Punyashlok Ahilyadevi Holkar Solapur University, Solapur

NAAC Accredited-2015
'B' Grade (CGPA 2.62)

Name of the Faculty: Science and Technology

CHOICE BASED CREDIT SYSTEM

Syllabus : Computer Science and Engineering

Name of the Course: Final Year B.Tech (CSE)

(Syllabus to be implemented from w.e.f. June 2021)

Programme Educational Objectives and Outcomes

A. Program Educational Objectives

1. Graduate will exhibit strong fundamental knowledge and technical skills in the field of Computer Science & Engineering to pursue successful professional career, higher studies and research.
2. Graduate will exhibit capabilities to understand and resolve various societal issues through their problem solving skills.
3. Graduate will be sensitive to ethical, societal and environmental issues as a software engineering professional and be committed to life-long learning.

B. Program Outcomes

Engineering Graduate 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 modeling 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.

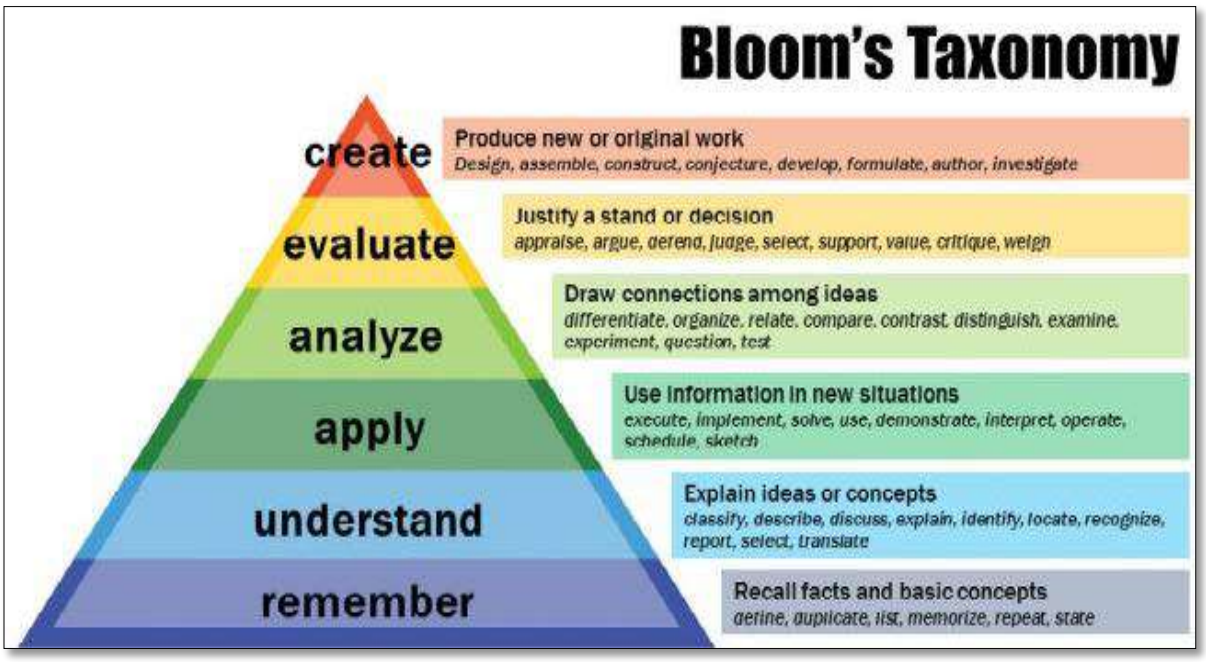
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities 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.

C. Program Specific Outcomes (PSOs)

1. Apply the principles of computational mathematics, computer systems and programming paradigms to solve computational problems.

2. Design and develop application software with functionalities applicable for desktop, web and mobile applications with due consideration of system software constraints.

3. Apply software engineering methods, cutting edge technologie and ICT, using appropriate tools and FOSS alternatives for designing ,developing & testing application software


Bloom's Taxonomy
create
Produce new or original work
Design, assemble, construct, conjecture, develop, formulate, author, investigate
evaluate
Justify a stand or decision
appraise, argue, defend, judge, select, support, value, critique, weigh
analyze
Draw connections among ideas
differentiate, organize, relate, compare, contrast, distinguish, examine, experiment, question, test
apply
Use information in new situations
execute, implement, solve, use, demonstrate, interpret, operate, schedule, sketch
understand
Explain ideas or concepts
classify, describe, discuss, explain, identify, locate, recognize, report, select, translate
remember
Recall facts and basic concepts
define, duplicate, list, memorize, repeat, state

- Semester I : Theory Courses

Course Code	*Name of the Course*	*Engagement Hours*			*Credits*	*FA*	*SA*		*Total*
		L	*T*	*P*		*ESE*	*ISE*	*ICA*	
C011/ C012	Engineering Physics / Engineering Chemistry$	3			3	70	30		100
C112	Engineering Mathematics I	3			3	70	30		100
C113	Basic Electrical & Electronics Engineering	4			4	70	30		100
C114	Engineering Mechanics	3			3	70	30		100
C115	Basic Mechanical Engineering	3			3	70	30		100
C116	Communication Skills	1			1		25		25
	Total	**17**			**17**	**350**	**175**		**525**

- Semester I : Laboratory / Tutorial Courses

Course Code	*Name of the Course*	*Engagement Hours*			*Credits*	*FA*	*SA*		*Total*
		L	*T*	*P*		*ESE*	*ISE*	*ICA*	
C011/ C012	Engineering Physics / Engineering Chemistry$			2	1			25	25
C112	Engineering Mathematics I		1		1			25	25
C113	Basic Electrical & Electronics Engineering			2	1			25	25
C114	Engineering Mechanics			2	1			25	25
C115	Basic Mechanical Engineering			2	1			25	25
C116	Communication Skills			2	1			25	25
C117	Workshop Practice			2	1			25	25
	Total		**1**	**12**	**7**			**175**	**175**
	Grand Total	**17**	**1**	**12**	**24**	**350**	**175**	**175**	**700**
C118	Induction Program	*# (Please see note below)*							

- Semester II : Theory Courses

Course Code	*Name of the Course*	*Engagement Hours*			*Credits*	*FA*	*SA*		*Total*
		L	*T*	*P*		*ESE*	*ISE*	*ICA*	
C011/ C012	Engineering Physics / Engineering Chemistry$	3			3	70	30		100
C122	Engineering Mathematics II	3			3	70	30		100
C123	Engineering Graphics & Design	3			3	70	30		100
C124	Basic Civil Engineering	3			3	70	30		100
C125	Programming for Problem Solving	2			2		25		25
C126	Professional Communication	1			1		25		25
	Total	**15**			**15**	**280**	**170**		**450**
C127	Democracy, Elections and Good Governance					30			30

- Semester II : Laboratory / Tutorial Courses

Course Code	*Name of the Course*	*Engagement Hours*			*Credits*	*FA*	*SA*		*Total*
		L	*T*	*P*		*ESE (POE)*	*ISE*	*ICA*	
C011/ C012	Engineering Physics / Engineering Chemistry$			2	1			25	25
C122	Engineering Mathematics II		1		1			25	25
C123	Engineering Graphics & Design			4	2			50	50
C124	Basic Civil Engineering			2	1			25	25
C125	Programming for Problem Solving			4	2	50#		50	100
C127	Professional Communication			2	1			25	25
	Total		1	14	8	50		200	250
	Grand Total	**15**	**1**	**14**	**23**	**330**	**170**	**200**	**700**
C128	Democracy, Elections and Good Governance							20	

- Legends used –

L	Lecture	FA	Formative Assessment
T	Tutorial	SA	Summative Assessment
P	Lab Session	ESE	End Semester Examination
		ISE	In Semester Evaluation
		ICA	Internal Continuous Assessment

- **Notes-**
  1. $ - Indicates approximately half of the total students at F.Y B.Tech. will enroll under Group A and remaining will enroll under Group B.

