous assessment shall be based on experiments performed, submission of results of program in the form of report/journal, timely completion, attendance ,understanding, efficient codes, punctuality and neatness.		
2) Practical/Oral examination shall be based on the practical's performed in the lab.		
3) Lab assessment of 25 marks shall be based on continuous assessment and performance in Practical/Oral examination		
List of Laboratory Assignments/Experiments		
1	Write a program to implement Best First Search traversal.	
2	Write a program to implement Tic-Tac-Toe game using A* algorithm.	
3	Solve 8-puzzle problem using A* algorithm	
4	Use Heuristic Search Techniques to Implement Hill-Climbing Algorithms.	
5	Constraint Satisfaction Problem: Implement crypt-arithmetic problem or n-queens or graph coloring problem ( Branch and Bound and Backtracking)	
6	Implement Goal stack planning for block world problem	
7	Implement a chatbot for customer enquiry	
8	Implement Expert system for medical diagnosis problem	
Text Books:		
T1. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach		
T2. Artificial Intelligence, Russel, Pearson		
Reference Books:		
R1. Artificial Intelligence, Ritch & Knight, TMH		
R2. Introduction to Artificial Intelligence & Expert Systems, Patterson, PHI		
R3. Logic & Prolog Programming, Saroj Kaushik, New Age International		
R4. Expert Systems. Giarranto. VIKAS		

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H.O.D, Computer

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Dean Academics

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Director RSCOE, Pune



**T. Y. B. Tech (Computer Engineering)**  
**Academic Year – 2022-2023 Semester -V**  
**[CS3102]: Computer Networks**

<b>Teaching Scheme:</b> TH: 3 Hours/Week PR: 2 Hours/Week	<b>Credit</b> TH:3 PR: 1	<b>Examination Scheme:</b> In Sem. Evaluation :15 Marks Mid Sem. Exam : 25 Marks End Sem. Exam : 60 Marks Lab Evaluation : 25 Marks
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**Course Prerequisites:** Computer Organization & Architecture [CS2103]

**Course Objective:**

- To learn the network architecture.
- To learn various networking protocols & layers.
- To learn and understand network security.

**Course Outcome:**

**After successful completion of the course, students will able to:**

**CO1:** Study the basic taxonomy and terminology of the computer networks and enumerate the layers of OSI model and TCP/IP model.

**CO2:** Introduce different LAN types and connecting media.

**CO3:** Learn data link layer concepts, design issues its protocols.

**CO4:** Gain core knowledge of network layer, routing protocols and IP addressing.

**CO5:** Acquire knowledge of transport layer paradigms and its protocols.

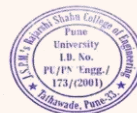
**CO6:** Discuss role of application layer with its protocols.

**Course Contents**

UNIT-I	Introduction and Data Communication Components	8 Hours
Computer Networks and Distributed Systems, Classifications of Computer Networks, Preliminaries of Layered Network Structures. Representation of Data and Its Flow, Various Connection Topology, Protocols and Standards, OSI Model, TCP/IP Model, Transmission Media.		
UNIT-II	LAN and Techniques for Bandwidth Utilization	7 Hours
Wired LAN, Wireless LAN and Virtual LAN, Multiplexing - Frequency Division, Time Division and Wave Division, Concepts on Spread Spectrum.		
UNIT-III	Data Link Layer	8 Hours
Fundamentals of Error Detection and Error Correction, Block coding, Hamming Distance, CRC; Flow Control and Error Control Protocols - Stop and Wait, Go-Back-N ARQ, Selective Repeat ARQ, Sliding Window, Piggybacking, Random Access, Multiple Access Protocols -Pure ALOHA, Slotted ALOHA, CSMA/CD, CDMA/CA.		
UNIT-IV	Network Layer	7 Hours
Switching, Logical Addressing – IPV4, IPV6; Address Mapping – ARP, RARP, BOOTP and DHCP-Delivery, Forwarding and Unicast Routing Protocols.		

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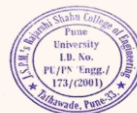
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<b>UNIT-V</b>	<b>Transport Layer</b>	<b>7 Hours</b>
Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), SCTP Congestion Control; Quality of Service (QoS), QoS Improving Techniques - Leaky Bucket and Token Bucket Algorithms.		
<b>UNIT-VI</b>	<b>Application Layer</b>	<b>8 Hours</b>
DNS, DDNS, TELNET, EMAIL, FTP, WWW, HTTP, SNMP, Bluetooth, Firewalls, Electronic Mail, Directory Services and Network Management.		
<b>Lab Contents</b>		
<b>Guidelines for Assessment</b>		
1) Continuous assessment shall be based on experiments performed, submission of results of program in the form of report/journal, timely completion, attendance, understanding, efficient codes, punctuality and neatness. 2) Practical/Oral examination shall be based on the practicals performed in the lab. 3) Lab assessment of 25 marks shall be based on continuous assessment and performance in Practical/Oral examination		
<b>List of Laboratory Assignments/Experiments</b>		
<b>1</b>	Setting up a small network (2PC/4 PC) and configuration for sharing resources.	
<b>2</b>	Write a program for error detection and correction for ASCII codes using CRC.	
<b>3</b>	Write a program to simulate Go-back-N and Selective Repeat modes of sliding window protocol.	
<b>4</b>	Write a program using TCP socket for following: a. Say Hello to Each other ( For all students) b. File transfer ( For all students) c. Calculator (Arithmetic)	
<b>5</b>	Write a program using UDP Sockets to enable file transfer (Script, Text, Audio and Video one file each) between two machines.	
<b>6</b>	Write a program using TCP sockets for wired network to implement: a. Peer to Peer Chat b. Multiuser Chat	
<b>7</b>	Write a program using UDP sockets for wired network to implement: a. Peer to Peer Chat b. Multiuser Chat	
<b>8</b>	Installation and configuration web server (Client-server based).	
<b>9</b>	Design a website using HTML for any application.	
<b>Text Books</b> <b>T1.</b> Computer Networks, A. Tannenbaum, Pearson Education-Prentice Hall. <b>T2.</b> Data and Computer Communication, William Stallings, Pearson.		
<b>Reference Books:</b> <b>R1.</b> Forouzan B, "Data communication & Networking", 5 th edition, Tata Macgraw Hill. <b>R2.</b> UNIX Network Programming, Vol. 1, 2 & 3, W. Richard Stevens.		

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**T. Y. B. Tech (Computer Engineering)**  
**Academic Year – 2022-2023 Semester -V**  
**[CS3103]: Design and Analysis of Algorithms**

<b>Teaching Scheme:</b> <b>TH: - 3 Hours/Week</b>	<b>Credit</b> <b>TH: 3</b>	<b>Examination Scheme:</b> <b>In Sem. Evaluation: 15 Marks</b> <b>Mid Sem. Exam : 25 Marks</b> <b>End Sem. Exam : 60 Marks</b>
<b>Course Prerequisites :</b> Introduction to Computer Programming [ CS1101] , Discrete Mathematics [ES1108], Fundamentals of Computer Programming [CS1103], Data Structure and Algorithms [CS1104]		
<b>Course Objective:</b> <ul style="list-style-type: none"> <li>To develop problem solving abilities using mathematical theories</li> <li>To analyze the performance of algorithms</li> <li>To study algorithmic design strategies</li> </ul>		
<b>Course Outcome:</b> <b>After successful completion of the course, students will able to:</b> <b>CO1:</b> To identify the problem, design the algorithm and confirm the correctness of algorithm <b>CO2:</b> Apply and analyze greedy and dynamic programming algorithmic design techniques <b>CO3:</b> Apply and analyze Abstract algorithm <b>CO4:</b> Analyze the asymptotic performance of algorithms <b>CO5:</b> Analyze the amortized algorithms. <b>CO6:</b> Analyze the multithreaded and distributed algorithms.		
<b>Course Contents</b>		
<b>UNIT-I</b>	<b>Fundamentals</b>	<b>07 Hours</b>
The Role of Algorithms in Computing - What are algorithms, Algorithms as technology, Evolution of Algorithms, Design of Algorithm, Need of Correctness of Algorithm, Confirming correctness of Algorithm – sample examples, Iterative algorithm design issues		
<b>UNIT-II</b>	<b>Models and Design</b>	<b>07 Hours</b>
Functional Model – Features, Recursive processes, Scope rules, Tail recursion, Checking correctness of Iterative process. Imperative Model – Basics, Specifications and Prototyping, Stepwise Refinement, Proof Rules – Basics, For loops, Goto and Exit loops, Functions and Procedures, Problem Solving using Greedy strategy - Knapsack problem, Huffman code generation algorithm.		
<b>UNIT-III</b>	<b>Abstract Algorithms</b>	<b>07 Hours</b>
Dynamic Programming, Divide and Conquer, Greedy strategy, Branch-n-Bound, Natural Algorithms – Evolutionary Algorithms and Evolutionary Computing, Introduction to Genetic Algorithm, Simulated		

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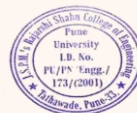
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Annealing, Artificial Neural Network and Tabu Search.		
<b>UNIT-IV</b>	<b>Complexity Theory</b>	<b>07 Hours</b>
Complexity theory – Counting Dominant operators, Growth rate, upper bounds, asymptotic growth, O, $\Omega$ , $\Theta$ , o and $\omega$ notations, polynomial and non-polynomial problems, deterministic and non-deterministic algorithms, P-class problems, NP-class of problems, Polynomial problem reduction NP complete problems- vertex cover and 3-SAT and NP hard problem – Hamiltonian cycle.		
<b>UNIT-V</b>	<b>Amortized Analysis</b>	<b>07 Hours</b>
Amortized Analysis – Binary, Binomial and Fibonacci heaps, Dijkstra's Shortest path algorithm, Splay Trees, Time-Space tradeoff, Introduction to Tractable and Non-tractable Problems, Introduction to Randomized and Approximate algorithms, Embedded Algorithms: Embedded system scheduling (power optimized scheduling algorithm), sorting algorithm for embedded systems.		
<b>UNIT-VI</b>	<b>Multithreaded and Distributed Algorithms</b>	<b>07 Hours</b>
Multithreaded Algorithms - Introduction, Performance measures, Analyzing multithreaded algorithms, Parallel loops, Race conditions. Problem Solving using Multithreaded Algorithms - Multithreaded matrix multiplication, Multithreaded merge sort. Distributed Algorithms - Introduction, Distributed breadth first search, Distributed Minimum Spanning Tree. String Matching- Introduction, The Naive string matching algorithm, The Rabin-Karp algorithm		
<b>Text Books:</b> <b>T1.</b> Parag Himanshu Dave, Himanshu Bhalchandra Dave, Design And Analysis of Algorithms, Pearson Education, ISBN 81-7758- 595-9 <b>T2.</b> Gilles Brassard, Paul Bratley, Fundamentals of Algorithmics, PHI, ISBN 978-81-203-1131-2		
<b>Reference Books:</b> <b>R1.</b> Michael T. Goodrich, Roberto Tamassia , —Algorithm Design: Foundations, Analysis and Internet Examples, Wiley, ISBN 978-81-265-0986-7 <b>R2.</b> Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein,—Introduction to Algorithms, MIT Press; ISBN 978-0-262-03384-8 <b>R3.</b> Horowitz and Sahani, "Fundamentals of Computer Algorithms", University Press, ISBN:978 81 7371 6126, 81 7371 61262 <b>R4.</b> Rajeev Motwani and Prabhakar Raghavan, —Randomized Algorithms, Cambridge University Press, ISBN: 978-0-521-61390-3 <b>R5.</b> Dan Gusfield, —Algorithms on Strings, Trees and Sequences, Cambridge University Press, ISBN:0-521-67035-7		

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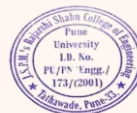


**T. Y. B. Tech (Computer Engineering)**  
**Academic Year – 2022-2023 Semester -V**  
**Elective I: [CS3104A]: Machine Learning**

<b>Teaching Scheme:</b> <b>TH: - 3Hours/Week</b> <b>PR: -2 Hours/Week</b>	<b>Credit</b> <b>TH: 3</b> <b>PR: 1</b>	<b>Examination Scheme:</b> <b>In Sem. Evaluation :15 Marks</b> <b>Mid Sem. Exam : 25 Marks</b> <b>End Sem. Exam : 60 Marks</b> <b>Lab Evaluation : 25 Marks</b>
<b>Course Prerequisites :</b> Linear algebra [ES1109] , Introduction to probability, Statistical and Calculus [ES1106], Computational Statistics [CS 2104]		
<b>Course Objective:</b> <ol style="list-style-type: none"> <li>1. To understand human learning aspects and relate it with machine learning concepts.</li> <li>2. To understand nature of the problem and apply machine learning algorithm</li> <li>3. To become aware of various parametric and non-parametric methods in machine learning</li> <li>4. Compare efficiency of learning algorithms.</li> </ol>		
<b>Course Outcome:</b> <b>After successful completion of the course, students will able to:</b> <b>CO 1:</b> Differentiate between learning algorithms Apply different pre-processing methods to prepare training data set for machine learning. <b>CO 2:</b> Design and implement machine learning solutions to classification, regression, and clustering problems <b>CO 3:</b> Evaluate and interpret the results of the algorithms.		
<b>Course Contents</b>		
<b>UNIT-I</b>	<b>Introduction to Machine Learning</b>	<b>7 Hours</b>
Introduction to Machine Learning (ML); Relationship between ML and human learning; A quick survey of major models of how machines learn; Supervised , Unsupervised, Reinforcement Learning, Example applications of ML , ML and Big data, Feature engineering; Training and testing classifier models; Data Scaling and Normalization, Cross-validation; Model evaluation (precision, recall, F1-mesure, accuracy, area under curve); Statistical decision theory including discriminant functions and decision surfaces;		
<b>UNIT-II</b>	<b>Classification :Regression, Naïve Bayes, Association Rule Mining</b>	<b>8 Hour</b>
Classification: Supervised Learning; The problem of classification; Linear Regression and higher dimensionality, Regularization; LASSO, Ridge, Elastic Net Polynomial regression, Isotonic regression, Model evaluation; Least squares regression; Applications of regression Naïve Bayes classification; Bayes Theorem, Type: Bernoulli Naïve Bayes, Multinomial Naïve Bayes, and Gaussian Naïve Baye, a-priori Algorithm		
<b>UNIT-III</b>	<b>SVM , Bayesian Networks and ANN</b>	<b>8 Hours</b>
Support Vector Machine(SVM)- Linear Support Vector Machines, soft margin, multiclass, non-linear Bayesian networks; Polynomial regression ,Generative models ,Discrete variables, Linear-Gaussian models, Artificial neural networks including backpropagation.		