     Group A will take up course of Engineering Physics (theory & laboratory) in Semester I and will take up course of Engineering Chemistry (theory & laboratory) in semester II.

     Group B will take up course of Engineering Chemistry (theory & laboratory) in Semester I and will take up course of Engineering Physics (theory & laboratory) in semester II

  2. # - Indicates the subject 'Programming for Problem Solving' shall have a University 'Practical and Oral Examination' at the end of the semester assessing student's programming skills.

  3. In Semester Evaluation (ISE) marks shall be based upon student's performance in minimum two tests & mid-term written test conducted & evaluated at institute level

     Internal Continuous Assessment Marks (ICA) are calculated based upon student's performance during laboratory sessions / tutorial sessions

  4. Democracy, Elections & Good Governance is mandatory course. The marks earned by student with this course shall not be considered for calculation of SGPA/CGPA. However student must complete ICA of 20 marks and End Semester Examination (ESE) of 30 marks (as prescribed by university, time to time) for fulfillment of this course. This course is not considered as a passing head for counting passing heads for ATKT. However, student must pass this subject for award of the degree

  5. Student must complete induction program of minimum five days before commencement of the regular academic schedule at the first semester.

GUIDELINES FOR INDUCTION PROGRAM (C128)

New entrants into an Engineering program come with diverse thoughts, mind set and different social, economical, regional and cultural backgrounds. It is important to help them adjust to the new environment and inculcate in them the ethos of the institution with a sense of larger purpose.

An induction program for the new UG entrant students is proposed at the commencement ofthe first semester. It is expected to complete this induction program before commencement of the regular academic schedule.

Its purpose is to make new entrants comfortable in their new environment, open them up, set a healthy daily routine for them, create bonding amongst the peers as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature.

The Induction Program shall encompass (but not limited to) below activity –

1. Physical Activities
2. Creative Arts
3. Exposure to Universal Human Values
4. Literary Activities
5. Proficiency Modules
6. Lectures by Experts / Eminent Persons
7. Visit to Local Establishments like Hospital / Orphanage
8. Familiarization to Department

Induction Program Course do not have any marks or credits however performance of students for Induction Program is assessed at institute level using below mandatory criteria –

1. Attendance and active participation
2. Report writing

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOAPUR
FACULTY OF SCIENCE & TECHNOLOGY
Credit System structure of Second Year B.Tech. (CSE) wef. 2019-2020

Semester – I

Course Code	Theory Course Name	Hrs./Week			Credits	Examination Scheme			
		L	T	P		ISE	ESE	ICA	Total
CS211	Applied Mathematics-I	3	1	--	4	30	70	25	125
CS212	Discrete Mathematical Structures	3	1	--	4	30	70	25	125
CS213	Data Communication	3	--	--	3	30	70	--	100
CS214	Digital Techniques	4	--	--	4	30	70	--	100
CS215	Computer Graphics	3	--	--	3	30	70	--	100
CS216	Advanced C Concepts	2	--	--	2	25	--	--	25
	Sub Total	18	2	--	20	175	350	50	575
Course Code	**Laboratory Course Name**								
							ESE / **POE**	**ICA**	
CS213	Data Communication	--	--	2	1	--	50	25	75
CS214	Digital Techniques	--	--	2	1	--	50	25	75
CS215	Computer Graphics	--	--	2	1	--	--	25	25
CS216	Advanced C Concepts	--	--	4	2	--	50	25	75
	Sub Total	--	--	10	5	--	150	100	250
	Grand Total	**18**	**2**	**10**	**25**	**175**	**500**	**150**	**825**
ENV21	**Environmental Studies**	1	--	--	--	--	--	--	--

- *Abbreviations: L - Lectures, P –Practical, T - Tutorial, ISE - In Semester Exam., ESE- End Semester Exam, ICA - Internal Continuous Assessment, ISE - Internal Tests, ESE University Examination (Theory &/ POE &/Oral examination)*

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOAPUR
FACULTY OF SCIENCE & TECHNOLOGY
Credit System structure of Second Year B.Tech. (CSE) wef. 2019-2020
Semester – II

Course Code	Theory Course Name	Hrs./Week			Credits	Examination Scheme			
		L	T	P		ISE	ESE	ICA	Total
CS221	Applied Mathematics-II	3	1	--	4	30	70	25	125
CS222	Theory of Computation	4	1	--	5	30	70	25	125
CS223	Microprocessors	3	--	--	3	30	70	--	100
CS224	Data Structures	3	--	--	3	30	70	--	100
CS225	Computer Networks	3	--	--	3	30	70	--	100
CS226	Object Oriented Programming through C++	2	--	--	2	25	--	--	25
	Sub Total	**18**	**2**	**--**	**20**	**175**	**350**	**50**	**575**
Course Code	**Laboratory Course Name**								
							ESE / **POE**	**ICA**	
CS223	Microprocessors	--	--	2	1	--	50	25	75
CS224	Data Structures	--	--	4	2	--	50	25	75
CS225	Computer Networks	--	--	2	1	--	--	25	25
CS226	Object Oriented Programming through C++	--	--	2	1	--	50	25	75
	Sub Total	**--**	**--**	**10**	**5**	**--**	**150**	**100**	**250**
	Grand Total	**18**	**2**	**10**	**25**	**175**	**500**	**150**	**825**
ENV22	**Environmental Studies**	1	--	--	--				

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Note :

1. Student is required to study and pass Environmental Science subject in Second Year of Engineering to become eligible for award of degree.
2. Batch size for the practical/tutorial shall be of 20 students. On forming the batches, if the strength of remaining students exceeds 9, then a new batch shall be formed.
3. Vocational Training (evaluated at Final year B.Tech. Part-I) of minimum 15 days shall be completed in any vacation after S.Y.B.Tech Part-II but before Final Year B.Tech Part-I & the report shall be submitted and evaluated in Final Year B. Tech. Part-I.
4. ICA assessment shall be a continuous process based on student's performance in – class tests, assignments, homework, subject seminars, quizzes, laboratory books and their interaction and attendance for theory and lab sessions as applicable.

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FACULTY OF SCIENCE & TECHNOLOGY
Credit System Structure of Third Year B.Tech. (CSE) wef. 2020-2021
Semester – I

Course Code	***Theory Course Name***	***Hrs./Week***			***Credits***		***Examination Scheme***		
		L	***T***	***P***		***ISE***	***ESE***	***ICA***	***Total***
CS311	System Programming	3	--	--	3	30	70	--	100
CS312	Operating Systems	3	--	--	3	30	70	--	100
CS313	Software Engineering	3	--	--	3	30	70	--	100
CS314	$ Database Engineering	4	--	--	4	30	70	--	100
CS315	Design and Analysis of Algorithm	3	--	--	3	30	70	--	100
CS316	Python Programming	2	--	--	2	25	--	--	25
CS317	Java Programming	2	--	--	2	25	--	--	25
SL31	Self Learning Module I (HSS)	--	--	--	2	--	50	--	50
	Sub Total	20	--	--	22	200	400	--	600
Course Code	**Laboratory Course Name**								
							ESE	**ICA**	
							POE	**OE**	
CS311	System Programming	--	--	2	1		--	--	25	25
CS313	Database Engineering	--	--	2	1		50	--	25	75
CS314	Design and Analysis of Algorithm	--	--	2	1		--	--	25	25
CS316	Python Programming	--	--	2	1		50	--	25	75
CS317	Java Programming	--	--	2	1		50	--	25	75
	Sub Total	--	--	10	5		150	--	125	275
	Grand Total	**20**	**--**	**10**	**27**	**200**	**550**		**125**	**875**

- *Abbreviations: L - Lectures, P –Practical, T - Tutorial, ISE - In Semester Exam., ESE- End Semester Exam, ICA - Internal Continuous Assessment, ISE - Internal Tests, ESE University Examination (Theory &/ POE &/Oral examination)*

$ - The theory courses for Computer Sci. and Engg. and Information Technology are same, therefore paper for ESE will be common to both.

Note :

1. Batch size for the practical/tutorial shall be of 15 students. On forming the batches, if the strength of remaining student exceeds 7, then a new batch shall be formed.

2. Vocational Training (evaluated at Final Year B.Tech. Part-I) of minimum 15 days shall be completed in vacation/s after S.Y. B.Tech. Part-II but before Final Year B.Tech. Part-I & the report shall be submitted and evaluated in Final Year B. Tech Part-I.

3. ICA assessment shall be a continuous process based on student's performance in – class tests, assignments, homework, subject seminars, quizzes, laboratory books and their interaction and attendance for theory and lab sessions as applicable.

4. **Self-Learning Module-I (HSS) at T.Y. B.Tech. – I**

Curriculum for Humanities and Social Sciences, Self Learning Module-I (HSS) is common for all under graduate engineering programs.

A. Student can select & enroll a Self Learning Module-I (HSS) Course from P.A.H. Solapur University, Solapur Course List (SL31-A) and appear for university examination.

SL31-A: P. A. H. Solapur University, Solapur: HSS Course List

1. Economics	4. Stress and Coping
2. Intellectual Property Rights for Technology Development and Management	5. Professional Ethics & Human Value
3. Introduction to Sociology	

OR

B. Student can select and enroll for university approved minimum eight weeks NPTEL HSS course (SL31-B), complete its assignments and appear for certificate examination conducted by NPTEL. The list of courses as shown in Table SL31-B will be updated from time to time by University authorities. Latest updated list will be valid for selection of self learning Module-I (HSS) courses

More details about NPTEL are available at http://nptel.ac.in.

SL31-B: University approved NPTEL- HSS course List

1. Soft skills	15. Management of Inventory Systems
2. Introduction to Modern India Political Thought	16. Economic Growth and Development
3. Intellectual Property	17. Ethic in Engineering Practice
4. Technical English for Engineers	18. Corporate Social Responsibility
5. Developing Soft Skills and Personality	19. Marketing Management –I
6. Educational Leadership	20. Marketing Research and Analysis
7. Microeconomics: Theory & Applications	21. Selected Topics in Decision Modeling
8. Engineering Economics	22. Innovation, Business Models and Entrepreneurship
9. Human Resource Development	23. Simulation of Business Systems: An Applied Approach
10. Project Management for managers	24. Sustainability through Green Manufacturing Systems: An Applied Approach
11. Data Analysis and Decision Making - I	25. Total Quality Management - I
12. E-Business	26. Introduction to Operations Research
13. Working Capital Management	27. Knowledge Management
14. Industrial Safety Engineering	

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FACULTY OF SCIENCE & TECHNOLOGY
Credit System Structure of Third Year B.Tech. (CSE) wef. 2020-2021
Semester – II

Course Code	***Theory Course Name***	***Hrs./Week***			***Credits***		***Examination Scheme***		
		L	***T***	***P***		***ISE***	***ESE***	***ICA***	***Total***
CS321	Compiler Construction	4	--	--	4	30	70	--	100
CS322	Unix Operating System	3	--	--	3	30	70	--	100
CS323	Computer Organization and Architecture	3	--	--	3	30	70	--	100
CS324	Artificial Intelligence	3	--	--	3	30	70	--	100
CS325	Mobile Application Development	2	--	--	2	25	--	--	25
CS326A to CS326C	Elective – I	3	--	--	3	30	70	--	100
SL32	Self Learning Module II (Technical)	--	--	--	2	--	50	--	50
	Sub Total	18	--	--	20	175	400	--	575
Course Code	***Laboratory Course Name***								
							ESE	***ICA***	
							POE	***OE***	
CS321	Compiler Construction	--	--	2	1		--	--	25	25
CS322	Unix Operating System	--	--	2	1		50	--	25	75
CS324	Artificial Intelligence	--	--	2	1		--	--	25	25
CS325	Mobile Application Development	--	--	2	1		50	--	25	75
CS326A to CS326C	Elective – I	--	--	2	1		--	--	25	25
CS327	Mini Project	--	--	2	1		--	50	25	75
	Sub Total	18	--	12	6		100	50	150	300
	Grand Total	**18**	**--**	**12**	**26**	**175**	**550**		**150**	**875**

- *Abbreviations: L - Lectures, P –Practical, T - Tutorial, ISE - In Semester Exam., ESE- End Semester Exam, ICA - Internal Continuous Assessment, ISE - Internal Tests, ESE University Examination (Theory &/ POE &/Oral examination)*

Elective-I

CS326A - Object Oriented Modelling and Design
CS326B - $ Artificial Neural Network
CS326C - $ Data Science

$ - The theory courses for Computer Sci. and Engg. and Information Technology are same, therefore paper for ESE will be common to both.

Note :

1. Batch size for the practical /tutorial shall be of 15 students. On forming the batches, if the strength of remaining student exceeds 7, then a new batch shall be formed.

2. Vocational Training (evaluated at Final Year B.Tech. Part-I) of minimum 15 days shall be completed in vacation/s after S.Y. B.Tech. Part-II but before Final Year B.Tech. Part-I & the report shall be submitted and evaluated in Final Year B. Tech Part-I.

3. ICA assessment shall be a continuous process based on student's performance in – class tests, assignments, homework, subject seminars, quizzes, laboratory books and their interaction and attendance for theory and lab sessions as applicable.

4. Mini Project shall consist of developing software, based on various tools &technologies.

5. Project groups shall not be of more than **five** students.

6. **Self-Learning Module II at T.Y. B.Tech. – II (HSS)**

   A. Student can select a Self Learning Module II (Technical Course) from Course List (SL32) and appear for university examination.

SL32 : Self Learning Module-II (Technical)

SL32A - UI or UX technology
SL32B - Software Licensing and Practices

OR

B. Student can select & enroll for university approved minimum eight week technical course from various NPTEL technical courses, complete its assignments and appear for certificate examination conducted by NPTEL.