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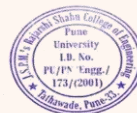
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UNIT-IV	Decision Tree and Ensemble Models	8 Hours
Decision Tree and Random Forests; AdaBoost, Gradient Tree Boosting, Voting Classifier, k-Nearest neighbor classification; Applications of classifications; Concepts of Weak and eager learner, Ensembles of classifiers including bagging and boosting, Evaluation Matrices in classification.		
UNIT-V	Hidden Markov Models (HMM)	6 Hours
Hidden Markov Models (HMM) with forward-backward and Vierbi algorithms; Sequence classification using HMM; Conditional random fields; Applications of sequence classification such as part-of-speech tagging.		
UNIT-VI	Clustering Techniques	8 Hours
Expectation-Maximization (EM) algorithm for unsupervised learning ,Clustering: average linkage; Ward’s algorithm; Minimum spanning tree clustering; K-nearest neighbors clustering; BIRCH; CURE; DBSCAN, Evaluation methods based on Ground Truth- Homogeneity, Completeness, Adjusted Rand Index. Anomaly and outlier detection methods.		
Lab Contents		
Guidelines for Assessment		
1) Continuous assessment shall be based on experiments performed, submission of results of program in the form of report/journal, timely completion, attendance, understanding, efficient codes, punctuality and neatness. 2) Practical/Oral examination shall be based on the practical’s performed in the lab. 3) Lab assessment of 25 marks shall be based on continuous assessment and performance in Practical/Oral examination		
List of Laboratory Assignments		
1	Download Credit Card Fraud dataset. Use Naive Bayes Algorithm in R for classification.	
2	Using Social_Network_Ads.csv, apply SVM in R to identify the right hyper-plane which best differentiates the data.	
3	Mini Project: Using suitable public domain dataset in UCI ML repository, apply a-priori algorithm to find frequently occurring items from given data and generate strong association rules using support and confidence thresholds. For Example: Market Basket Analysis.	
4	Mini Project: Using public domain datasets in UCI ML repository, Implementation of clustering algorithm. For clustering of data instances in different groups, apply different clustering techniques (minimum 2). Visualize the clusters using suitable tools.	
5	Mini Project: Implementation of EM algorithm for some specific problem.	
6	Mini Project: Implementation of one anomaly detection algorithms.	
Text Books:		
T1. Ethem Alpaydin, Introduction to Machine Learning, PHI, Third Edition, ISBN No. 978-81-203- 5078-6		
T2.Christopher M. Bishop, Pattern Recognition and Machine Learning, Mcgraw-Hill, ISBN No. 0-07-115467-1		
T3. Tom Mitchell, Machine Learning, Mcgraw-Hill, First Edition, ISBN No. 0-07-115467-1.		
T4.Giuseppe Bonaccorso, “Machine Learning Algorithms”, Packt Publishing Limited, ISBN10: 1785889621, ISBN-13: 978-1785889622		
Reference Books:		
R1. R.O. Duda, P.E. Hart, D.G. Stork, Pattern Classification, 2/e, Wiley, 2001		
R2. Shai shalev-Shwartz and Shai Ben-David, Understanding Machine Learning(From Theory to Algorithms), Cambridge University Press, First Edition, ISBN No. 978-1-107-51282-5.		

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**R3.** A. Rostamizadeh, A. Talwalkar, M. Mohri, Foundations of Machine Learning, MIT Press.  
**R4.**A. Webb, Statistical Pattern Recognition, 3/e, Wiley, 2011.

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**T. Y. B. Tech (Computer Engineering)**  
**Academic Year – 2022-2023 Semester -V**  
**Elective I: [CS3104B]: Cryptology and Network Security**

<b>Teaching Scheme:</b> TH: - 3 Hours/Week PR: - 2 Hours/Week	<b>Credit</b> TH: 03 PR: 01	<b>Examination Scheme:</b> In Sem. Evaluation: 15 Marks Mid Sem. Exam: 25 Marks End Sem. Exam : 60 Marks Lab Evaluation: 25 Marks
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**Course Prerequisites : Computer Network [CS3102]**

**Course Objective:**

To learn about the threats of network security and understand what causes these threats by studying how vulnerabilities arise in the development and uses of computer system. To narrate and evaluate the design principles of conventional encryption and decryption techniques and introduce the knowledge of wireless communication technologies and its applications to the students.

**Course Outcome:**

**After successful completion of the course, students will able to:**

**CO1:** Understand Different Concepts of Security.

**CO2:** Analyze the concepts of cryptographic techniques.

**CO3:** Implement key security algorithms regarding symmetric key and asymmetric key cryptographic.

**CO4:** Ability to distinguish and analyze available network security protocols

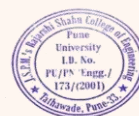
**CO5:** Understand different types of wireless networks.

**Course Contents**

UNIT-I	Introduction to the Concept of Security	7 Hours
Introduction, The Need of Security, Security Approaches, Principal of Security, Types of Attacks. <b>Cryptographic Techniques:</b> Introduction, Plain Text and Cipher Text, Substitution Techniques, Transposition Techniques, Encryption and decryption, Symmetric and Asymmetric Key Cryptography, Steganography, Key Range and Key Size, Possible Types of Attacks.		
UNIT-II	Symmetric Key Cryptography	7 Hours
Introduction, Algorithm Types and Models, An Overview of Symmetric Key Cryptography, Data Encryption Standard(DES), International Data Encryption Algorithm(IDEA), RC5, Blowfish, Advanced Encryption Standard(AES), Differential and Linear Cryptanalysis.		
UNIT-III	Asymmetric Key Cryptography	7 Hours
Introduction, Brief History of Asymmetric Key Cryptography, An Overview of Asymmetric Key Cryptography, The RSA Algorithm, Symmetric and Asymmetric Key Cryptography Together, Digital Signatures, Knapsack Algorithm, Some Other Algorithms		
UNIT-IV	Internet Security Protocols	7 Hours
Basic Concepts, Security Socket Layer(SSL), Secure Hyper Text Transfer Protocol(SHHTTP), Time stamping Protocol(TSP), Secure Electronic Transaction(SET), SSL Versus SET, 3-D Secure Protocol,		

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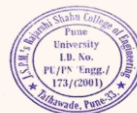
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Electronic Money , Email Security, Wireless Application Protocol(WAP) Security, Security in GSM, Brief Introduction to TCP/IP, Firewalls, IP Security, Virtual Private Networks (VPN)		
UNIT-V	Wireless Network Security	7 Hours
Issues in Ad Hoc Wireless Networks - Classifications of MAC Protocols - Classifications of Routing Protocols - Classifications of Transport Layer Protocols - Classification of Energy Management Schemes – Wired Equivalent Privacy(WEP) – The Extensible Authentication Protocol - Security in Ad Hoc Wireless Networks.		
UNIT-VI	Wireless Sensor Network	7 Hours
Introduction - Sensor Network Architecture - Data Dissemination - Data Gathering - MAC Protocols for Sensor Networks - Location Discovery - Quality of a Sensor Network, Evolving Standards - Other Issues.		
Lab Contents		
Guidelines for Assessment		
1) Continuous assessment shall be based on experiments performed, submission of results of program in the form of report/journal, timely completion, attendance ,understanding, efficient codes, punctuality and neatness.		
2) Practical/Oral examination shall be based on the practical’s performed in the lab.		
3) Lab assessment of 25 marks shall be based on continuous assessment and performance in Practical/Oral examination		
List of Laboratory Assignments/Experiments (Any 6)		
1	Implement any two of the following Substitution & Transposition Techniques concepts: a) Caesar Cipher b) Playfair Cipher c) Hill Cipher d) Vigenere Cipher	
2	Implement any two of the following algorithms a) DES b) RSA Algorithm c) Diffiee-Hellman d) MD5 e) SHA-1	
3	Implement the Signature Scheme - Digital Signature Standard	
4	Demonstrate intrusion detection system (ids) using any tool (snort or any other s/w)	
5	Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript. Consider the end user as one of the parties (Alice) and the JavaScript application as other party (bob).	
6	Write a JAVA program to implement the Rijndael algorithm logic	
7	Write a JAVA program to implement the BlowFish algorithm Logic.	
8	Study of Anti-Intrusion Technique – Honey pot.	
9	Set up IPSEC under LINUX	
Text Books:		
T1. Stallings, W. Network security Essentials: Applications and standards, Prentice Hall, 2000.		
T2. Kaufman, c., Perlman, R., and Speciner, M., Network Security, Private Communication in a public world, 2nd ed., Prentice Hall PTR., 2002		
T3.Atul Kahate – Cryptography and Network Security , 2 <sup>nd</sup> Edition Tata McGraw Hill ublication, New Delhi-2006		
Reference Books:		
R1. Charlie Kaufman, Radia Perlman, and Mike Speciner, Network Security: Private Communication in a Public World, 2nd Edition, Prentice Hall, 2002, ISBN: 0-13-0460192.		
R2. Stallings, W.,.Cryptography and Network Security: Principles and Practice, 3rd ed., Prentice Hall PTR.,2003.		

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**R3.** Cryptography and Network Security; McGraw Hill; Behrouz A Forouzan.

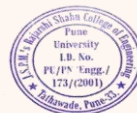
**R4.** Information Security Intelligence Cryptographic Principles and App. Calabrese Thomson

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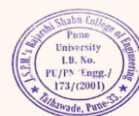


**T. Y. B. Tech (Computer Engineering)**  
**Academic Year – 2022-2023 Semester -V**  
**Elective I: [CS3104C]: Image Processing and Pattern Recognition**

<b>Teaching Scheme:</b> <b>TH: - 3 Hours/Week</b> <b>PR: -2 Hours/Week</b>	<b>Credit</b> <b>TH: 3</b> <b>PR: 1</b>	<b>Examination Scheme:</b> <b>In Sem. Evaluation:15 Marks</b> <b>Mid Sem. Exam: 25 Marks</b> <b>End Sem. Exam: 60 Marks</b> <b>Lab Evaluation : 25 Marks</b>
<b>Course Prerequisites:</b> Computer Graphics and Animation [CS2113], Machine Learning [CS3104A]		
<b>Course Objective:</b> <ul style="list-style-type: none"> <li>Imparts knowledge in the area of image and image processing.</li> <li>Understand fundamentals of digital image processing.</li> <li>Provide knowledge of the applications of the theories taught in digital image processing.</li> <li>Learn the fundamentals of pattern recognition and to choose an appropriate feature.</li> </ul>		
<b>Course Outcome:</b> <b>After successful completion of the course, students will able to:</b> <b>CO1:</b> Comprehend basics of image formation and transformation using sampling and quantization. <b>CO2:</b> Explain different types signal processing techniques used for image sharpening and smoothing. <b>CO3:</b> Implement different color image processing techniques. <b>CO4:</b> Summarize the basics of pattern recognition using different approaches. <b>CO5:</b> Apply a suitable classifier to address a desired pattern recognition problem.		
<b>Course Contents</b>		
<b>UNIT-I</b>	<b>Introduction to Image Processing</b>	<b>07 Hours</b>
Image processing systems and its applications. Basic image file formats, Fundamental steps in digital image processing, Geometric and photometric models, Digitization - Sampling, Quantization, Image definition and its representation, Neighbourhood metrics, Preprocessing - Techniques of preprocessing. Case Study: Sampling techniques.		
<b>UNIT-II</b>	<b>Intensity Transformations and Spatial Filtering</b>	<b>07 Hours</b>
Basics of intensity transformations and Spatial filtering, Intensity transformation functions, Enhancement, Contrast stretching, Histogram specification, Local contrast enhancement, Smoothing, Linear and order statistic filtering, Sharpening, Spatial convolution, Gaussian smoothing, DoG, LoG.		
<b>UNIT-III</b>	<b>Segmentation</b>	<b>07 Hours</b>
Pixel classification, Grey level thresholding, Global/local thresholding, Optimum thresholding - Bayes analysis, Otsu method, Derivative based edge detection operators, Edge detection/linking, Canny edge detector, Region growing, Split/merge techniques, Line detection, Hough transform.		

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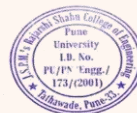
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UNIT-IV	Image/Object Feature Extraction	07 Hours
Textural features - Grey level co-occurrence matrix, Moments, Connected component analysis, Convex hull, Distance transform, Medial axis transform, Skeletonization/thinning, Shape properties. Registration - Mono-modal/multimodal image registration, Global/local registration, Transform and similarity measures for registration, Intensity/pixel interpolation.		
UNIT-V	Color Image Processing	07 Hours
Fundamentals of different color models - RGB, CMY, HSI, YCbCr, Lab, False color, Pseudo colour, Enhancement, Segmentation. Morphological Filtering Basics - Dilation and Erosion Operators, Top Hat Filters. Case Study: Shading algorithms.		
UNIT-VI	Pattern Recognition	07 Hours
Basics of pattern recognition, Design principles of pattern recognition system, Learning and adaptation, Pattern recognition approaches, Bayesian decision theory, Pattern classification by distance functions, Minimum distance pattern classifier.		
Lab Contents		
Guidelines for Assessment		
1) Continuous assessment shall be based on experiments performed, submission of results of program +in the form of report/journal, timely completion, attendance, understanding, efficient codes, punctuality and neatness. 2) Practical/Oral examination shall be based on the practical's performed in the lab. 3) Lab assessment of 25 marks shall be based on continuous assessment and performance in Practical/Oral examination		
List of Laboratory Assignments/Experiments		
1	Implement digital image conversion from RGB to gray, gray to binary.	
2	Implement image transformations.	
3	Implement image sharpening and smoothing filters.	
4	Write a program to display histogram and histogram equalization.	
5	Write a program for image enhancement by intensity/gray scale slicing.	
6	Write a program for image thresholding.	
7	Implement segmentation using background subtraction technique.	
8	Write a program to building classifiers using Gaussian mixture models.	
Text Books: T1. Digital Image Processing – Ganzalez and Wood, Addison Wesley, 1993. T2. Pattern Classification – R.O. Duda, P.E. Hart and D.G. Stork, Second Edition John Wiley, 2006.		
Reference Books: R1. Digital Picture Processing – Rosenfeld and Kak, Vol.I&Vol.II, Academic,1982. R2. Computer Vision – Ballard and Brown, Prentice Hall, 1982.		

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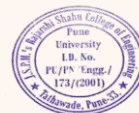
- R3.** An Introduction to Digital Image Processing – Wayne Niblack, Prentice Hall, 1986.  
**R4.** Pattern Recognition and Machine Learning – C. M. Bishop, Springer, 2009.  
**R5.** Pattern Recognition – S. Theodoridis and K. Koutroumbas, 4<sup>th</sup> Edition, Academic Press, 2009.

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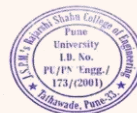
**T. Y. B. Tech (Computer Engineering)**  
**Academic Year – 2022-2023 Semester -V**

**Elective II: [HS3102]: Fundamentals of Management and Strategy**  
**Formulation**

<b>Teaching Scheme:</b> <b>TH: - 3 Hours/Week</b>	<b>Credit</b> <b>TH:3</b>	<b>Examination Scheme:</b> <b>In Sem. Evaluation:15 Marks</b> <b>Mid Sem. Exam : 25 Marks</b> <b>End Sem. Exam : 60 Marks</b>
Course Prerequisites : Basics of Management		
<b>Course Objectives:</b> <ul style="list-style-type: none"> <li>To prepare the students for various forms of the Management Systems and its application in organizations.</li> <li>To expose the students to the managerial issues relating to Organization help them identify and evaluate various options in Management Systems.</li> <li>To prepare engineering students for the inter-relationships of business to individuals, other organizations, government and society.</li> </ul>		
<b>Course Outcome:</b> After successful completion of the course, students will able to: CO1: Understand the need, usage and importance of Management basics. CO2: Understand the activities that are undertaken while planning, Organizing, staffing, directing and controlling of management. CO3: understand the activities and culture of organization. CO4: learn and understand the concepts of strategic management. CO5: understand the fundamental principles of and interrelationships among business functions. CO6: understand the inter-relationships of business to individuals, other organizations, government and society.		
<b>Course Contents</b>		
<b>UNIT-I</b>	<b>Introduction of Management Theories</b>	<b>6 Hours</b>
Concept and Foundations of Management, Evolution of Management Thoughts [Pre-Scientific Management Era (before 1880), Classical management Era (1880-1930), Neo-classical Management Era (1930-1950), Modern Management era (1950-on word). Contribution of Management Thinkers: Taylor, Fayol, Elton Mayo etc		

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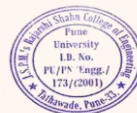
UNIT-II	<b>Functions of Management</b>	<b>6 Hours</b>
Planning, Organizing, Staffing, Directing, Controlling		
UNIT-III	<b>Organization Behavior</b>	<b>8 Hours</b>
Introduction, Personality, Perception, Learning and Reinforcement, Motivation, Group Dynamics, Power & Influence, Work Stress and Stress Management, Decision Making, Problems in Decision Making, Decision Making, Organizational Culture, Managing Cultural Diversity.		
UNIT-IV	<b>Introduction to Strategic Management</b>	<b>7 Hours</b>
Importance of Strategic Management, Vision and Objectives, Schools of thought in Strategic Management, Strategy Content, Process, and Practice, Fit Concept and Configuration Perspective in Strategic Management		
UNIT-V	<b>Internal Environment of Firm- Recognizing a Firm's Intellectual Assets</b>	<b>7 Hours</b>
Core Competence as the Root of Competitive Advantage, Sources of Sustained Competitive Advantage, Business Processes and Capabilities-based Approach to Strategy		
UNIT-VI	<b>External Environments of Firm- Competitive Strategy</b>	<b>6 Hours</b>
Five Forces of Industry Attractiveness that Shape Strategy, The concept of Strategic Groups, and Industry Life Cycle, Generic Strategies, Generic Strategies and the Value Chain		
Text Books:  T1 Richard L. Daft, <i>Understanding the Theory and Design of Organizations</i> .		
Reference Books:  R1. Stephen P. Robbins, Timothy A. Judge, Neharika Vohra, <i>Organizational Behavior</i> .		

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**T. Y. B. Tech (Computer Engineering)**  
**Academic Year – 2022-2023 Semester -V**

**Elective II: [HS3101B]: Computational Finance & Modeling**

<b>Teaching Scheme:</b> <b>PR: -3 Hours/Week</b>	<b>Credit</b> <b>TH: 3</b>	<b>Examination Scheme:</b> <b>In Sem. Evaluation: 15 Marks</b> <b>Mid Sem. Exam : 25 Marks</b> <b>End Sem. Exam : 60 Marks</b>
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**Course Prerequisites: Principles of Economics[HS1106]**

**Course Objectives:**

1. To understand various concepts related to financial management.
2. Obtain an overview of useful tools for analyzing a firm's profitability, growth, and risk, including financial ratios, common-size financial statements, and percentage change financial statements, as well as how to use this information to forecast the future business activities of a firm, and to value a firm.
3. To help the students to develop the practical skills in trading stock using advance concepts, tools and techniques of technical analysis to become a successful trader.
4. Understanding charts and their patterns for buy-sell decisions, Learn all candles, patterns and indicators and many more.

**Course Outcome:**

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

**CO1:** Understanding the functions of Capital Markets & SEBI.

**CO2:** Vertical and horizontal analysis of the Financial Report of the Company,

**CO3:** Calculate Ratio and analysis of liquidity, solvency, risk, and profitability,

**CO4 :** Determine the Financial Fundamentals of the company

**CO5:** Applying various Technical Analysis tools for Stock Market Investments

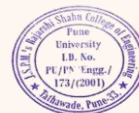
**CO6:** Describe the various Fundamental Analysis required for analyzing the Industry.

**Course Contents**

<b>UNIT-I</b>	<b>Indian Capital Market and Financial statements of Corporate organizations</b>	<b>7 Hours</b>
Features, Instruments and Constituents. Stock Exchanges in India : Functions, Regulation of stock exchanges; National Stock Exchange (NSE). Financial statements of Corporate organizations, Introduction to Schedule- VI, Provisions of Companies Act 1956. Case study of /from annual report of listed companies on Bombay stock exchange and national stock exchange.		
<b>UNIT-II</b>	<b>Liquidity Ratio and Profitability Ratio</b>	<b>7 Hours</b>
LIQUIDITY RATIO: Current Ratio, Acid Test Ratio, Quick Ratio, Cash ratio PROFITABILITY RATIO: Gross Profit Ratios, Net Profit Ratio, Operating Profit Ratio, Return on Capital Employed, Return on Equity, Return on Net worth, Return on assets. Case study of /from annual report of listed companies on Bombay stock exchange and national stock exchange		

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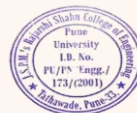
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<b>UNIT-III</b>	<b>Turnover Ratio/Activity Ratio</b>	<b>7 Hours</b>
<b>TURNOVER RATIO/ACTIVITY RATIO:</b> Inventory turnover Ratio, Debtors Receivables turnover Ratio, Creditors/Payables turnover Ratio, Fixed asset turnover Ratio, Total asset turnover Ratio. <b>SOLVENCY RATIO (Leverage Ratios):</b> Debt ratios, Debt-to-equity ratios, Debt to Total Assets Ratios, Proprietary Ratio, Capital Gearing Ratio, Interest-coverage ratios. Case study of /from annual report of listed companies on Bombay stock exchange and national stock exchange.		
<b>UNIT-IV</b>	<b>Market Ratios</b>	<b>7 Hours</b>
Earnings Per Share, Dividend Per Share, Book Value Per Share, Dividend Yield, Earnings Yield, Price/Earnings (P/E), Price/Cash Flow, Price/Sales (P/S), Price/Earnings/Growth Rate (PEG). Case study of /from annual report of listed companies on Bombay stock exchange and national stock exchange		
<b>UNIT-V</b>	<b>Fundamental Analysis</b>	<b>7 Hours</b>
Economic analysis: Factors in Domestic and International economy – Economic forecasting and stock-investment decisions – – Macroeconomic activities and security markets, The Cyclical Indicator Approach, Monetary Variables Industry analysis: Industry classification schemes –Classification by product and according to business cycle – Key characteristics in industry analysis – Industry life cycle – Sources of information for industry analysis. Industry Analysis – Business Cycles and industry sectors, Evaluating Industry life cycle, analysis of industry competition and industry rate of returns Company analysis: Sources of information for company analysis (Internal, External) – Factors in company analysis – Operating analysis – Management analysis – Financial analysis – Earnings quality. Company Analysis, SWOT Analysis, Analysis of Financial Statement and Stock Valuation		
<b>UNIT-VI</b>	<b>Technical Analysis</b>	<b>7 Hours</b>
Technical Analysis- Meaning, Basic Assumptions, Rationale of Technical Analysis, Strengths and Weakness of Technical Analysis, Difference between Fundamental and Technical Analysis, Dow Theory – Assumptions, Study of past Prices and Volumes, Charts types – Bar Charts, Point and Figure Charts, Candle Stick Charts, Concept of Support and Resistance, Trend – Meaning and Types of Trend, Key skills required to identify a trend. Introduction to Japanese Candlestick basic technique, different type of candle stick charts and patterns covering Bullish Reversal, Bullish Continuation, Bearish Reversal, Bearish Continuation and Candlesticks that Reflect Indecision (Head and Shoulder, Inverted Head and Shoulder, Hammer, Inverted Hammer, Bullish/Bearish Engulfing, Bullish/Bearish Harami, Piercing Line, Bullish Doji Star, Evening Doji Star, Bullish Meeting Lines, Three White Soldiers, Morning Star, Spinning Top, Dragonfly Doji, Gravestone Doji, Bullish Abandoned Baby, Marubozu etc.)		
<b>Text Books:</b> <b>T1.</b> Donald E. Fischer Ronald J. Jordan, Security Analysis and Portfolio Management, PrenticeHall of India <b>T2.</b> Security Analysis And Portfolio Management by V. Gangadhar Anmol Publications <b>T2.</b> Security Analysis And Portfolio Management by S Kevin, Prentice hall of India. <b>T3.</b> Ramanujan, S. Mergers: The New Dimensions for Corporate Restructuring. Tata McGraw Hill. <b>T4.</b> Khan & Jain, Financial Management, TATA Mc Graw Hill <b>T5.</b> I. M. Pandey, Financial Management, Vikas Publication		
<b>Reference Books:</b> <b>T1.</b> R1: Murphy, John J., Technical Analysis of the Financial Markets, New York Institute of Finance <b>T2.</b> R2: Mandar Jamsandekar, Trading and Technical Analysis Course: How to Trade Safely and		

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Profitably, Kindle Edition

**T3.R3** Aswath Damodaran, Corporate Finance, Theory and Practice, Wiley Publication

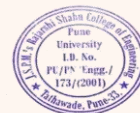
**T4.R4** Ravi Kishore, Financial Management, Taxman Publication

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**T. Y. B. Tech (Computer Engineering)**  
**Academic Year – 2022-2023 Semester -V**  
**Elective II: [HS3101C]: Financial & Cost Accounting**

<b>Teaching Scheme:</b> <b>TH: 03 Hours/Week</b>	<b>Credit</b> <b>TH:3</b>	<b>Examination Scheme:</b> <b>In Sem. Evaluation:15 Marks</b> <b>Mid Sem. Exam : 25 Marks</b> <b>End Sem. Exam : 60 Marks</b>
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**Course Prerequisites:**

**Course Objective:**

- To create an awareness about the importance and usefulness of the accounting concepts and their managerial implications.
- To develop an understanding of the financial statements and the underlying principles and learn to interpret financial statements.
- To create an awareness about cost accounting, different types of costing and cost management.

**Course Outcome:**

**After successful completion of the course, students will able to:**

**CO1:** Understand and explain the conceptual framework of Cost & Management Accounting.

**CO2:** Explain the basic concepts and processes in determination of products and services cost.

**CO3:** Interpret cost accounting statements.

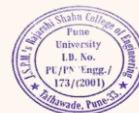
**CO4:** Identify and apply the concepts of Financial Management.

**Course Contents**

<b>UNIT-I</b>	<b>Accounting Concepts</b>	<b>07 Hours</b>
Evolution of cost accounting, Cost accounting concepts, Cost accounting principles, Techniques and Conventions, Cost accounting standards, Financial Statements- Understanding and Interpreting Financial Statements.		
<b>UNIT-II</b>	<b>Accounting Process</b>	<b>07 Hours</b>
Book keeping and record maintenance, Fundamental principles and double entry, Journal, Ledger, Trial balance, Balance sheet, Final accounts, Cash book and subsidiary books, Rectification of errors.		
<b>UNIT-III</b>	<b>Financial Statements</b>	<b>07 Hours</b>
Financial Statements: Form and Contents of Financial Statements, Types of financial statements, Analyzing and interpreting financial statements, Accounting standards.		
<b>UNIT-IV</b>	<b>Cost Accounting</b>	<b>07 Hours</b>
Basic Concepts of Cost Accounting, Objectives, Importance and Advantages of Cost Accounting, Cost Centre, Cost Unit, Elements of Cost, Classification and Analysis of Costs, Relevant and Irrelevant		

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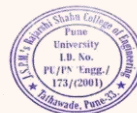
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Costs, Differential Costs, Sunk Cost, Opportunity Cost, Preparation of Cost Sheet.		
<b>UNIT-V</b>	<b>Short Term Business Decision Techniques – Marginal Costing</b>	<b>07 Hours</b>
Meaning, Principles, Advantages and Limitations, Contribution, P/V Ratio, Break-Even Point (BEP), Cost Volume Profit (CVP) Analysis, Short Term Business Decisions–Product Mix Decisions, Make or Buy (Outsourcing) Decisions, Accept or Reject Special Order Decisions, Shutting Down Decisions.		
<b>UNIT-VI</b>	<b>Company Accounts and Annual Reports</b>	<b>07 Hours</b>
Company annual report- Purpose, Contents, Types of readers of an annual report and their purpose, Audit Reports and Statutory Requirements, Directors Report, Notes to Accounts, Pitfalls.		
<b>Text Books:</b> <b>T1.</b> Financial Accounting by Kimmel and Weygandt and Kieso, John Wiley, 7th Edition. <b>T2.</b> A Textbook of Financial Cost and Management Accounting, by P. Periasamy, Himalaya Pub. House, 2010.		
<b>Reference Books:</b> R1. Accounting: Texts and Cases, by Robert N Anthony, David Hawkins and Kenneth Marchant, McGraw-Hill, 1995. R2. Financial Intelligence: A Manager's Guide to Knowing What the Numbers Really Mean, by Joe Knight and Karen Berman, Harvard Business Review Press, 2006. R3. Cost Accounting: Text, Problems and Cases, by Jawahar Lal, Manisha Singh, and Seema Srivastav, McGraw-Hill Education, 2019. R4. Financial Policy And Management Accounting, By Bhabatosh Banerjee, PHI Learning Pvt. Ltd, 2012.		

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**T. Y. B. Tech (Computer Engineering)**  
**Academic Year – 2021-2022 Semester -V**  
**[HS3111]: Fundamentals of Management**

<b>Teaching Scheme:</b> <b>TH: - 3 Hours/Week</b>	<b>Credit</b> <b>TH: 3</b>	<b>Examination Scheme:</b> <b>In Sem. Evaluation: 15 Marks</b> <b>Mid Sem. Exam : 25 Marks</b> <b>End Sem. Exam : 60 Marks</b>
<b>Course Prerequisites :</b> Basics of Management		
<b>Course Objectives:</b> <ul style="list-style-type: none"> <li>To prepare the students to various forms of the Management Systems and its application in organizations.</li> <li>To expose the students to the managerial issues relating to Organization help them identify and evaluate various options in Management Systems.</li> <li>To prepare engineering students to the inter-relationships of business to individuals, other organizations, government and society.</li> </ul>		
<b>Course Outcome:</b> <b>After successful completion of the course, students will able to:</b> <b>CO1:</b> Explain the need, usage, and importance of Management basics. <b>CO2:</b> Summarize the activities that are undertaken while planning, Organizing, staffing, directing and controlling of management. <b>CO3:</b> Explain the activities and culture of the organization. <b>CO4:</b> Learn and explain the concept of organizational theory and design <b>CO5:</b> Explain the fundamentals of managerial ethics. <b>CO6:</b> Identify the attributes of a leader.		
<b>Course Contents</b>		
<b>UNIT-I</b>	<b>Introduction of Management Theories</b>	<b>6 Hours</b>
Concept and Foundations of Management, Evolution of Management Thoughts [Pre-Scientific Management Era (before 1880), Classical management Era (1880-1930), Neo-classical Management Era (1930-1950), Modern Management era (1950-on word). Contribution of Management Thinkers: Taylor, Fayol, Elton Mayo etc		
<b>UNIT-II</b>	<b>Functions of Management</b>	<b>6 Hours</b>
Planning, Organizing, Staffing, Directing, Controlling		
<b>UNIT-III</b>	<b>Organization Behavior</b>	<b>8 Hours</b>
Introduction, Personality, Perception, Learning and Reinforcement, Motivation, Group Dynamics, Power & Influence, Work Stress and Stress Management, Decision Making, Problems in Decision Making, Decision Making, Organizational Culture, Managing Cultural Diversity.		
<b>UNIT-IV</b>	<b>Organizational Design</b>	<b>7 Hours</b>

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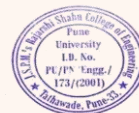
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Classical, Neoclassical and Contingency approaches to organizational design; Organizational theory and design, Organizational structure (Simple Structure, Functional Structure, Divisional Structure, Matrix Structure)		
<b>UNIT-V</b>	<b>Managerial Ethics</b>	<b>7 Hours</b>
Ethics and Business, Ethics of Marketing & advertising, Ethics of Finance & Accounting, Decision – making frameworks, Business and Social Responsibility, International Standards, Corporate Governance, Corporate Citizenship, Corporate Social Responsibility		
<b>UNIT-VI</b>	<b>Leadership</b>	<b>6 Hours</b>
Concept, Nature, Importance, Attributes of a leader, developing leaders across the organization, Leadership Grid		
<b>Text Books:</b> T1. Richard L. Daft, <i>Understanding the Theory and Design of Organizations</i> .		
<b>Reference Books:</b> R1. Stephen P. Robbins, <b>Timothy A. Judge</b> , Neharika Vohra, <i>Organizational Behavior</i> .		