BOS Chairman / Coordinator will announce the list of approved NPTEL online courses of minimum eight weeks duration for 'Self Learning Module-II (Technical)' on commencement of the Sem-II of respective academic year from the available NPTEL courses through university system and will make available to student through University / institute website.

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FACULTY OF SCIENCE AND TECHNOLOGY
Credit System Structure of Final Year B.Tech.(CSE) wef. 2021-2022

Semester – I

Course Code	Theory Course Name	Hrs./Week			Credits	Examination Scheme			
		L	T	P		ISE	ESE	ICA	Total
CS411	Distributed Systems	3	--	--	3	30	70	--	100
CS412	Machine Learning	3	--	--	3	30	70	--	100
CS413	Modern Database System	4	--	--	4	30	70	--	100
CS 414A to CS414B	Elective-II	3	1	--	4	30	70	25	125
CS 415A to CS415B	Elective-III	3	1	--	4	30	70	25	125
CS416	# Web Technology	2	--	--	2	25	--	--	25
	Sub Total	18	2	--	20	175	350	50	575
	Laboratory / Workshop								
							ESE / **POE**		
CS413	Modern Database System	--	--	2	1		50	25	75
CS412	Machine Learning	--	--	2	1		--	25	25
CS416	# Web Technology	--	--	2	1		50	25	75
CS417	Lab-I : Project Phase I	--	--	4	2		50	25	75
	Vocational Training	--	--	--	1		--	25	25
	Sub Total				6		150	125	275
	Grand Total	**18**	**2**	**10**	**26**	**175**	**500**	**175**	**850**

Semester – II

Course Code	Theory Course Name	Hrs./Week			Credits	Examination Scheme			
		L	T	P		ISE	ESE	ICA	Total
CS421	Management Information System	4	--	--	4	30	70		100
CS422	Information & Cyber Security	4	--	--	4	30	70		100
CS423A to CS423B	Elective-IV	3	--	--	3	30	70		100
CS424A to CS424B	Elective-V	3	--	--	3	30	70		100
CS425	# Programming in C#.Net	2	--	--	2	25	--		25
	Sub Total	16	--	--	16	145	280		425
	Laboratory / Workshop								
							ESE		
							POE		
CS422	Information & Cyber Security	--	--	2	1		50	25	75
CS423	Elective-IV	--	--	2	1			25	25
CS424	Elective-V	--	--	2	1			25	25
CS425	# Programming in C#.Net	--	--	2	1		50	25	75
CS426	Lab-II : Project Phase II	--	--	6	3		100	100	200
	Sub Total			14	7		200	200	400
	Grand Total	**16**		**14**	**23**	**145**	**480**	**200**	**825**

Elective II CS414A - Internet of Things CS414B - Software Testing and Quality Assurance CS414C – Adhoc and Sensor Networks	**Elective III** CS415A - Business Intelligence CS415B - Data Mining CS415C – Real Time Systems
Elective IV CS423A - Big data Analytics CS423B –Natural Language Programming	**Elective V** CS424A - Cloud Computing CS424B - Deep Learning

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR
Final Year B.Tech. (COMPUTER SCIENCE & ENGINEERING)
SEMESTER - I
CS411: DISTRIBUTED SYSTEMS

Teaching Scheme	**Examination Scheme**
Lectures: 3 Hours/Week, 3 Credits	ESE: 70 Marks
	ISE: 30 Marks

COURSE OUTCOME:

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

1. Describe the basics of distributed systems and middleware.
2. Design and simulate distributed system software modules using various methods, strategies, and techniques presented in the course that fulfils requirements for desired properties.
3. Apply principles of distributed systems in a real world setting across multidisciplinary areas.
4. Apply knowledge of Hadoop Distributed File system, its architecture and working for active research at the forefront of these areas.

SECTION – I

Unit 1: Fundamentals (4)

Fundamentals of OS, What is Distributed System? Evolution of Distributed Computing System, Distributed Computing System Models, Distributed Computing Gaining Popularity, Issues in Designing Distributed System, Introduction to Distributed Computing Environment, Protocols for Distributed Systems – FLIP and VMTP

Unit 2: Message Passing (6)

Introduction, Desirable features of Good Message-Passing System, Issues in IPC by Message Passing, Synchronization, Buffering, Message Passing Interface, Multidatagram Messages, Process Addressing, Failure Handling, Group communication, Case Study: RMI, CORBA

Unit 3: Remote Procedure Calls (6)

Introduction, The RPC Model, Transparency of RPC, Implementing RPC mechanism, Stub Generation, RPC Messages, Marshalling Arguments and Results, Server Management, Parameter-Passing Semantics, Call Semantics, Communication Protocols for RPCs, Client-Server Binding, Exception Handling, Security

Unit 4: Synchronization in Distributed Systems (6)

Introduction, Process Migration, Threads, Clock Synchronization, Event Ordering, Election algorithms, Distributed Consensus algorithms

SECTION – II

Unit 5: Distributed Mutual Exclusion (5)

Introduction, Classification of Mutual Exclusion Algorithms, Preliminaries, A simple solution toDistributed Mutual Exclusion, Non-Token-Based Algorithms, Lamport's Algorithm, The Ricart-Agrawala Algorithm, Token-Based Algorithms, Suzuki-Kasami's Broadcast Algorithms

Unit 6: Distributed Deadlock Detection (5)

Introduction, Preliminaries, Deadlock handling strategies in Distributed Systems, Issues in Deadlock

Detection and Resolution, Control organizations for distributed deadlock detection, Centralized deadlock detection algorithms, Distributed deadlock detection algorithms, Avoidance and Prevention algorithms, Hierarchical deadlock detection algorithms

Unit 7: Distributed File Systems **(6)**

Introduction, Architecture, Mechanisms for building Distributed File System, Design issues, Log-Structured file systems, Case studies- Google FS

Unit 8: Distributed Shared Memory **(6)**

Introduction, Architecture and Motivation, Algorithms for implementing DSM, Memory Coherence, Coherence Protocols, Design issues, Case studies-Linda

Text Books:

1. Distributed O.S. Concepts and Design, P.K.Sinha, PHI (Unit 1, 2, 3, 4)
2. Advanced Concepts in Operating Systems, Mukesh Singhal & N.G.Shivaratri, TMH (Unit 5, 6, 7, 8)
3. Distributed Computing, Sunita Mahajan, Seema Shah, OXFORD University Press (Unit 1, Case studies 7, 8)

Reference Books:

1. Distributed System Principles and Paradigms, Andrew S. Tanenbaum, 2nd edition, PHI
2. Distributed Systems, Colouris, 3rd Edition

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR
Final Year B.Tech. (COMPUTER SCIENCE & ENGINEERING)
SEMESTER - I
CS412 : MACHINE LEARNING

Teaching Scheme	**Examination Scheme**
Lecture: 3 Hours /Week, 3 Credits	ESE – 70 Marks
Practical: 2 Hours /Week, 1 Credits	ISE – 30 Marks
	ICA - 25 Marks

COURSE OUTCOMES:

Students will be able to:

1. Interpret the need and applications of machine learning.
2. Build machine learning model for a given problem.
3. Analyze machine learning model to improve their accuracy.