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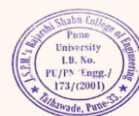


**T. Y. B. Tech (Computer Engineering)**  
**Academic Year – 2022-2023 Semester -V**  
**[HS3104]: Business Communication & Value Science -IV**

<b>Teaching Scheme:</b> <b>PR: -2 Hours/Week</b>	<b>Credit</b> <b>PR: 1</b>	<b>Examination Scheme:</b> <b>Lab Evaluation: 50 Marks</b>
<b>Course Prerequisites:</b> Basic Knowledge of English (verbal and written). Completion of all units from previous Semesters.		
<b>Course Objectives:</b> <ul style="list-style-type: none"> <li>Recognize the importance of diversity in workplace</li> <li>Recognize the best practices of communicative writing.</li> <li>Apply emotional intelligence in real life scenarios.</li> <li>Use the best practices of public speaking in real life scenarios.</li> <li>Understand the importance of corporate social responsibility (CSR)</li> <li>Practice corporate etiquettes in real life scenarios.</li> <li>Use the basic guidelines required to manage conflicts.</li> <li>Practice the best stress and time management practices.</li> </ul>		
<b>Course Outcome:</b> <b>After successful completion of the course, students will able to:</b> CO1: Apply emotional intelligence in real life scenarios. CO2: Apply the best practices of communicative writing. CO3: Identify the best practices to manage stress and to identify time management techniques. CO4: Recognize the best practices to manage conflicts and to share and receive feedback. CO5: Describe the attributes needed to function and grow in a corporate environment		
<b>Course Contents</b>		
<b>UNIT-I</b>	<b>Communicative Writing</b>	<b>4 Hours</b>
Introduce the concept of Diversity in corporate environments through an activity. Discussion, role plays and sharing reference materials. Communicative Writing -Principles of Communicative Writing Formal and Business letters, create a business proposal to get funding to begin a start-up of their choice. Tell a story with charts and graphs.		
<b>UNIT-II</b>	<b>Emotional Intelligence &amp; CSR</b>	<b>4 Hours</b>
Introduce the concept of EI and give them the experience through a game/activity. Lead them to the concept of public speaking. Public speaking – best practices Get, Set, go – sell your start-up ideas- Presentation of Startup ideas to panel. Anubhav activities to be carried out. Introduction to CSR and why CSR is important. Attributes required for work and life - Qualities of a good team member:		
<b>UNIT-III</b>	<b>Personal Branding</b>	<b>4 Hours</b>

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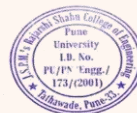
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Who am I? (Image Management. Building a perfect image) connect to importance of personal branding to stay relevant. Activity for applying Emotional Intelligence using scenarios within each start-up group. short session in which students will participate in at least 2 Anubhav Activities. awareness of multiple intelligences and learning styles in communication. Tips to receive and give feedback.		
UNIT-IV	Corporate Teams and Conflict Management	4 Hours
Understanding conflicts - tips to manage conflicts at work. Corporate etiquette. Business idioms and Corporate Terms. Download the TCS BizVocab on their smartphones.		
UNIT-V	Managing Stress	4 Hours
Introduction to stress management - discuss stress and its impact. The Long-term Effects of Stress. Create a poster with stress management tips to be presented in the next class and upload on their Fb/Insta pages. A list of stress management tips to be put up on the Fb/Insta page.		
UNIT-VI	Managing Time Effectively	4 Hours
Importance of Time Management for Better Life Style. Open house discussion, where the participants will share their challenges to manage time. Managing your time better - Time Squared Activity for better time management. Recap activity on the entire BCVS Course.		
Lab Contents		
Guidelines for Assessment		
1) Continuous assessment shall be based on experiments performed, submission of results of program in the form of report/journal, timely completion, attendance, understanding, efficient codes, punctuality and neatness. 2) Practical/Oral examination shall be based on the practical's performed in the lab. 3) Lab assessment of 25 marks shall be based on continuous assessment and performance in Practical/Oral examination		
List of Laboratory Assignments/Experiments		
1	Formal and Business letter writing	
2	Presentation to pitch their start-up idea to a panel consisting of external professors.	
3	Prepare and present CSR activity of Tata Steel, Microsoft, Google, TCS, Starbucks, Titan, Tata Chemicals and TOMS Shoes. (Any one company)	
4	Activity for applying Emotional Intelligence using scenarios within each start-up group – To be evaluated as per TCS guidelines.	
5	Presentation on Time /conflict/Stress management at work place.	
6	Project - The evaluation for this POC will be done as part of the Sem end assessment by the TCS team.	
Text Books:		
There are no prescribed texts for Semester 6 – there will be handouts and reference links shared.		
Reference Books:		
R1.Emotional Intelligence: Why it Can Matter More Than IQ by Daniel Goleman		
R2.Putting Emotional Intelligence to Work by Ryback David.		
R3.How to Develop Self Confidence and Improve Public Speaking - Time - Tested Methods of Persuasion by Dale Carnegie		
R4.TED Talks: The official TED guide to public speaking: Tips and tricks for giving unforgettable speeches and presentations		

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**T. Y. B. Tech (Computer Engineering)**  
**Academic Year – 2022-2023 Semester -V**  
**[CS3106]: DESIGN THINKING**

<b>Teaching Scheme:</b> <b>TUT: - 1 Hours/Week</b>	<b>Credit</b> <b>TW:1</b>	<b>Examination Scheme:</b> <b>Term Work : 25 Marks</b>
<b>Course Prerequisites :</b> Project Ideation and Intellectual Property Right [CS2112], Business Communication & Value Science III [HS2105]		
<b>Course Objective:</b> The course titled Innovation, Business Models and Entrepreneurship is designed to give an in-depth Understanding on Various aspects of Innovation, Creativity, evolving business models, incubation and entrepreneurship. Come up with exposure to design thinking for designing innovative products. The course is a blend of theory and practice therefore this course does not require any prerequisite and will be useful to understand innovation and its applications in different spheres of development and growth		
<b>Course Outcome:</b> <b>After successful completion of the course, students will able to:</b> <b>CO1 :</b> Make use of practical design thinking methods in every stage of problem with the help of method templates. <b>CO2 :</b> Apply design thinking to a problem in order to generate innovative and user-centric solutions. <b>CO3 :</b> Empathize with end user and initiate a new working culture based on user-centric approach. <b>CO4 :</b> Prototype and run usability tests for unbiased examination of the product in order to identify problem areas.		
<b>Course Contents</b>		
<b>UNIT-I</b>	<b>Introduction to Design Thinking</b>	<b>05 Hours</b>
Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry.		
<b>UNIT-II</b>	<b>Design thinking</b>	<b>05 Hours</b>
Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brain storming, product development.		
<b>UNIT-III</b>	<b>Innovation</b>	<b>05 Hours</b>
Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations. Creativity to Innovation. Teams for innovation, Measuring the impact and value of creativity. Product Design: problem formation, introduction to product design, Product strategies,		

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H.O.D, Computer

Dr. R B. Joshi  
Dean Academics

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Director RSCOE, Pune

Product value, Product planning, product specifications.		
<b>UNIT-IV</b>	<b>Design thinking for strategic Innovation</b>	<b>05 Hours</b>
An exercise in design thinking – implementing design thinking for better process. Implement design thinking process in various Industries. Design thinking for Startups.		
<b>UNIT-V</b>	<b>Design thinking in various sectors</b>	<b>05 Hours</b>
Case studies in Information Technology, Finance, Education, Management and Retail sector. Analyze and Prototyping, Usability testing, Organizing and interpreting results.		
<b>Text Books:</b> T1. Change by design, Tim Brown, Harper Bollins (2009) T2. Design Thinking in the Class Room by David Lee, Ulysses press		
<b>Reference Books:</b> R1. Design the Future , by Shrrutin N Shetty , Norton Press R2. Universal principles of design- William lidwell, kritina holden, Jill butter. R3. The era of open innovation – chesbrough.H R4. Product Design and Manufacturing by A.K. Chitale and R.C. Gupta, Prentice Hall  <b>Web References:</b> <a href="https://drive.google.com/file/d/1cplqb1eOWnoNMhFWNP8TyYLF2qHdGY_K/view">https://drive.google.com/file/d/1cplqb1eOWnoNMhFWNP8TyYLF2qHdGY_K/view</a> <a href="https://nptel.ac.in/courses/110/106/110106124/#">https://nptel.ac.in/courses/110/106/110106124/#</a>		

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Director RSCOE, Pune





**T. Y. B. Tech (Computer Engineering)**  
**Academic Year – 2022-2023 Semester -V**  
**[CS3107]: Engineering Design & Innovation III**

<b>Teaching Scheme:</b> <b>Tut: 01 Hour/Week</b> <b>PR: 02 Hours/Week</b>	<b>Credit</b> <b>TW: 1</b> <b>PR: 2</b>	<b>Examination Scheme:</b> <b>Term Work : 25 Marks</b>  <b>Lab Evaluation : 25Marks</b>
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**Course Prerequisites :** Engineering Design & Innovation (CS2106 )

**Course Objective:**

The primary objective of this project-based learning course is to develop critical thinking and problem-solving skills by exploring and proposing solutions to current computer engineering problems in the real world. This course will help students begin to identify themselves as computer engineers and prepare them for opportunities for their undergraduate studies.

**Course Outcome:**

**After successful completion of the course, students will able to:**

**CO1:** Implement system.

**CO2:** Test implemented part of system.

**CO3:** Evaluate the system

**Tutors Role in Project Based Learning**

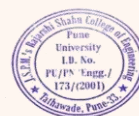
1. The fundamentals of problem based learning, lies with the Tutors role.
2. Tutors are not the source of solutions rather they act as the facilitator and mentor.
3. The facilitator skills of the Tutors / Teacher are central to the success of PBL.
4. Students are not used to the constructivist approach to learning, it is important that they are carefully told what to expect in PBL.
5. Tutors need to explain the differences between PBL and traditional learning.
6. Tutors need to explain the principals involved and role of the students in PBL learning.

**Students Role in Project Based Learning**

1. Prepare students for Prepare students for PBL before starting the sessions.
2. Students must have ability to enhance the task/idea .they should not be mere imitators.
3. They must learn to think.
4. Students working in EDI must be responsible for their own learning.
5. Throughout the PBL process, students have to define and analyze the problem, generate learning issues and apply what they have learned to solve the problem and act for them-selves and be free.
6. Students must quickly learn how to manage their own learning, Instead of passively receiving instruction.
7. Students in EDI are actively constructing their knowledge and understanding of the situation in groups.

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8. Students in EDI are expected to work in groups.
9. They have to develop interpersonal and group process skills, such as effective listening or coping creatively with conflicts.

### Guidelines for Assessment

EDI require regular mentoring by faculty throughout the semester for successful completion of the idea/project tasks selected by the students per batch. EDI is monitored and continuous assessment is done by supervisor /mentor and authorities. It is recommended that all activities should to be recorded regularly, regular assessment of work need to be done and proper documents need to be maintained at college end by both students as well as mentor (EDI work book). EDI is an integral part of the EDI. Continuous Assessment Sheet (CAS) is to be maintained by all mentors Recommended parameters for assessment, evaluation and weightage:

- Outcomes of PBL/ Problem Solving Skills/ Solution provided/ Final product (60%) (Individual assessment and team assessment)
- Documentation (Gathering requirements/ design & modeling/ implementation/execution, use of technology and final report, other documents) (20%)
- Demonstration (Presentation, User Interface, Usability etc) (20%)

As a part of the progress report of EDI, the candidate shall deliver a presentation on the advancement in Technology pertaining to the selected project topic. PBL workbook will serve the purpose and facilitate the job of students, mentor and project coordinator. This workbook will reflect accountability, punctuality, technical writing ability and work flow of the work undertaken. During university examination Internal examiner (preferably the guide) and External examiners jointly, evaluate the project work. The student shall submit the duly certified progress report of project in standard format for satisfactory completion of the work by the concerned guide and head of the Department/Institute. Project Exam will be conducted at end of semester.

### Project Assignments

1	Determine , dissect, and estimate the parameters, required in the solution.
2	Implement the system with existing algorithms
3	Perform system testing.
4	Evaluate the solution by considering the standard data / Objective function and by using appropriate performance metrics
5	Submit a Progress Report on work done.

#### Text Books:

- T1.** A new model of problem based learning. By Terry Barrett. All Ireland Society for higher education (AISHE). ISBN:978-0-9935254-6-9; 2017
- T2.** Problem Based Learning. By Mahnazmoallem, woei hung and Nada Dabbagh, Wiley Publishers. 2019.
- T3.** Stem Project based learning and integrated science, Technology, Engineering and mathematics approach. By Robert Capraro, Mary Margaret Capraro
- T4.** Hassan Gomaa, "Software Modeling and Design- UML, Use cases, Patterns and Software Architectures" Cambridge University Press, 2011, ISBN 978-0-521-76414-8.

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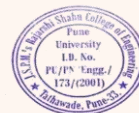
- R1.**De Graaff E, Kolmos A., red.: Management of change: Implementation of problem-based and project-based learning in engineering. Rotterdam: Sense Publishers. 2007.
- R2.**Gopalan,” Project management core text book”, 2 Indian Edition
- R3.**James Shore and Shane Warden, “ The Art of Agile Development”
- R4.**Gardy Booch, James Rambaugh, Ivar Jacobson,”The unified modeling language user guide” , Pearson Education, Second edition, 2008, ISBN 0-321-24562-8.
- R5.**Mason, Peter & Wright, Pamela & Luu, Hoat. (2008). Writing and Publishing a Scientific Paper. 10.13140/2.1.4010.0480.