Unit 1: Introduction to Machine learning (4)

- **Understanding Machine Learning:** What Is Machine Learning?, Leveraging the Power of Machine Learning, The Roles of Statistics and Data Mining with Machine Learning, Putting Machine Learning in Context.
- **Applying Machine Learning:** Getting Started with a Strategy, Applying Machine Learningto Business Needs,Understanding Machine Learning Techniques, Tying Machine Learning Methods to Outcomes

Unit 2: Offerings of Machine learning (4)

- **Looking Inside Machine Learning:** The Impact of Machine Learning on Applications,Data Preparation, The Machine Learning Cycle.
- **Getting Started with Machine Learning:** Understanding How Machine Learning Can Help, Focus on the Business Problem, Requirement of Collaboration in Machine Learning, Executing a Pilot Project, Determining the Best Learning Model.

Unit 3: Basic mathematics for Machine Learning (10)

- **Getting Started With The Math Basics:**Working with Data, Exploring the World of Probabilities, Describing the Use of Statistics, Interpreting Learning As Optimization, Exploring Cost Functions, Descending the Error Curve, Updating by Mini-Batch and Online.

Unit 4: Validating Machine Learning Models (12)

- **Validating Machine Learning:**Checking Out-of-Sample Errors, Getting to Know the Limits of Bias, Keeping Model Complexity in Mind and Solutions Balanced, Training, Validating, and Testing, Resorting to Cross-Validation.Looking for Alternatives in Validation., Optimizing Cross-Validation Choices, Avoiding Sample Bias and Leakage Traps, Discovering the Incredible Perceptron
- **Simplest learning strategies to learn from Data:**Discovering the Incredible Perceptron, Growing Greedy Classification Trees, Taking a Probabilistic Turn

Unit 5: Improving Machine Learning Models (10)

- **Improving Machine Learning Models:**Studying Learning Curves , Using Cross-Validation Correctly , Choosing the Right Error or Score Metric , Searching for the Best Hyper-Parameters , Testing Multiple Models , Averaging Models , Stacking Models, Applying Feature Engineering , Selecting Features and Examples , Looking for More Data

Unit 6: Applications of Machine Learning (5)

- **Applying Learning to Real Problems: Classifying Images, Scoring Opinions and Sentiments, Recommending Products and Movies, Using Machine Learning to Provide Solutions to Business Problems. Future of Machine Learning.**

Internal Continuous Assessment (ICA) :

Minimum 10 assignments requiring students to design, implement and validate machine learning models using either of R, Python, Julia, Weka, Octave or any other machine learning toolkits.

Text Books:

1. Machine Learning For Dummies, IBM Limited Edition by Judith Hurwitz, Daniel Kirsch (Published by Wiley, First edition)
2. Machine Learning For Dummiesby John Paul Mueller , Luca Massaron (Published by For Dummies; First edition)

Reference Books:

1. Machine Learning by Tom M. Mitchell (Publisher: McGraw Hill Education; First edition + New Chapters from Second edition)

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR
Final Year B.Tech. (COMPUTER SCIENCE & ENGINEERING)
SEMESTER - I
CS413: MODERN DATABASE SYSTEM

Teaching Scheme	**Examination Scheme**
Lectures : 4 Hours /Week, 4 Credits	ESE – 70 Marks
Practical : 2 Hours/week, 1 Credits	ISE – 30 Marks
	ICA - 25 Marks
	POE – 50 Marks

Course Prerequisites

This course requires knowledge of basic database management system course and any relational database language such as open-source MySQL.

Course Outcome:

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

1. Implement principles of parallel and distributed database.
2. Apply object-oriented design principles for the database design.
3. Apply OLAP operations on a given data and use data mining algorithms for prediction.
4. Use query evaluation and query optimization algorithms for query processing.
5. Describe modern database technologies for Bigdata.

SECTION-I

Unit 1 : Database System architectures (8)

Centralized & C/S architectures, Server system Architectures, Distributed systems, Distributed databases –homogeneous & heterogeneous databases, Distributed data storage, Distributed transactions, Commit protocols, Concurrency control in distributed databases, Availability, Distributed query processing, Heterogeneous distributed databases.

Unit 2 : Parallel Databases (7)

Introduction, I/O parallelism, Inter-query parallelism, Intra-query parallelism, Intra-operation parallelism, Inter-operation parallelism.

Unit 3 : Data Analysis and Mining (8)

Introduction to decision support, OLAP: Multidimensional Data Model, Multidimensional Aggregation Queries, Window Queries in SQL: 1999, Implementation Techniques for OLAP, Data Warehousing, Introduction to data mining, The knowledge Discovery Process, Counting co-occurrences, Mining for rules, Clustering, Similarity search over sequences.

SECTION-II

Unit 4 : Object Based Databases (6)

Overview, Complex Data Types, Structured Types and Inheritance in SQL, Table Inheritance, Array and Multisets Types in SQL, Object Identity and Reference Types in SQL, Object Oriented DBMS versus Object Relational DBMS.

Unit 5 : Query Processing & Optimization (6)

Overview of query processing, Measure of query cost, Selection Operation, Sorting, Join Operation, Other Operation, Evaluation of Expression, Overview of optimization, Transformation of Relational Expressions, Estimating Statistics of Expression Results, Choice of Evaluation plans.

Unit 6 : BIG data and HADOOP & No SQL (8)

Big data, characteristics of Big data, introduction to HADOOP, High level architecture of HADOOP,HDFS file system architecture, special feature of HADOOP, working with HAD OOP commands, working of MAP reduce with an example. Getting started with NoSQL, Types of databases, New SQL, Postgre SQL.

Internal Continuous Assessment (ICA) :

Practical Assignments (minimum 10 to be implemented):

1. Implement 2 PC protocol.
2. Implement join operation on n relations using parallelism approach.
3. Implement the Round Robin partitioning for parallel database environment.
4. Implement the Hash partitioning for parallel database environment.
5. Implement the Range partitioning for parallel database environment.
6. Implement Interquery parallelism in parallel databases.
7. Implementation of intraquery parallelism using multithreading
8. Implement Range partitioning Sort algorithm using intraquery parallelism through interoperation
9. Implementation of Asymmetric fragment & replicate join.
10. Write a program to join r1 r2 r3 r4 using Independent Parallelism for Interoperation parallelism.
11. Implement OLAP queries.
12. Implement algorithm for finding Frequent Itemsets for a given minimum support.
13. Implement algorithm for finding association rules for given minimum support and confidence.
14. Implement queries in SQL: 1999 that work on Complex Data types, Arrray and Multisets.
15. Implement queries for type inheritance and table inheritance.

Text Book :

1. Data base System Concepts sixth Edition, by Abra ham Silberschatz, Hen ry F. Korth, S. Sudarshan, Sixth Edition, McGraw Hill Publication.
2. Data base Management Systems Third Edition, by Raghu Ramakrishan and Johannes Gehrke, McGrawhill Education
3. Mon goDB, The Definitive Guide, Kristina Cho dorow, Oreilly, Shroff Publishers and Distributors Pvt. Ltd., ISBN : 978-93-5110-269-4

Refernce Books:

1. Hadoop in Action, Chuck Lam, Dreamtech Press, ISBN : 97 8-81-7722-813-7.

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR
Final Year B.Tech. (COMPUTER SCIENCE & ENGINEERING)
SEMESTER - I
CS414A : ELECTIVE II : INTERNET OF THINGS

Teaching Scheme	**Examination Scheme**
Lectures : 3 Hours /Week, 3 Credits	ESE – 70 Marks
Tutorial : 1 Hour/Week, 1 Credit	ISE – 30 Marks
	ICA – 25 Marks

PREREQUISITES:

1. Fundamentals of digital communication and computer networks
2. Micro-controller, network security and web programming

COURSE OUTCOME:

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

1. Explain what Internet of Things is
2. Differentiate between IoT & M2M systems
3. Describe and choose sensors and actuators for a given IoT system
4. Interpret IoT communication standards & network protocols

SECTION – I

Unit 1: Introduction to IoT (7)

Definition & characteristics of IoT, physical and logical design of IoT, IoT protocols, IoT communication models & APIs, IoT enabling technologies, IoT levels & deployment templates

Unit 2: Architectures of M2M and IoT Solutions (7)

M2M systems, difference between IoT and M2M systems, components of M2M and IoT solutions, M2M communication, IoT/M2M systems, layers and design standards

Unit 3: Hardware Components of IoT Devices, RFID and WSNs (7)

Sensor technology, actuators, popular IoT development boards, participatory sensing, industrial IoT, automotive IoT, RFID, WSN technology

SECTION – II

Unit 4: IoT Devices Communication Standards & Network Protocols (10)

Serial/UART, serial buses, JTAG, USB, ethernet, NFC, Bluetooth LE, LoRa, SigFox, WiFi, ZigBee, Internet protocol suite, RESTful APIs, HTTP for IoT communication, COAP, XMPP, AMQP, MQTT

Unit 5: Data Collection, Storage and Computing Using a Cloud Platform (7)

Cloud computing paradigm for data collection, storage and computing, everything as a service and cloud service models, IoT cloud based services using the Xively, Nimbits and other platforms

Unit 6: IoT Security and Case Studies (7)

Introduction to IoT privacy, vulnerabilities, security requirements and threat analysis, use case and misuse cases, IoT security tomography and layered attacker model, domain specific IoTs: home automation, smart cities, agriculture, industry

Internal Continuous Assessment (ICA) :

Minimum 8-10 assignments on the above topics.

Text Book:

1. Internet of Things: A Hands-on approach, Arshdeep Bahga, Vijay Madisetti, Orient Blackswan Private Limited - New Delhi, 2015 (Unit 1 and 6)
2. IoT Architecture and Design Principles, Raj Kamal, McGraw Hill Education, 2017 (Unit 2, 3, 5 & 6)
3. The Technical Foundations of IoT, Boris Adryan, Dominik Obermaier and Paul Fremantle, Artech House, 2017 (Unit 2 & 4)

Reference Books:

1. The Internet of Things: Applications and Protocols, Oliver Hersent, David Boswarthick, Omar Elloumi, Wiley publications, 2011
2. Building the IoT with IPv6 and MIPv6, Daniel Minoli, Wiley Publication, 2013
3. Sensors, Cloud, and Fog: The Enabling Technologies for the Internet of Things, Sensors, Cloud, and Fog: The Enabling Technologies for the Internet of Things, Sudip Misra, Subhadeep Sarkar, Subarna Chatterjee, CRC Press, 2019

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR
Final Year B.Tech. (COMPUTER SCIENCE & ENGINEERING)
SEMESTER - I

CS414B : Elective-II : SOFTWARE TESTING & QUALITY ASSURANCE

Teaching Scheme	**Examination Scheme**
Lectures : 3 Hours /Week, 3 Credits	ESE – 70 Marks
Tutorial : 1 Hour/Week, 1 Credit	ISE – 30 Marks
	ICA – 25 Marks

COURSE OUTCOME:

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

1. Identify what a software bug is, how serious they can be, and why they occur.
2. Test software to meet quality objectives & requirements.
3. Apply testing skills to common testing tasks.
4. Perform the planning and documentation of test efforts.
5. Describe software quality concepts, assurance & standards.
6. Use testing tools to test software in order to improve test efficiency with automation.

SECTION – I

Unit-1: Fundamentals of Software Testing (08)

Introduction, Basics of Software Testing, Approaches to Testing, Testing During Development Life Cycle, Essential of Software Testing, Features of Testing, Misconceptions About Testing, Principles of Software Testing, Test Policy, Defect Classification, Defect, Error, Mistake in Software, Defect Life Cycle, Defect Management Process, Developing Test Strategy, Developing Testing Methodologies

Unit-2: Methods of Testing (06)

Software Verification and Validation, Black-Box and White-Box Testing, Static and Dynamic Testing, Black-Box Testing Techniques-Equivalence Partitioning, Data Testing, State Testing, Other Black Box Test Techniques. White-Box Testing Techniques-Data Coverage, Code Coverage, Other White Box Test Techniques.

Unit-3: Levels of Testing (06)

Levels of Testing, Proposal Testing, Requirement Testing, Design Testing, Code Review, Unit Testing, Module Testing, Integration Testing, Big-Bang Testing, Sandwich Testing,

Unit-4: System Testing (06)

GUI Testing, Compatibility Testing, Security Testing, Performance Testing, Volume Testing, Stress Testing, Load Testing, Installation Testing, Regression Testing, Smoke Testing, Sanity Testing, Ad hoc Testing, Usability Testing, Acceptance Testing-Alpha Testing, Beta Testing, Gamma Testing.

SECTION – II

Unit-5: Test Planning & Documentation (08)

Test Planning-The goal of Test Planning, Test Planning Topics, Writing and Tracking Test Cases-The Goal of Test Case Planning, Test Case Planning Overview, Test Case Organization and Tracking, Reporting Bugs- Getting Your Bugs Fixed, Isolating and Reproducing Bugs

Unit-6: Quality Concepts & Software Quality Assurance (06)

Quality Concepts-What is Quality?, Software Quality, The Software Quality Dilemma, Achieving Software Quality, Software Quality Assurance-Background Issues, Elements of Software Quality Assurance, SQA Processes and Product Characteristics, SQA Tasks, Goals and Metrics

Unit-7 Formal Approaches to SQA (06)

Statistical SQA, Software Reliability, The ISO 9000 Quality Standards, CMM, The SQA Plan.

Unit-8: Automated Testing and Testing Tools (08)

Introduction, The Benefits of Automation and Tools, Test Tools, Software Test Automation, Random Testing, Realities of Using Test Tools and Automation Case Studies on Testing Tools-Selenium.

Internal Continuous Assessment (ICA) :

Minimum 8-10 assignments on the above topics.