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Dr. S V Kedar  
H.O.D, Computer

*R B Joshi*

Dr. R B. Joshi  
Dean Academics



*R K Jain*

Dr. R. K. Jain  
Director RSCOE, Pune

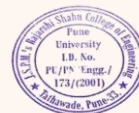
# Semester VI

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H.O.D, Computer

*R B Joshi*

Dr. R B. Joshi  
Dean Academics



*R K Jain*

Dr. R. K. Jain  
Director RSCOE, Pune



**T. Y. B. Tech (Computer Engineering)**  
**Academic Year – 2022-2023 Semester -VI**  
**[CS3105]: Cloud Microservices & Application**

<b>Teaching Scheme:</b> <b>TH: - 3 Hours/Week</b>	<b>Credit</b> <b>TH: 03</b>	<b>Examination Scheme:</b> <b>In Sem. Evaluation: 15 Marks</b> <b>Mid Sem. Exam : 25 Marks</b> <b>End Sem. Exam : 60 Marks</b>
<b>Course Prerequisites :</b> Object Oriented Programming [CS2102]		
<b>Course Objective:</b> <ul style="list-style-type: none"> <li>How to design applications for cloud.</li> <li>Develop applications using various services.</li> <li>Deploy Applications on cloud by using cloud native services.</li> </ul>		
<b>Course Outcome:</b> <b>After successful completion of the course, students will able to:</b> <b>CO1:</b> Understand the evolution of cloud computing paradigm and its architecture. <b>CO2:</b> Explain and characterize different cloud deployment models and service models. <b>CO3:</b> Identify the technological drivers of cloud computing paradigm. <b>CO4:</b> Identify the security issues in cloud computing.		
<b>Course Contents</b>		
<b>UNIT-I</b>	<b>Cloud Fundamentals</b>	<b>9 Hours</b>
Introduction to Enterprise Software, multi-user interface like ERP or CRM and works on basis of shared data or transactional data (like an HR system where employee data is circulated via multiple departments), Cloud Service Components, Cloud service/Deployment Models. Cloud components Guiding Principle with respect to utilization/Security/Pricing. and the applications of Cloud. Public Cloud Platforms overview and their usage. Test1.		
<b>UNIT-II</b>	<b>Application architectures</b>	<b>9 Hours</b>
Monolithic & Distributed, Microservice fundamental and design approach, Cloud Native applications- 12 Factors App. Application integration process/Amplification Process, API Fundamental. Microservice /API management, Spring boot Fundamental and design of microservice, API tools. Developer Portal. Applications of Microservice and APIFICATION., Test2.		
<b>UNIT-III</b>	<b>Devops fundamentals</b>	<b>8 Hours</b>
Devops Tools and their usage in cloud application development. Docker and Containerization Process. Tools and Applications, Containerization Process and application. Test 3.		
<b>UNIT-IV</b>	<b>AWS</b>	<b>6 Hours</b>
Overview, AWS, Use cases for cloud application development, EC2, SimpleDB, S3, Simple Queue, Simple Relational Database, Elastic MapReduce, Virtual Amazon Cloud. S3 Command Line tool		
<b>UNIT-V</b>	<b>Cloud Application development</b>	<b>6 Hours</b>
Cloud Application development/Deployment/Execution steps. Design and developing solution steps using containers-containerization of application and deployment using Kubernetes, Projects use cases covering this.		
<b>UNIT-VI</b>	<b>Security Aspects</b>	<b>6 Hours</b>
Data Security, Virtualization Security, Network Security Platform Related Security Security Issues in		

Cloud Service Models, Software-as-a-Service Security Issues, Platform-as-a-Service Security Issues, Infrastructure-as-a-Service Security Issues ,Cloud Security and Monitoring Tools.

**Text Books:**

**T1.** Fundamentals of cloud application development Siddhartha Gupta | Soumya Chatterjee |Ashok Mishra | Siddhartha Ghoshal | Rohit Malik | Ankan Ganguly | Jasvinder Singh Bhatia | Ganesh Baviskar | Sandeep Sadhukhan | Avijit Das | Sumedh Waikar

**T2.** K. Chandrasekaran, Essentials of Cloud Computing, CRC Press, 2015

**Reference Books:**

**R1.** Barrie Sosinsky, Cloud Computing Bible, Wiley-India, 2010

**R2.** RajkumarBuyya, James Broberg, Andrzej M. Goscinski, Cloud Computing: Principles and Paradigms, Wiley, 2011

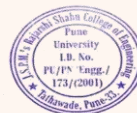
**R3.** Nikos Antonopoulos, Lee Gillam, Cloud Computing: Principles, Systems and Applications, Springer, 2012

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Dr. S V Kedar  
H.O.D, Computer

*R B Joshi*

Dr. R B. Joshi  
Dean Academics



*R K Jain*

Dr. R. K. Jain  
Director RSCOE, Pune





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**T. Y. B. Tech (Computer Engineering)**  
**Academic Year – 2022-2023 Semester -VI**  
**[CS3113]: Internet of Things**

<b>Teaching Scheme:</b> <b>TH: - 3 Hours/Week</b>	<b>Credit</b> <b>TH: 3</b>	<b>Examination Scheme:</b> <b>In Sem. Evaluation: 15 Marks</b> <b>Mid Sem. Exam: 25 Marks</b> <b>End Sem. Exam: 60 Marks</b>
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**Course Prerequisites:** Fundamentals of Computer Programming [CS1103], Principles of Electronics Engineering [EC1102] and Computer Networks [CS3102].

**Course Objective:**

- To understand fundamentals of Embedded System and IoT basic design strategy and process modeling.
- To introduce students to a set of advanced topics in IoT and lead them to understand research in networks.
- To understand fundamentals of security in IoT.
- To develop a comprehensive approach towards building small low cost embedded IoT systems.
- To understand fundamentals of IoT physical server and cloud.

**Course Outcome:**

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

**CO 1:** Summarize the basic concepts of Embedded System and IoT.

**CO 2:** Design implementation procedure for IoT application.

**CO 3:** Illustrate interfacing of different techniques supporting IoT.

**CO 4:** Study different protocols and security aspects of IoT.

**CO 5:** Apply the design concept of IoT application in various domains.

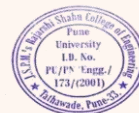
**CO 6:** Illustrate the concept of IoT physical servers and cloud.

**Course Contents**

<b>UNIT-I</b>	<b>Introduction to Embedded System and Internet of Things</b>	<b>07 Hours</b>
Embedded Systems: Application Domain and Characteristic of Embedded System, Real time systems and Real time scheduling. Introduction to Internet of Things, Defining IoT, Characteristics of IoT, Functional blocks of IoT, Physical design of IoT, Logical design of IoT, Communication models & APIs, IoT levels and deployment templates.		
<b>UNIT-II</b>	<b>IoT Design Methodology</b>	<b>06 Hours</b>
Purpose and requirement specification, Process specification, Domain model specification, information model specification, Service specifications, IoT level specification, Functional view specification, Operational view specification, Device and component integration, Application development.		
<b>UNIT-III</b>	<b>IoT &amp; M2M</b>	<b>07 Hours</b>

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M2M: The internet of devices, RFID: The internet of objects, WSN: The internet of transducer, SCADA: The internet of controllers, DCM: Device, Connect and Manage, Device: Things that talk, IoT Physical Devices and Endpoints: Basic building blocks of and IoT device, Exemplary device: Raspberry Pi, Raspberry Pi interfaces, Programming Raspberry Pi with Python, Other IoT Devices.

<b>UNIT-IV</b>	<b>IoT Protocol Standardization and Security</b>	<b>07 Hours</b>
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Protocol Standardization for IoT, SCADA and RFID Protocols, Unified Data Standards, Protocols – IEEE 802.15.4, BACNet Protocol, Modbus, KNX, Zigbee Architecture, Network layer. IoT Security: Vulnerabilities of IoT, Security Requirements, Challenges for Secure IoT, Threat Modeling, Key elements of IoT Security: Identity establishment, Access control, Security model for IoT.

<b>UNIT-V</b>	<b>Domain specific applications of IoT</b>	<b>06 Hours</b>
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Home automation, Industry applications, Surveillance applications, Agriculture, Industry, Home Intrusion Detection, Weather Monitoring System, Air Pollution Monitoring, Smart Irrigation. Other IoT Applications.

<b>UNIT-VI</b>	<b>IoT Physical Servers and Cloud Offerings</b>	<b>07 Hours</b>
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Introduction to cloud storage models Models and Communication API's, WAMP - AutoBahn for IoT, Xively cloud for IoT, Python web application framework – Django, Designing a RESTful web API, Amazon web service for IoT, SkyNet IoT Messaging Platform.

#### Text Books:

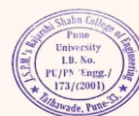
- T1.** Arshdeep Bahga, Vijay Madisetti, — Internet of Things– A hands -on approach, Universities Press, ISBN: 0: 0996025510, 13:978-0996025515.
- T2.** Honbo Zhou, —The Internet of Things in the Cloud: A Middleware Perspective, CRC Press, 2012. ISBN: 9781439892992.
- T3.** Lyla B. Das, “Embedded Systems: An Integrated Approach” Pearson , ISBN: 9332511675, 9789332511675.

#### Reference Books:

- R1.** Olivier Hersent, David Boswarthick, Omar Elloumi, —The Internet of Things – Key applications and Protocols, Wiley, 2012, ISBN:978-1-119-99435-0.
- R2.** Adrian McEwen, Hakim Cassimally, — Designing the Internet of Things, Wiley, 2014, ISBN: 978-1-118-43063-7.

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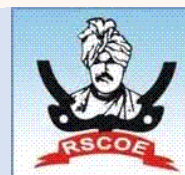


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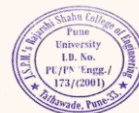


**T. Y. B. Tech (Computer Engineering)**  
**Academic Year – 2022-2023 Semester -VI**  
**[CS3109]: Compiler Design**

<b>Teaching Scheme:</b> <b>TH: - 3 Hours/Week</b> <b>PR: - 2 Hours/Week</b>	<b>Credit</b> <b>TH: 3</b> <b>PR: 1</b>	<b>Examination Scheme:</b> <b>In Sem. Evaluation: 15 Marks</b> <b>Mid Sem. Exam : 25 Marks</b> <b>End Sem. Exam : 60 Marks</b> <b>Lab Evaluation : 25 Marks</b>
<b>Course Prerequisites :</b> Discrete mathematics [ES1108], Formal language & Automata theory [CS2101]		
<b>Course Objective:</b> <ul style="list-style-type: none"> <li>To learn and understand the design of a compiler</li> <li>To learn and use tools for construction of a compiler.</li> </ul>		
<b>Course Outcome:</b> <b>After successful completion of the course, students will able to:</b> <b>CO 1:</b> Analyse lexical structure of language and Design Lexical analyzer for given language using tools. <b>CO 2:</b> Analyse syntactic structure of language and Design syntax analyzer for given language using tools. <b>CO 3:</b> Analyse semantic structure of language and implement symbol table. <b>CO 4:</b> Describe techniques for intermediate code and machine code optimisation. <b>CO 5:</b> Design the structures and support required for compiling advanced language features.		
<b>Course Contents</b>		
<b>UNIT-I</b>	<b>Lexical Analysis</b>	<b>07 Hours</b>
<b>Introduction:</b> Phases of compilation and overview. Lexical Analysis (scanner): Regular languages, finite automata, regular expressions, relating regular expressions and finite automata, scanner generator (lex, flex)		
<b>UNIT-II</b>	<b>Syntax Analysis</b>	<b>08 Hours</b>
<b>Syntax Analysis (Parser):</b> Context-free languages and grammars, Error-Recovery Strategies, push-down automata, LL(1) grammars and top-down parsing, operator grammars, LR(O), SLR(1), LR(1), LALR(1) grammars and bottom-up parsing, ambiguity and LR parsing, LALR(1) parser generator (yacc, bison)		
<b>UNIT-III</b>	<b>Semantic Analysis &amp; Symbol Table</b>	<b>08 Hours</b>
<b>Semantic Analysis:</b> Attribute grammars, syntax directed definition, evaluation and flow of attribute in a syntax tree, Introduction to Type Systems, Type Checking and Conversion.  <b>Symbol Table:</b> Basic structure, symbol attributes and management. Run-time environment: Procedure activation, parameter passing, value return, memory allocation, scope.		
<b>UNIT-IV</b>	<b>Intermediate Code Generation</b>	<b>08 Hours</b>

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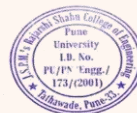
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<b>Intermediate Code Generation:</b> Translation of different language features, different types of intermediate forms. Declarations, assignment statements, iterative statements, case statements, arrays, structures, conditional statements, Boolean expressions, back patching, procedure calls, Intermediate code generation using YACC.		
<b>UNIT-V</b>	<b>Code Optimization</b>	<b>07 Hours</b>
<b>Code Improvement (optimization):</b> control-flow, data-flow dependence etc.; local optimization, global optimization, loop optimization, peep-hole optimization etc.  Optimizing transformations: compile time evaluation, Common sub-expression elimination, variable propagation, code movement, strength reduction, dead code elimination and loop optimization		
<b>UNIT-VI</b>	<b>Code Generation &amp; Advanced topics</b>	<b>07 Hours</b>
<b>Architecture dependent code improvement:</b> instruction scheduling (for pipeline), loop optimization (for cache memory) etc. Register allocation and target code generation.  <b>Advanced topics:</b> Type systems, data abstraction, compilation of Object-Oriented features and non-imperative programming languages.		
<b>Lab Contents</b>		
<b>Guidelines for Assessment</b>		
1) Continuous assessment shall be based on experiments performed, submission of results of program in the form of report/journal, timely completion, attendance ,understanding, efficient codes, punctuality and neatness. 2) Practical/Oral examination shall be based on the practical’s performed in the lab. 3) Lab assessment of 25 marks shall be based on continuous assessment and performance in Practical/Oral examination		
<b>List of Laboratory Assignments/Experiments</b>		
1	Write a program to count number of lines, tabs, spaces, words, characters from a given text file.	
2	Implement the Lexical analyzer for the given language. The lexical analyzer should ignore redundant spaces, tabs and new lines. It should also ignore comments. Although the syntax specification states that identifiers can be arbitrarily long, you may restrict the length to some reasonable value.	
3	Write a program for syntax checking of subset of given language using LEX and YACC.	
4	Write a program for syntax checking of control statements using LEX and YACC.	
5	Write a program to check syntax of declaration statement using LEX and YACC.	
6	Implement a desk calculator using LEX and YACC.	
7	Write a program to generate ICG using LEX and YACC.	
8	Write a program for code optimization.	
9	Write a program for code generation.	
<b>Text Books:</b> <b>T1.</b> A.V. Aho, R. Sethi, J D Ullman, "Compilers: Principles, Techniques, and Tools", Pearson Education, ISBN 81 - 7758 - 590 - 8. <b>T2.</b> D. M. Dhamdhare, “Compiler Construction: Principles and Practice”, Macmillan India, 1983. <b>T3.</b> J. R. Levine, T. Mason, D. Brown, "Lex & Yacc", O'Reilly, 2000, ISBN 81-7366-061-X.		
<b>Reference Books:</b> <b>R1.</b> Bjarne Stroustrup, " The Design and Evolution of C++", Addison-Wesley, ISBN 0-201-54330-3. <b>R2.</b> S. Chattopadhyay, "Compiler Design", Prentice-Hall of India, 2005, ISBN 81-203-2725-X.		