Text books:

1. Software Testing Principles, Techniques and Tools By M G Limaye, Published by Tata McGrawHill Education Private Limited, Published 2009, ISBN (13): 978-0-07-013990-9, ISBN (10): 0-07-013990-3 (Chapter 1 & 3)
2. Software Testing, Second Edition By: Ron Patton, Published by SAMS, ISBN-13: 978-0672327988 ISBN-10: 0672327988 (Chapter 2, 4 & 6)
3. Software Engineering: A Practitioner's Approach by Roger S Pressman, 8 th Edition, Publisher McGraw Hill (Chapter 5)

Reference books:

1. Software Testing Principle and Practices By Ramesh Desikan, Gopalaswamy Ramesh, Pearson Education, ISBN 978-81-7758-121-8
2. Software Testing Principles and Practices By Naresh Chauhan, Publisher OXFORD UNIVERSITY PRESS-NEW DELHI, ISBN 0-19-806184-6
3. Beautiful Testing: Leading Professionals Reveal How They Improve Software By Adam Goucher, Tim Riley, Publisher O'reilly
4. Foundations of Software Testing By Rex Black, Dorothy Graham, Erik Van Veenendaal, Isabel Evans, Published by Cengage Learning India Pvt Ltd.
5. Lessons Learned in Software Testing by Cem Kaner , James Bach , Bret Pettichord, Publisher Wiley
6. Testing Computer Software Cem Kaner, Jack Falk, Hung Q. Nguyen, Publisher Wiley
7. Selenium Testing Tools Cookbook By Unmesh Gundecha Published by Packt, ISBN: 978-1-84951-574-0 8. Dr. K.V.K.K. Prasad, "Software Testing Tools: Covering Win Runner, Silk Test, Load Runner, JMeter and Test Director With Case Studies", Dreamtech Publications ISBN:10:81-7722-532-4

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR
Final Year B.Tech. (COMPUTER SCIENCE & ENGINEERING)
SEMESTER - I
CS414C : ELECTIVE II : Ad-hoc and Sensor Networks

Teaching Scheme	**Examination Scheme**
Lectures : 3 Hours /Week, 3 Credits	ESE – 70 Marks
Tutorial : 1 Hour/Week, 1 Credit	ISE – 30 Marks
	ICA – 25 Marks

COURSE PREREQUISITE:
Students should have knowledge of Data Communication and Computer Network

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COURSE OUTCOME:
At the end of this course, students will be able to
1. Understand the concept of ad-hoc and sensor networks, their applications and typical node and network architectures.
2. Describe the MAC protocol issues of ad hoc networks.
3. Identify and describe routing protocols for ad hoc wireless networks with respect to TCP design issues.
4. Explain the concepts of network architecture and MAC layer protocol for WSN.
5. Differentiate protocol designs in terms of their energy-efficiency and Quality of service.

SECTION-I

Unit 1 : Introduction (8)
Fundamentals of Wireless Communication Technology, The Electromagnetic Spectrum, Radio propagation Mechanisms, Characteristics of the Wireless channel and issues in mobile Ad hoc networks (MANETs), Cellular Ad Hoc networks.
Wireless Sensor Networks (WSNs): Concepts and architectures, Applications of Ad Hoc and Sensor Networks, Design Challenges in Ad hoc and Sensor Networks.

Unit 2 : MAC Protocols for Ad hoc Wireless Networks (8)
Issues in designing a MAC Protocol: Issues in Designing a MAC Protocol for Ad Hoc Wireless Networks , Design Goals of a MAC Protocol for Ad Hoc Wireless Networks, Classification of MAC Protocols: Contention based protocols, Contention based protocols with Reservation Mechanisms, Contention based protocols with Scheduling Mechanisms ,Multi channel MAC, IEEE 802.11.

Unit 3 : Routing Protocols for Ad hoc Networks (6)
Introduction, Issues in designing a routing protocol for ad hoc wireless networks, Classification of routing protocols:
- Table driven protocols :- Destination Sequenced Distance Vector (DSDV), Wireless Routing Protocol (WRP)
- On-demand routing protocol :- Dynamic Source Routing (DSR), Ad Hoc On-Demand Distance Vector Routing (AODV),
- Hybrid routing protocol :-Zone Routing Protocol (ZRP)

SECTION-II

Unit 4 : Transport Layer in Ad hoc Wireless Networks (6)
Transport Layer protocol for Ad Hoc networks, Design Goals of a Transport Layer Protocol for Ad hoc Wireless Networks, Classification of Transport Layer solutions, TCP over Ad hoc wireless, Network Security: Security in Ad Hoc Wireless Networks, Network Security Requirements.

Unit 5 : Wireless Sensor Networks (WSNs) and MAC Protocol (6)
Single node architecture: hardware and software components of a sensor node -WSN Network architecture: typical network architectures -data relaying and aggregation strategies -MAC layer protocols: self-organizing - Hybrid TDMA/FDMA and CSMA based MAC -IEEE 802.15

Unit 6 : Wireless Sensor Network (WSN) Routing, Localization & QOS (8)
Issues in WSN routing, OLSR, Localization: Indoor and Sensor Network localization, Absolute and relative localization, Triangulation, QOS in WSN, Energy Efficient Design, Synchronization.

Internal Continuous Assessment (ICA) :
Minimum 8-10 assignments on the above topics.

Text Books:

1. Siva Ram Murthy, and B. S. Manoj, "Ad Hoc Wireless Networks: Architectures and Protocols ", Pearson Education, 2008.
2. Labiod. H, "Wireless Adhoc and Sensor Networks", Wiley, 2008.
3. Li, X, "Wireless ad -hoc and sensor Networks: theory and applications", Cambridge University Press, 2008.

Reference Books :

1. Carlos De Morais Cordeiro, Dharma Prakash Agrawal "Ad Hoc & Sensor Networks: Theory and Applications", World Scientific Publishing Company, 2nd edition, 2011.
2. Feng Zhao and Leonides Guibas, "Wireless Sensor Networks", Elsevier Publication
3. Holger Karl and Andreas Willig "Protocols and Architectures for Wireless Sensor Networks", Wiley, 2005 (soft copy available)
4. Kazem Sohraby, Daniel Minoli, & Taieb Znati, "Wireless Sensor Networks Technology, Protocols, and Applications", John Wiley, 2007. (soft copyavailable)
5. Anna Hac, "Wireless Sensor Network Designs", John Wiley, 2003.(soft copy available)

Online Resources
1. www.wirelessnetworksonline.com
2. www.securityinwireless.com
3. www.ida.liu.se/~petel71/SN/lecture-notes/sn.pdf

Practice Aspects
1. NS2 Simulator tool

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR
Final Year B.Tech. (COMPUTER SCIENCE & ENGINEERING)
CS415A: ELECTIVE – III : BUSINESS INTELLIGENCE

Teaching Scheme	**Examination Scheme**
Lectures : 3 Hours /week, 3 credits	ESE : 70 Marks
Tutorial : 1 Hour/Week, 1 Credit	ISE – 30 Marks
	ICA – 25 Marks

COURSE OUTCOME:

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

1. Describe the basic components of BI environment.
2. Apply data mining techniques for data analysis.
3. Use ETL and BI tools for the decision support system.
4. Describe various applications of Business Intelligence.

SECTION – I

Unit 1 : Introduction to Business Intelligence (08)

Effective and timely decisions, role of mathematical models, BI architectures, ethics on BI. Introduction to data warehouse, architecture, OLAP

Unit 2 : **Decision Support System (07)**

Representation of decision making system, evolution of information system, definition and development of decision support system, mathematical models for decision making

Unit 3 : Analysis of Data Mining (10)

Definition and applications of data mining, data mining process, analysis methodologies, data preparation, data validation, data transformation, data reduction, data exploration, Univariate analysis, Bivariate analysis, Multivariate analysis.