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Dr. S V Kedar  
H.O.D, Computer

Dr. R B. Joshi  
Dean Academics

Dr. R. K. Jain  
Director RSCOE, Pune

**R3.** K. Louden, "Compiler Construction: Principles and Practice", Cengage Learning, ISBN 978-81-315-0132-0.

**R4.** K. Cooper, L. Torczon, "Engineering a Compiler", Morgan Kaufmann Publishers, ISBN 81-8147-369-8.

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Dr. S V Kedar  
H.O.D, Computer

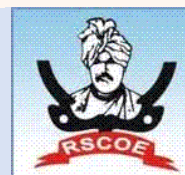
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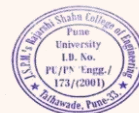


**T. Y. B. Tech (Computer Engineering)**  
**Academic Year – 2022-2023 Semester -VI**  
**Elective III: [CS3110A]: Data Mining**

<b>Teaching Scheme:</b> <b>TH: - 3 Hours/Week</b> <b>PR: - 2 Hours/Week</b>	<b>Credit</b> <b>TH: 3</b> <b>PR: 1</b>	<b>Examination Scheme:</b> <b>In Sem. Evaluation: 15 Marks</b> <b>Mid Sem. Exam : 25 Marks</b> <b>End Sem. Exam : 60 Marks</b> <b>Lab Evaluation : 25 Marks</b>
<b>Course Prerequisites :</b> Computational Statistics [CS2104]		
<b>Course Objective:</b> <ul style="list-style-type: none"> <li>Understand basic concepts and techniques of Data Mining.</li> <li>Develop skills of using data mining software for solving practical problems.</li> <li>Understand and apply several statistical analysis techniques: regression, ANOVA, data reduction.</li> </ul>		
<b>Course Outcome:</b> <b>After successful completion of the course, students will able to:</b> <b>CO1:</b> Explain basic concepts and techniques of Data Mining. <b>CO2:</b> Apply data mining software for solving practical problems. <b>CO3:</b> Explain and apply Descriptive analytics and Forecasting models for solving practical problems. <b>CO4:</b> Explain and apply Linear and non linear models. <b>CO5:</b> Explain and apply Time series models and Prescriptive analytics.		
<b>Course Contents</b>		
<b>UNIT-I</b>	<b>Introduction to Data Mining</b>	<b>7 Hours</b>
<b>Introduction to Data Mining:</b> What is data mining? Related technologies - Machine Learning, DBMS, OLAP, Statistics, Stages of the Data Mining Process, Data Mining Techniques, Knowledge Representation Methods, Applications		
<b>UNIT-II</b>	<b>Data Preprocessing and knowledge representation</b>	<b>7 Hours</b>
<b>Data preprocessing:</b> Data cleaning, Data transformation, Data reduction, Discretization and generating concept hierarchies, Installing Weka 3 Data Mining System, Experiments with Weka - filters, discretization <b>Data mining knowledge representation:</b> Task relevant data, Background knowledge, Representing input data and output knowledge, Visualization techniques <b>Attribute-oriented analysis:</b> Attribute generalization, Attribute relevance, Class comparison, Statistical measures.		
<b>UNIT-III</b>	<b>Data Mining Algorithms</b>	<b>7 Hours</b>
<b>Data mining algorithms - Association rules:</b> Motivation and terminology, Example: mining weather data, Basic idea: item sets, Generating item sets and rules efficiently, Correlation analysis <b>Data mining algorithms - Classification:</b> Basic learning/mining tasks, Inferring rudimentary rules: 1R, algorithm, Decision trees, covering rules		

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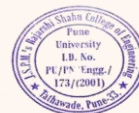
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<b>Data mining algorithms</b> – Prediction: The prediction task, Statistical (Bayesian) classification, Bayesian networks, Instance-based methods (nearest neighbor), linear models.		
<b>UNIT-IV</b>	<b>Descriptive analytics and Forecasting</b>	<b>7 Hours</b>
<b>Descriptive analytics:</b> Data Modeling, Trend Analysis, Simple Linear Regression Analysis <b>Forecasting models:</b> Heuristic methods, predictive modeling and pattern discovery, Logistic Regression: Logit transform, ML estimation, Tests of hypotheses, Wald test, LR test, score test, test for overall regression, multiple logistic regression, forward, backward method, interpretation of parameters, relation with categorical data analysis. Interpreting Regression Models, Implementing Predictive Models.		
<b>UNIT-V</b>	<b>Linear and Non Linear models</b>	<b>7 Hours</b>
<b>Generalized Linear model:</b> link functions such as Poisson, binomial, inverse binomial, inverse Gaussian, Gamma. <b>Non Linear Regression (NLS):</b> Linearization transforms, their uses & limitations, examination of non-linearity, initial estimates, iterative procedures for NLS, grid search, Newton-Raphson, steepest descent, Marquardt's methods. Introduction to semiparametric regression models, additive regression models. Introduction to nonparametric regression methods.		
<b>UNIT-VI</b>	<b>Time series models and Prescriptive analytics</b>	<b>7 Hours</b>
<b>Time Series Analysis: Auto</b> - Covariance, Auto-correlation and their properties. Exploratory time series analysis, Test for trend and seasonality, Exponential and moving average smoothing, Holt – Winter smoothing, forecasting based on smoothing <b>Linear time series models:</b> Autoregressive, Moving Average, Autoregressive Moving Average and Autoregressive Integrated Moving Average models; Estimation of ARMA models such as Yule-Walker estimation for AR Processes, Maximum likelihood and least squares estimation for ARMA Processes, Forecasting using ARIMA models <b>Prescriptive Analytics:</b> Mathematical optimization, Networks modeling-Multi-objective optimization-Stochastic modeling, Decision and Risk analysis, Decision trees.		
<b>Lab Contents</b>		
<b>Guidelines for Assessment</b>		
1) Continuous assessment shall be based on experiments performed, submission of results of program in the form of report/journal, timely completion, attendance ,understanding, efficient codes, punctuality and neatness. 2) Practical/Oral examination shall be based on the practical's performed in the lab. 3) Lab assessment of 25 marks shall be based on continuous assessment and performance in Practical/Oral examination		
<b>List of Laboratory Assignments</b>		
1	For an organization of your choice, choose a set of business processes. Design star / snow flake schemas for analyzing these processes. Create a fact constellation schema by combining them. Extract data from different data sources, apply suitable transformations and load into destination tables using an ETL tool.	
2	Trip History Analysis: Use trip history dataset that is from a bike sharing service in the United States. The data is provided quarter-wise from 2010 (Q4) onwards. Each file has 7 columns. Predict the class of user.	
3	Consider a suitable text dataset. Remove stop words, apply stemming and feature selection techniques to represent documents as vectors. Classify documents and evaluate precision, recall.	

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4	Apply a-priori algorithm to find frequently occurring items from given data and generate strong association rules using support and confidence thresholds.
5	Download Boston Housing dataset. Create a Model using linear regression to predict the houses price.
6	Predict the number of bicycle trips across Seattle's Fremont Bridge based on weather, season, and other factors and also Figure out what we can learn about people in Seattle from hourly commute data. (The daily or hourly bicycle counts can be downloaded from <a href="http://data.seattle.gov/">http://data.seattle.gov/</a> )
7	Apply ARIMA model to perform time series analysis on COVID- India Datasr from Kaggle.
8	Mini-Project Base on Data Mining and analytics

#### Text Books:

- T1.** Jiawei Han and Micheline Kamber, “Data Mining: Concepts and Techniques”, Morgan Kaufmann Publishers, 3<sup>rd</sup> ed, 2010.
- T2.** Lior Rokach and Oded Maimon, “Data Mining and Knowledge Discovery Handbook”, Springer, 2<sup>nd</sup> edition, 2010.
- T3.** Box, G.E.P and Jenkins G.M. (1970) Time Series Analysis, Forecasting and Control, Holden-Day.

#### Reference Books:

- R1.** Draper, N. R. and Smith, H. (1998), "Applied Regression Analysis", John Wiley, Third Edition.
- R2.** Hosmer, D. W. and Lemeshow, S. (1989), "Applied Logistic Regression", Wiley.

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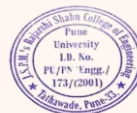


**T. Y. B. Tech (Computer Engineering)**  
**Academic Year – 2022-2023 Semester -VI**  
**Elective III: [CS3110B]: Information Security**

<b>Teaching Scheme:</b> <b>TH: 03 Hours/Week</b> <b>PR: 02 Hours/Week</b>	<b>Credit</b> <b>TH: 03</b> <b>PR: 01</b>	<b>Examination Scheme:</b> <b>In Sem. Evaluation: 15 Marks</b> <b>Mid Sem. Exam : 25 Marks</b> <b>End Sem. Exam : 60 Marks</b> <b>Lab Evaluation : 25 Marks</b>
<b>Course Prerequisites :</b> Operating System [CS2108], Computer Network [CS3102]		
<b>Course Objective:</b> To understand concept of Security Parameters and Security Policies, Access Control models and Operating System & Database Security.		
<b>Course Outcome:</b> <b>After successful completion of the course, students will able to:</b> <b>CO 1:</b> Comprehend basic concepts of Security Parameters and Security Policies. <b>CO 2:</b> Illustrate concepts of Access Control models. <b>CO 3:</b> Comprehend concept of Systems Design and Logic-based System. <b>CO 4:</b> Illustrate concepts of Operating System and Database Security.		
<b>Course Contents</b>		
<b>UNIT-I</b>	<b>Overview of Security Parameters</b>	<b>7 Hours</b>
Confidentiality, integrity and availability, Security violation and threats, Security policy and procedure; Assumptions and Trust; Security Assurance, Implementation and Operational Issues; Security Life Cycle.		
<b>UNIT-II</b>	<b>Access Control Models</b>	<b>7 Hours</b>
Discretionary, mandatory, roll-based and task-based models, unified models, access control algebra, temporal and spatio-temporal models.		
<b>UNIT-III</b>	<b>Security Policies</b>	<b>7 Hours</b>
Confidentiality policies, integrity policies, hybrid policies, non-interference and policy composition, international standards.		
<b>UNIT-IV</b>	<b>Systems Design</b>	<b>7 Hours</b>
Design principles, representing identity, control of access and information flow, confinement problem. Assurance: Building systems with assurance, formal methods, evaluating systems.		
<b>UNIT-V</b>	<b>Logic-based System</b>	<b>7 Hours</b>
Malicious logic, vulnerability analysis, auditing, intrusion detection. Applications: Network security, operating system security, user security, program security. Special Topics: Data privacy, introduction to digital forensics, enterprise security specification.		
<b>UNIT-VI</b>	<b>Operating Systems and Database Security</b>	<b>7 Hours</b>

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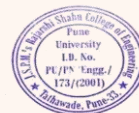
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Operating Systems Security Architecture, Analysis of Security in Linux/Windows. Database Security Architecture, Enterprise security, Database auditing.	
<b>Lab Contents</b>	
<b>Guidelines for Assessment</b>	
1) Continuous assessment shall be based on experiments performed, submission of results of program in the form of report/journal, timely completion, attendance, understanding, efficient codes, punctuality and neatness. 2) Practical/Oral examination shall be based on the practical's performed in the lab. 3) Lab assessment of 25 marks shall be based on continuous assessment and performance in Practical/Oral examination	
<b>List of Laboratory Assignments/Experiments</b>	
1	Write a Program to perform Confidentiality, integrity and availability.
2	Write a Program to create Brute force attack.
3	Write a Program to create Dictionary attack.
4	Write a Program to create Cryptanalytic attack.
5	Write a Program to Create an instant messaging account and encrypt a message.
6	Write a Program to Convert a text message to hex (Bless Hex Editor).
7	Write a Program to Encrypt message using key.
8	Write a Program to decryption messages using key.
<b>Text Books:</b> <b>T1.</b> <i>Security Engineering</i> , Ross Anderson <b>T2.</b> <i>Computer Security: Art and Science</i> , M. Bishop, Pearson Education. <b>T3.</b> <i>Information Security: Principles and Practice</i> , M. Stamp.	
<b>Reference Books:</b> <b>R1.</b> <i>Security in Computing</i> , C.P. P fleeger, S.L. P fleeger, J. Margulies <b>R2.</b> <i>Secure Programming HOWTO</i> , David Wheeler. <b>R3.</b> <i>Browser Security Handbook</i> , Michael Zalewski. <b>R4.</b> <i>Handbook of Database Security</i> , M. Gertz, S. Jajodia.	

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**T. Y. B. Tech (Computer Engineering)**  
**Academic Year – 2022-2023 Semester -VI**

**Elective III: [CS3110C] Industrial Robotics**

<b>Teaching Scheme:</b> <b>TH: - 4 Hours/Week</b> <b>PR: - 2 Hours/Week</b>	<b>Credit</b> <b>TH: 4</b> <b>PR: 1</b>	<b>Examination Scheme:</b> <b>In Sem. Evaluation: 15 Marks</b> <b>Mid Sem. Exam: 25 Marks</b> <b>End Sem. Exam: 60 Marks</b> <b>Lab Evaluation: 25 Marks</b>
<b>Course Prerequisites:</b> Discrete Mathematics [ES1108], Data Structure and Algorithm [CS1104], Artificial Intelligence [CS3101].		
<b>Course Objective:</b> <ul style="list-style-type: none"> <li>To understand fundamentals of Robotics and their industrial applications.</li> <li>To understand essential technology of cognitive robotics.</li> <li>To acquire the knowledge of AI in the context of cognitive Robotics.</li> <li>To understand the basics of basics of Robotic operating system.</li> </ul>		
<b>Course Outcome:</b> After successful completion of the course, students will able to: <b>CO 1:</b> Summarize the basic concept of Robotics and their industrial application. <b>CO 2:</b> Summarize the basics of Robotics operating system. <b>CO 3:</b> Learn essential technologies for cognitive Robotics. <b>CO 4:</b> Ability to apply the knowledge of AI in Robotics. <b>CO 5:</b> Describe the application of Cloud Computing in Robotics. <b>CO 6:</b> Analyze the concept of Data Science and Big data in Robotics.		
<b>Course Contents</b>		
<b>UNIT-I</b>	<b>Introduction to Modern Day Robotics and their industrial applications</b>	<b>07 Hours</b>
Industry 4.0 Concept: Background and Overview-Industry 4.0 technologies: implementation patterns in manufacturing companies-Evolution of Industrial Robots and their Applications-Advancements in Robotics and Its Future Uses-Types of robotics in various fields for applications.		
<b>UNIT-II</b>	<b>Basics of Robotic operating System</b>	<b>07 Hours</b>
ROS for beginners an overview- Introduction to the Robot Operating System (ROS) Middleware - Secure communication for the Robot Operating System - An Introduction to Robot Operating System: The Ultimate Robot Application Framework by Adnan Quality of Service and Cyber security Communication Protocols -Analysis for the Robot Operating System Robotics systems communication- Threat modelling using ROS.		
<b>UNIT-III</b>	<b>Technologies essential for Cognitive Robotics</b>	<b>07 Hours</b>
Computer systems and Technologies relevant to modern day robotics-Robotic Process Automation: Overview of RPA and its applications-RPA, AI, and Cognitive Technologies for Leaders-Introduction to Robotics: Analysis, Control, Applications.		

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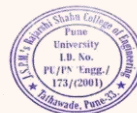
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UNIT-IV	AI in the context of Cognitive Robotics and Role of AI in Robotics	07 Hours
Foundation for Advanced Robotics and AI- A Concept for a Practical Robot Design Process- Demo to train A Robot Using AI - Deep learning core applications-Deep learning business applications. <b>Artificial Intelligence and Robotics</b> - The Review of Reliability Factors Related to Industrial Robots - Failure analysis of mature robots in automated production- Data Analytics for Predictive Maintenance of Industrial Robots - Failure Is an Option: How the Severity of Robot Errors Affects Human-Robot Interaction.		
UNIT-V	Concepts of Cloud computing, cloud platforms and it applications in Robotics	07 Hours
Learning Cloud Computing: Core Concepts - Cloud Computing: Private Cloud Platforms -Robot as a Service in Cloud Computing -Cloud Computing Technology and Its Application in Robot Control - A Comprehensive Survey of Recent Trends in Cloud.		
UNIT-VI	Data Science and Big Data in the context of Cognitive Robotics	07 Hours
Cognitive Technologies: The Next Step Up for Data and Analytics in robotics-Cognitive Deep Learning Technology for Big Data Cognitive Assistant Robots for Reducing Variability in Industrial Human-Robot Activities		
Lab Contents		
Guidelines for Assessment		
1) Continuous assessment shall be based on experiments performed, submission of results of program in the form of report/journal, timely completion, attendance, understanding, efficient codes, punctuality and neatness. 2) Practical/Oral examination shall be based on the practicals performed in the lab. 3) Lab assessment of 25 marks shall be based on continuous assessment and performance in Practical/Oral examination.		
List of Laboratory Assignments		
1	Study of configuration of robots and motion of robot manipulator.	
2	Demonstration of hydraulic actuators, accumulators and intensifiers	
3	Create interface for simulating Robot with 2 DOF and 3 DOF.	
4	Robot programming and simulation for pick and place.	
Text Books:		
T1. Saeed Benjamin Niku, “Introduction to Robotics: Analysis, Control, Applications”, Wiley Publishers, 2nd edition,2011.		
T2. Francis X. Govers,” Artificial Intelligence for Robotics: Build Intelligent Robots that Perform Human Tasks Using AI Techniques”, Packt publishing,2018.		
Reference Books:		
R1. Deb S.R., “Robotics”, Tata McGraw Hill Publications, New Delhi. ISBN 13: 9780070077911.		
R2. Yoram Koren, & quot; Robotics for Engineers", McGraw Hill Book Co. ISBN-10: 0070353999, ISBN-13: 978-0070353992.		
R3. Todd D.J., “Fundamentals of Robot Technology”, Wiley Publications, ISBN:978-0-470-20301-9		

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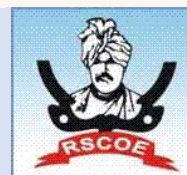
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**T. Y. B. Tech (Computer Engineering)**  
**Academic Year – 2022-2023 Semester -VI**  
**Elective IV: [HS3103A]: Industrial Psychology**

<b>Teaching Scheme:</b> <b>PR: -3 Hours/Week</b>	<b>Credit</b> <b>TH:3</b>	<b>Examination Scheme:</b> <b>In Sem. Evaluation:15 Marks</b> <b>Mid Sem. Exam : 25 Marks</b> <b>End Sem. Exam : 60 Marks</b>
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**Course Prerequisites: Basic Knowledge of English**

**Course Objectives:**

- To help students to understand the rationale behind positive psychology.
- To help students understand structure –functions and design of organizations.
- To make students understand the processes of group decision making and leadership functions in different organizations.
- To make students understand the individuals and groups in respect to patterns of social behavior and attitudes
- To help students gain insight into the dynamics of intergroup relationships, conflict, prejudice and cooperation.

**Course Outcome:**

**After successful completion of the course, students will able to:**

CO1: **Define** the basic concepts of psychology.

CO2: **Describe** the significance of social cognition, attitudes, stereotypes and prejudices in explaining human behavior in the social contexts.

CO3: **Understand** the significant aspects group behavior and social influence that constitute the core of human relationships.

CO4: **Explain** different concepts and dynamics related to organizational systems, behavior, and management.

CO5: **Identify** steps to motivate employees in the perspectives of the theories of work motivation.

CO6: **Discuss** the role of positive psychology in building effective professional relationships.

**Course Contents**

<b>UNIT-I</b>	<b>Basic Concepts in Psychology :</b>	<b>6 Hours</b>
Introduction to Psychology, Definitions of Psychology, Research Methods, Statistics, and Evidence-based Practice, Introduction & Legal Context of Industrial Psychology, Job Analysis & Competency Modelling, Job Evaluation & Compensation, Job Design & Employee Well-Being, Recruitment		
<b>UNIT-II</b>	<b>Psychological Testing</b>	<b>6 Hours</b>
Identifying Criteria & Validating Tests and Measures, Screening Methods, Intensive Methods,		
<b>UNIT-III</b>	<b>Organization &amp; Leadership</b>	<b>6 Hours</b>
Leadership- Definitions and functions, Organizational Climate, Culture, and Development, Teams in Organizations, The Organization of Work Behavior		

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<b>UNIT-IV</b>	<b>Social Behavior &amp; Motivation</b>	<b>6 Hours</b>
Pro-social behavior- Cooperation and helping, personal, situational and socio-cultural determinants, Theoretical explanations of pro-social behavior. Employee Motivation, Satisfaction and Commitment, Fairness and Diversity		
<b>UNIT-V</b>	<b>Performance Management</b>	<b>6 Hours</b>
Performance Goals and Feedback, Performance Coaching and Evaluation, Evaluating Employee Performance. Modern Methods of Performance evaluation.		
<b>UNIT-VI</b>	<b>Work Stress Management</b>	<b>6 Hours</b>
Stress – Definition, types – Eustress and Distress. Stress Management Techniques: Demands of Life and Work. Quality of work life. Work life balance.		
<b>Text Books:</b> <b>T1.</b> Landy, F. J. and Conte, J. M. (2013). Work in the 21st Century (4th Edition). Oxford: Blackwell Publishing <b>T2.</b> Robbins, S.P.; Timothy, A.J. & Vohra, N. (2012). Organizational Behavior, 15th Edn. Pearson Education: New Delhi		
<b>Reference Books:</b> <b>R1.</b> Essentials of understanding psychology, Feldman. S.R, Tata Mc Graw Hill. <b>R2.</b> Psychology, Baron, R.A and Misra, G. Pearson Education Ltd. <b>R3.</b> Greenberg, J. & Baron, R.A. (2007). Behavior in Organizations (9th Ed.). India: Dorling Kindersley.		

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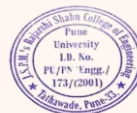


**T. Y. B. Tech (Computer Engineering)**  
**Academic Year – 2021-2022 Semester -VI**  
**Elective IV: [CS3111A]: Enterprise Systems**

<b>Teaching Scheme:</b> TH: -3 Hours/Week	<b>Credit</b> TH: 3	<b>Examination Scheme:</b> In Sem. Evaluation: 15 Marks Mid Sem. Exam : 25 Marks End Sem. Exam : 60 Marks
Course Prerequisites : Fundamentals of Management [HS3101]		
Course Objectives:		
Course Outcome: After successful completion of the course, students will be able to: <b>CO 1:</b> Design and deploy Simple Web Applications using MVC <b>CO 2:</b> Design SOA and ERP models <b>CO 3:</b> Design of CRM models <b>CO 4:</b> Design interactive network and application <b>CO 5:</b> Manage, Maintain and configuration of Networking		
<b>Course Contents</b>		
<b>UNIT-I</b>	<b>Introduction</b>	<b>7 Hours</b>
Overview of Database Management Systems. Service Oriented Architecture (SOA), Electronic Data Exchange, Overview of : MPLS, Hardware Architectures for Enterprise Systems Overview of Model - View - Control (MVC), Principles of loose coupling, encapsulation, Customer Relationship Management (CRM), Virtual Private Networks (VPN) Servers		
<b>UNIT-II</b>		<b>7 Hours</b>
Control (MVC) method of software development in a 3 tier environment, Inter-operability Web Services as the implementation vehicle protocols, usage, Customer Relationship Management (CRM), Supplier Relationship Management (SRM), Firewalls, Network monitoring and enforcement of policies, Clustering, Storage area network		
<b>UNIT-III</b>	<b>Java</b>	<b>7 Hours</b>
Brief overview of the following : Java server pages and related technologies, ERP, systems and their architecture, Security Issues - Authentication, Authorization, Software Acquisition Process, Tendering; conditions of contract, storage units and backup strategies.		
<b>UNIT-IV</b>	<b>.NET and SAP</b>	<b>7 Hours</b>
Microsoft .NET framework, Overview of SAP and Oracle Applications, Generic ERP Modules :		

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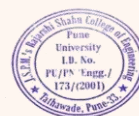
Finance, Access control, Roles; single-sign-on, Commercial off the shelf software (COTS) versus Bespoke Implementations;, Commercial off the shelf software (COTS) versus Bespoke Implementations; Local Area Network (LAN) technologies and products, Data Centers		
UNIT-V		<b>7 Hours</b>
PHP, Ruby on rails, Generic ERP Modules : HR, Material Management, Directory servers, Audit trails; Digital signatures; Encryption: review of IPSec, Digital signatures; Encryption: review of IPSec, Disaster recovery site design and implementation issues		
UNIT-VI	<b>ERP</b>	<b>7 Hours</b>
Java Script , Ajax, Generic ERP Modules : Investment, etc, Examples of Domain Specific Modules, SSL and other technologies; Simple Applications Demo Issues on using Open source software or free software, Licensed software. Hardware Acquisition Issues		
Text Books: <b>T1.</b> Enterprise Resource Planning - Alexis Leon, Tata McGraw Hill. <b>T2.</b> Enterprise Resource Planning – Diversified by Alexis Leon, TMH. <b>T3.</b> Enterprise Resource Planning - Ravi Shankar & S. Jaiswal , Galgotia. <b>T4.</b> E-Business Network Resource planning using SAP R/3 Baan and Peoplesoft : A Practical Roadmap For Success By Dr. Ravi Kalakota		

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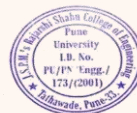


**T. Y. B. Tech (Computer Engineering)**  
**Academic Year – 2022-2023 Semester -VI**  
**Elective IV: [CS3111B]: Modern Web Application**

<b>Teaching Scheme:</b> <b>TH: - 3Hours/Week</b>	<b>Credit</b> <b>TH:03</b>	<b>Examination Scheme:</b> <b>In Sem. Evaluation: 15 Marks</b> <b>Mid Sem. Exam : 25 Marks</b> <b>End Sem. Exam : 60 Marks</b>
<b>Course Prerequisites :</b> Database Management Systems[CS2109], Computer Networks[CS3102]		
<b>Course Objective:</b> <ul style="list-style-type: none"> <li>To understand the principles and methodologies of web based applications development process</li> <li>To understand current client side and server side web technologies</li> <li>To understand current client side and server side frameworks</li> <li>To understand web services and content management</li> </ul>		
<b>Course Outcome:</b> After successful completion of the course, students will able to: <b>CO 1:</b> Describe the concepts of WWW including browser and HTTP protocol. <b>CO 2:</b> Develop the modern web pages using the HTML and CSS features with different layouts as per need of applications <b>CO 3:</b> Develop the modern Web applications using the client and server side technologies and the web design fundamentals. <b>CO 4:</b> Use server side scripting with PHP to generate the web pages dynamically using the database connectivity. <b>CO 5:</b> Use client and server side framework to design dynamic web pages. <b>CO 6:</b> Develop Web Application using web services and content management		
<b>Course Contents</b>		
<b>UNIT-I</b>	<b>Fundamentals of Web Technologies</b>	<b>07 Hours</b>
Concept of WWW, Internet and WWW, HTTP Protocol : Request and Response, Web browser and Web servers, Features of Web 2.0, Concepts of effective web design, Web design issues including Browser, Bandwidth and Cache, Display resolution, Look and Feel of the Website, Page Layout and linking, User centric design, Sitemap, Planning and publishing website, Designing effective navigation		
<b>UNIT-II</b>	<b>Web Application Development Tools</b>	<b>07 Hours</b>
Introduction to web technology, internet and www, Web site planning and design issues, HTML: structure of html document , HTML elements: headings, paragraphs, line break, colors & fonts, links, frames, lists, tables, images and forms, Difference between HTML and HTML5. CSS: Introduction to Style Sheet,		

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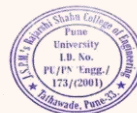
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Inserting CSS in an HTML page, CSS selectors, XML: Introduction to XML, XML key component, Transforming XML into XSLT, DTD: Schema, elements, attributes, Introduction to JSON.		
<b>UNIT-III</b>	<b>Client Side Technologies</b>	<b>07 Hours</b>
JavaScript: Overview of JavaScript, using JS in an HTML (Embedded, External), Data types, Control Structures, Arrays, Functions and Scopes, Objects in JS, DOM: DOM levels, DOM Objects and their properties and methods, Manipulating DOM, JQuery: Introduction to JQuery, Loading JQuery, Selecting elements, changing styles, creating elements, appending elements, removing elements, handling events.		
<b>UNIT-IV</b>	<b>Server Side Technologies</b>	<b>07 Hours</b>
Introduction to Server Side technology and TOMCAT, Servlet: Introduction to Servlet, need and advantages, Servlet Lifecycle, Creating and testing of sample Servlet, session management. JSP: Introduction to JSP, advantages of JSP over Servlet, elements of JSP page: directives, comments, scripting elements, actions and templates, JDBC Connectivity with JSP. PHP and MySQL : Basic commands with PHP examples, Connection to server, creating database, selecting a database, listing database, listing table names, creating a table, inserting data, altering tables, queries, deleting database, deleting data and tables, AJAX: Introduction, Working of AJAX, AJAX processing steps, coding AJAX script.		
<b>UNIT-V</b>	<b>Client and Server Side Frameworks</b>	<b>07 Hours</b>
Angular JS : Overview, MVC architecture, directives, expression, controllers, filters, tables, modules, forms, includes, views, scopes, services, dependency injection, custom directives, Internationalization, Introduction to NodeJS. Struts: Overview, architecture, configuration, actions, interceptors, result types, validations, localization, exception handling, annotations.		
<b>UNIT-VI</b>	<b>Web Services</b>	<b>07 Hours</b>
Web Services: Overview, types of WS, difference between SOAP and REST, EJB: types of EJB, benefits, Architecture, EJB technology, JNDI lookup, Introduction to Content Management System(CMS) , Wordpress / Joomla, Advanced Technology: Bootstrap, JSF, Spring.		
<b>Text Books:</b>		
<b>T1.</b> Achyut Godbole & Atul Kahate, Web Technologies: TCP/IP to Internet Application Architectures, McGraw Hill Education publications, ISBN, 007047298X, 9780070472983 <b>T2.</b> Ralph Moseley & M. T. Savaliya, —Developing Web Applications, Wiley publications, ISBN 13 : 9788126538676		
<b>Reference Books:</b>		
R1: Black Book, —Struts 2, Dreamtech Press, ISBN 13, : 9788177228700 R2: Black Book, — JDBC 4.2, Servlet 3.1 & JSP 2.3, Dreamtech Press, ISBN-13: 978-8177228700 R3: Giulio Zambon, — Beginning JSP, JSF and Tomcat, Apress Publication, ISBN-10: 1430246235; ISBN-13: 978-1430246237 R4: Robin Nixon, —Learning PHP, Mysql and Javascript with JQuery, CSS & HTML5, O'REILLY, ISBN: 13:978-93-5213-015-3		

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H.O.D, Computer

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Dean Academics

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Director RSCOE, Pune



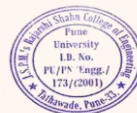
R5:Giulio Zambon, — Beginning JSP, JSF and Tomcat®, Apress Publication, ISBN-10: 1430246235; ISBN-13: 978-1430246237  
R6:Sandeep Panda, —Angular JS: Novice To Ninja, SPD, First Edition 2014, ISBN-13: 978-0992279455

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Dr. S V Kedar  
H.O.D, Computer

*R B Joshi*

Dr. R B. Joshi  
Dean Academics



*R K Jain*

Dr. R. K. Jain  
Director RSCOE, Pune

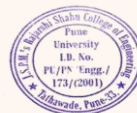


**T. Y. B. Tech (Computer Engineering)**  
**Academic Year – 2022-2023 Semester -VI**  
**[CS3114]: Lab Practice**

<b>Teaching Scheme:</b> <b>TH: - Hours/Week</b> <b>PR: -4 Hours/Week</b> <b>TU:-Hours/Week</b>	<b>Credit</b> <b>PR: 2</b>	<b>Examination Scheme:</b> <b>Lab Evaluation: 75 Marks</b>
<b>Course Prerequisites :Cloud Micro services and Application, Modern Web Application, Internet of Things</b>		
<b>Course Objective:</b> <ul style="list-style-type: none"> <li>To explore the different features of Cloud computing platform.</li> <li>To use Devops CI/CD tools for cloud-based application.</li> <li>To understand the principles and methodologies of web-based applications development process</li> <li>To use client side and server-side web technologies and frameworks.</li> <li>To understand functionalities of various single board embedded platforms fundamentals</li> <li>To develop comprehensive approach towards building small low cost embedded IoT system.</li> <li></li> </ul>		
<b>Course Outcome:</b> After successful completion of the course, students will able to: CO1: Illustrate need of AWS cloud platform instead of traditional approach. CO2: Apply different Devops tools on cloud based application. CO3:Apply client-side technologies for designing web applications. CO4:Apply server-side technologies, frameworks, web services and also use content management tools. CO5: Create an Interface with Raspberry Pi by LED and Buzzer. CO6: Design and Implement Real Time Application using Raspberry-Pi.		
<b>Lab Contents</b>		
<b>Guidelines for Assessment</b>		
1) Continuous assessment shall be based on experiments performed, submission of results of program in the form of report/journal, timely completion, attendance ,understanding, efficient codes, punctuality and neatness. 2) Practical/Oral examination shall be based on the practical's performed in the lab. 3) Lab assessment of 50 marks shall be based on continuous assessment and performance in Practical/Oral examination		
<b>List of Laboratory Assignments/Experiments</b>		
<b>1</b>	Launch different EC2 Instance and connect to remote machine using AWS console	

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	platform. Launch different EC2 Instance and connect to remote machine using AWS command line interface.
2	To study difference between EBS and S3 storage. Create Buckets on AWS and explore versioning option on AWS console.
3	Create application Load Balancer.
4	Design attractive web application for any event organized in your institute using HTML, CSS, JavaScript and XML.
5	Add dynamic web application essence in webpage using Servlet/JSP/AngularJS.
6	Add dynamic web application essence in webpage using PHP and MySQL database connectivity.
7	To interface LED/Buzzer with Raspberry Pi and write a program to turn on LED for 1 sec after every 2 seconds.
8	Write a program on Raspberry-Pi to capture and store the image with camera.
9	Create an interface for simulating traffic signal by using Raspberry Pi.
10	Mini project: 1. Deploy any web application on cloud with auto scaling features. 2. Develop an application on Raspberry-Pi to upload the temperature and humidity data on cloud.

#### Text Books:

T2. Thomas Erl “Cloud Computing Technology and Architecture” Pearson publication 2<sup>nd</sup> edition.

T3. Jeffrey C. Jackson, "Web Technologies: A Computer Science Perspective", Second Edition, Pearson Education, 2007, ISBN 978-0131856035

T4. Matt Richardson and Shawn Wallace, “Getting with Raspberry Pi”, MAKER MEDIA, ISBN: 978-93-5213-450-2

T5. Dr. Simon Monk, “Raspberry Pi Cook-Book”, O'REILLY, ISBN: 978-93-5213-389-5

#### Reference Books:

R1. <https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/concepts.html>

R2. [https://docs.aws.amazon.com/directoryservice/latest/admin-guide/gsg\\_create\\_vpc.html#create\\_vpc](https://docs.aws.amazon.com/directoryservice/latest/admin-guide/gsg_create_vpc.html#create_vpc)

R3. Marty Hall, Larry Brown, "Core Web Programming", Second Edition, Pearson Education, 2001, ISBN 978-0130897930

R4. Robert W. Sebesta, “Programming the World Wide Web”, 4th Edition, Pearson education, 2008.

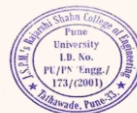
R5. Black Book, — Struts 2l, Dreamtech Press, ISBN 13, : 9788177228700

R6. Black Book, — JDBC 4.2, Servlet 3.1 & JSP 2.3l, Dreamtech Press, ISBN-13: 978-8177228700

R7. Nitesh Dhanjani, “Abusing the Internet of Things”, O'REILLY, ISBN: 13:978-93-5313-217-1

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H.O.D, Computer

Dr. R B. Joshi  
Dean Academics

Dr. R. K. Jain  
Director RSCOE, Pune



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**T. Y. B. Tech (Computer Engineering)**  
**Academic Year – 2020-2021 Semester -VI**  
**[CS3112]: Engineering Design & Innovation IV**

Teaching Scheme: PR: 02 Hours/Week	Credit PR: 1	Examination Scheme: Lab Evaluation : 75 Marks
Course Prerequisites : Project Ideation and Intellectual Property Right [CS2112 ]		
<b>Course Objective:</b> The primary objective of this project-based learning course is to develop critical thinking and problem-solving skills by exploring and proposing solutions to current computer engineering problems in the real world. This course will help students begin to identify themselves as computer engineers and prepare them for opportunities for their undergraduate studies.		
<b>Course Outcome:</b> <b>After successful completion of the course, students will able to:</b> <b>CO 1:</b> Implement complete system <b>CO 2:</b> Test the complete system. <b>CO 3:</b> Evaluate the performance of the system. <b>CO 4:</b> Perform comparative result analysis.		
<b>Tutors Role in Project Based Learning</b>		
<ol style="list-style-type: none"> <li>1. The fundamentals of problem based learning, lies with the Tutors role.</li> <li>2. Tutors are not the source of solutions rather they act as the facilitator and mentor.</li> <li>3. The facilitator skills of the Tutors / Teacher are central to the success of EDI.</li> <li>4. Students are not used to the constructivist approach to learning, it is important that they are Carefully told what to expect in PBL.</li> <li>5. Tutors need to explain the differences between PBL and traditional learning.</li> <li>6. Tutors need to explain the principals involved and role of the students in EDI learning.</li> </ol>		
<b>Students Role in Project Based Learning</b>		
<ol style="list-style-type: none"> <li>1. Prepare students for EDI before starting the sessions.</li> <li>2. Students must have ability to initiate the task/idea .they should not be mere imitators.</li> <li>3. They must learn to think.</li> <li>4. Students working in EDI must be responsible for their own learning.</li> <li>5. Throughout the EDI process, students have to define and analyze the problem, generate learning issues and apply what they have learned to solve the problem and act for them-selves and be free.</li> <li>6. Students must quickly learn how to manage their own learning, Instead of passively receiving instruction.</li> <li>7. Students in EDI are actively constructing their knowledge and understanding of the situation in groups.</li> </ol>		

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H.O.D, Computer

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8. Students in EDI are expected to work in groups.
9. They have to develop interpersonal and group process skills, such as effective listening or coping creatively with conflicts.

### Guidelines for Assessment

EDI requires regular mentoring by faculty throughout the semester for successful completion of the idea/project tasks selected by the students per batch. EDI is monitored and continuous assessment is done by supervisor /mentor and authorities. It is recommended that all activities should to be recorded regularly, regular assessment of work need to be done and proper documents need to be maintained at college end by both students as well as mentor (EDI work book). Continuous Assessment Sheet (CAS) is to be maintained by all mentors Recommended parameters for assessment, evaluation and weightage:

- Idea Inception (10%)
- Outcomes of PBL/ Problem Solving Skills/ Solution provided/ Final product (40%) (Individual assessment and team assessment)
- Documentation (Gathering requirements/ design & modeling/ implementation/execution, use of technology and final report, other documents) (10%)
- Demonstration (Presentation, User Interface, Usability etc) (10%)
- Contest Participation (10 %)
- Publication (15 %)
- Awareness /Consideration of -Environment/ Social /Ethics/ Safety measures/Legal aspects (5%)

EDI workbook will serve the purpose and facilitate the job of students, mentor and project coordinator. This workbook will reflect accountability, punctuality, technical writing ability and work flow of the work undertaken. The student shall submit the duly certified progress report of project in standard format for satisfactory completion of the work by the concerned guide and head of the Department/Institute. During examination Internal examiner (preferably the guide) and External examiners jointly, evaluate the project work.

### Assignments

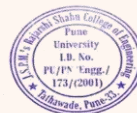
1	Propose or modify existing algorithm/model or include new modules to enhance system functionality/performance.
2	Implement the system
3	Perform system testing.
4	Evaluate the solution by considering the standard data / Objective function and by using appropriate performance metrics
5	Prepare an implementation paper for Conference presentation/Publication in Journals, if possible;

#### Text Books:

- T1.** A new model of problem based learning. By Terry Barrett. All Ireland Society for higher education (AISHE). ISBN:978-0-9935254-6-9; 2017
- T2.** Problem Based Learning. By Mahnazmoallem, woei hung and Nada Dabbagh, Wiley Publishers. 2019.

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**T3.**Stem Project based learning and integrated science, Technology, Engineering and mathematics approach. By Robert Capraro, Mary Margaret Capraro

**T4.** Hassan Gomaa, "Software Modeling and Design- UML, Use cases, Patterns and Software Architectures" Cambridge University Press, 2011, ISBN 978-0-521-76414-8.

Reference Books:

**R1.**De Graaff E, Kolmos A., red.: Management of change: Implementation of problem-based and project-based learning in engineering. Rotterdam: Sense Publishers. 2007.

**R2.**Gopalan," Project management core text book", 2 Indian Edition

**R3.**James Shore and Shane Warden, " The Art of Agile Development"

**R4.**Gardy Booch, James Rambaugh, Ivar Jacobson,"The unified modeling language user guide" , Pearson Education, Second edition, 2008, ISBN 0-321-24562-8.

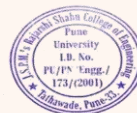
**R5.** R5. Mason, Peter & Wright, Pamela & Luu, Hoat. (2008). Writing and Publishing a Scientific Paper. 10.13140/2.1.4010.0480.

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Dr. R. K. Jain  
Director RSCOE, Pune





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**T. Y. B. Tech (Computer Engineering)**  
**Academic Year – 2022-2023 Semester -V**

Teaching Scheme:	Credit	Examination Scheme:
-	-	-

List of Courses to be opted (Any one) under Audit Course III

Code	Name of Course	Link
HS3106	Essence of Indian Knowledge Tradition -I	<a href="https://www.aicte-india.org/sites/default/files/Model_Curriculum/UG-2/ug-vol2.pdf">https://www.aicte-india.org/sites/default/files/Model_Curriculum/UG-2/ug-vol2.pdf</a>
HS3108	Cultural Studies	<a href="https://onlinecourses.swayam2.ac.in/aic19_as04/preview">https://onlinecourses.swayam2.ac.in/aic19_as04/preview</a>
CE 3113	Urbanization and Environment	<a href="https://onlinecourses.nptel.ac.in/noc21_hs96/preview">https://onlinecourses.nptel.ac.in/noc21_hs96/preview</a>

**GUIDELINES FOR CONDUCTION OF AUDIT COURSE**

A student shall be awarded the bachelor's degree if he/she earns 170 credits and clears all the audit courses specified in the syllabus. The student shall be awarded grade as AP (Audit Course Pass) on successful completion of audit course. The student may opt for one of the audit courses per semester, starting from second year first semester. List of options offered is provided. Each student has to choose one audit course from the list per semester. Evaluation of audit course shall be done. Method of conduction and method of assessment for audit courses are suggested.

**Using NPTEL Platform:**

NPTEL is an initiative by MHRD to enhance learning effectiveness in the field of technical education by developing curriculum based video courses and web based e-courses. The details of NPTEL courses are available on its official website [www.nptel.ac.in](http://www.nptel.ac.in)

Student can select any one of the courses mentioned above and has to register for the corresponding online course available on the NPTEL platform as an Audit course.

- Once the course is completed the student can appear for the examination as per the guidelines on the NPTEL portal.
- After clearing the examination successfully; student will be awarded with certificate.

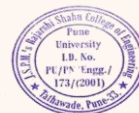
**Guidelines for Assessment:**

The assessment of the course will be done at the institute level. The department has to maintain the record of the various audit courses opted by the students. The audit course opted by the students could be interdisciplinary.

- During the course students will be submitting the online assignments. A copy of same students can submit as a part of term work for the corresponding Audit course.
- On the satisfactory submission of assignments, the institute can mark as "Present" and the student will be awarded the grade AP on the marksheet.

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Dr. S V Kedar  
H.O.D, Computer

Dr. R B. Joshi  
Dean Academics

Dr. R. K. Jain  
Director RSCOE, Pune



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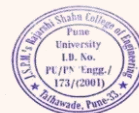


**T. Y. B. Tech (Computer Engineering)**  
**Academic Year – 2022-2023 Semester -VI**

Teaching Scheme:	Credit	Examination Scheme:
-	-	-
List of Courses to be opted (Any one) under Audit Course IV		
Code	Name of Course	Link
HS3107	Essence of Indian Knowledge Tradition -II	<a href="https://www.aicte-india.org/sites/default/files/Model_Curriculum/UG-2/ug-vol2.pdf">https://www.aicte-india.org/sites/default/files/Model_Curriculum/UG-2/ug-vol2.pdf</a>
HS3109	Introduction to Human Factors and Ergonomics	<a href="https://onlinecourses.swayam2.ac.in/aic20_ed03/preview">https://onlinecourses.swayam2.ac.in/aic20_ed03/preview</a>
HS3110	Mind Education	<a href="https://onlinecourses.swayam2.ac.in/aic19_as05/preview">https://onlinecourses.swayam2.ac.in/aic19_as05/preview</a>
<b>GUIDELINES FOR CONDUCTION OF AUDIT COURSE</b>		
<p>A student shall be awarded the bachelor's degree if he/she earns 170 credits and clears all the audit courses specified in the syllabus. The student shall be awarded grade as AP (Audit Course Pass) on successful completion of audit course. The student may opt for one of the audit courses per semester, starting from second year first semester. List of options offered is provided. Each student has to choose one audit course from the list per semester. Evaluation of audit course shall be done. Method of conduction and method of assessment for audit courses are suggested.</p>		
<p><b>Using NPTEL Platform:</b>          NPTEL is an initiative by MHRD to enhance learning effectiveness in the field of technical education by developing curriculum based video courses and web based e-courses. The details of NPTEL courses are available on its official website <a href="http://www.nptel.ac.in">www.nptel.ac.in</a></p> <ul style="list-style-type: none"> <li>• Student can select any one of the courses mentioned above and has to register for the corresponding online course available on the NPTEL platform as an Audit course.</li> <li>• Once the course is completed the student can appear for the examination as per the guidelines on the NPTEL portal.</li> <li>• After clearing the examination successfully; student will be awarded with certificate.</li> </ul>		
<p><b>Guidelines for Assessment:</b>          The assessment of the course will be done at the institute level. The department has to maintain the record of the various audit courses opted by the students. The audit course opted by the students could be interdisciplinary.</p> <ul style="list-style-type: none"> <li>• During the course students will be submitting the online assignments. A copy of same students can submit as a part of term work for the corresponding Audit course.</li> </ul>		

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H.O.D, Computer

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Dean Academics

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Director RSCOE, Pune

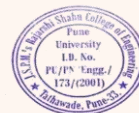
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H.O.D, Computer

*R B Joshi*

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Dean Academics



*R K Jain*

Dr. R. K. Jain  
Director RSCOE, Pune