SECTION – II

Unit 4 : Machine learning and Data analysis (06)

Regression, simple and multiple regression, validation of regression models, time series, evaluating and analysis of time series, exponential smoothing models, autoregressive models

Unit 5 : Data mining Techniques for BI (10)

Classification and its problems, evaluating classification models, classification trees, Bayesian methods, neural networks, structure of association rules, Apriori algorithm, general association rules,clustering methods, partition methods and hierarchical methods

Unit 6 : Business Intelligence Applications (10)

Marketing models: Relational marketing, Salesforce management, Business case studies, supply chain optimization, optimization models for logistics planning, revenue management system, Logistics business case studies

Internal Continuous Assessment (ICA) :

ICA shall be a continuous process based on Student's performance in – class tests, assignments, homework, subject seminars, quizzes, laboratory books and their interaction during theory.

Text Book:

1. Business Intelligence Data mining and optimization for Decision making by CarloVercellis, ISBN:978-81-265-4188-1, Wiley Publication
2. Data Mining and Business Intelligence by S.K. Shinde and Uddagiri Chandrashekhar

Reference Books:

1. Data Warehousing in the Real World – Anahory & Murray, Pearson Edt.
2. Data Warehousing Fundamentals – Ponniah [Wiley Publication]

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR
Final Year B.Tech. (COMPUTER SCIENCE & ENGINEERING)
SEMESTER - I
CS415B : ELECTIVE III : DATA MINING

Teaching Scheme	**Examination Scheme**
Lectures : 3 Hours /Week, 3 Credits	ESE – 70 Marks
Tutorial : 1 Hour/Week, 1 Credit	ISE – 30 Marks
	ICA – 25 Marks

COURSE OUTCOMES:

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

1. Examine the types of the data to be mined for a particular application.
2. Apply preprocessing statistical methods for any given raw data.
3. Select and apply proper data mining algorithms to build analytical applications
4. Comprehend the roles that data mining plays in various fields and manipulate different data mining techniques.
5. Demonstrate and apply a wide range of Clustering, Classification and association rule mining algorithms

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SECTION- I

UNIT 1: Introduction (3)

Why data Mining, What is Data Mining?, Basic data mining tasks,What kind of Data can be mined, What kinds of Patterns can be mined?, technological support for data mining, target applications of data mining, major issues in data mining, KDD process ,Data mining Vs Knowledge Discovery in Databases.

UNIT 2: Data Preprocessing (3)

Need to Preprocess the data, major tasks in Data Preprocessing, Data Cleaning, Data integration, Data Reduction, Data Transformation and Data Dicretization.

UNIT 3: Mining Frequent Patterns, Associations, and Correlations: Basic and advanced Concepts (6)

Basic Concepts, Frequent Itemset Mining Methods, Which Patterns Are Interesting? – Pattern Evaluation Methods, Pattern Mining: A Road Map, Pattern Mining in Multilevel, Multidimensional Space , Constraint-Based Frequent Pattern Mining, Pattern Exploration and Application.

UNIT 4: Classification (8)

Issues in Classification, Statistical-Based Algorithms: Regression, Bayesian Classifiers. Distance Based Algorithms: K -Nearest Neighbors Classifiers, Decision Tree Based Algorithms.

SECTION II

UNIT 5: Cluster Analysis- Basic Concept and Methods (6)

Cluster Analysis : What is Cluster Analysis?, Requirements for Cluster Analysis, Overview of Basic Clustering Methods, **Partitioning Methods**: k-Means, k-Medoids.
Hierarchical Methods : Agglomerative Algorithms and Divisive Clustering, BIRCH: Multiphase Herarchical Clustering Using Clustering Feature Trees, Evaluation of Clustering.

UNIT 6: Association Rules (6)

Introduction, Large Item sets, Basic Algorithms: Apriori Algorithm, Sampling Algorithm, Partitioning Algorithm, Parallel and Distributed Algorithms, Comparing Approaches, Incremental Rules, Advanced association rule-Techniques, Measuring the quality of rules.

UNIT 7: Web Mining **(4)**

Introduction, Web mining: Introduction, web content mining, web usage mining, web structure mining, web crawlers.

UNIT 8: Outlier Detection **(4)**

Outliers and Outlier Analysis, Outlier Detection Methods, Statistical Approaches, Clustering-Based Approaches, Classification-Based Approaches

Internal Continuous Assessment (ICA) :

Minimum 10 to 12 assignment based on above topics.

Text Books:

1. Margaret H. Dunham, "DATA MINING Introductory and Advanced Topics", PEARSON (Units 4,6)
2. Han, Kamber, Pei, "DATA MINING Concept and Techniques", 3rd Edition, ELSEVIER (Units 1,2,3,5,8)
3. Tan, Vipin Kumar, Steinbach , "Introduction to Data Mining" , PEARSON (Unit 3)
4. G. K. Gupta , \Introduction to Data mining with case studies", PHI, second edition (Unit 7)

Reference Books:

1. Galit Shmueli, Nitin Patel, Peter Bruce, "Data mining For Business intelligence" Wiley Student Edition.
2. M.Berry and G. Linoff, "Mastering Data Mining", Wiley Student Edition

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR
Final Year B.Tech. (COMPUTER SCIENCE & ENGINEERING)
SEMESTER - I
CS415C : ELECTIVE III : REAL TIME SYSTEMS

Teaching Scheme	**Examination Scheme**
Lectures : 3 Hours /Week, 3 Credits	ESE – 70 Marks
Tutorial : 1 Hour/Week, 1 Credit	ISE – 30 Marks
	ICA – 25 Marks

COURSE OUTCOME:

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

1. Choose a real time system suitable for an organization's needs.
2. Understand concepts of Real-Time systems and modeling
3. Understand and develop document on an architectural design of a real-time system
4. Develop and document, real-time operating systems , Programming Languages for Real-Time and Software Design Approaches of Real-Time Systems
5. Recognize communication techniques and Databases required for Real-Time Systems

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SECTION I

Unit 1 : Fundamentals of Real-Time Systems (04)

Concepts and misconceptions, definitions for real-time systems, usual misconceptions, multidisciplinary design challenges, influencing disciplines, birth and evolution of real-time systems, diversifying applications, advancements behind modern real-time systems, hard real time systems and soft real time systems, jobs and processors, release times, deadlines, and timing constraints, hard and soft timing constraints, hard real-time systems, soft real-time systems.

Unit 2 : Hardware for Real-Time Systems (08)

Basic Processor Architecture, Von Neumann Architecture, Instruction Processing, Input/Output and Interrupt Considerations, Architectural Advancements, Pipelined Instruction Processing, Superscalar and Very Long Instruction Word Architectures, Multi-Core Processors, Complex Instruction Set versus Reduced Instruction Set, Peripheral Interfacing, Interrupt-Driven Input/Output, Direct Memory Access, Microprocessor versus Microcontroller, Distributed Real-Time Architectures, Fieldbus Networks, Time-Triggered Architectures

Unit 3 : Real-Time Operating Systems (08)

From Pseudokernels to Operating Systems, Theoretical Foundations of Scheduling, System Services for Application Memory Management Issues, Selecting Real-Time Operating Systems,

SECTION II

Unit 4 : Programming Languages for Real-Time (08)

Coding of Real-Time Software, Assembly Language, Procedural Languages, Object-Oriented Languages, Overview of Programming Languages, Requirements Engineering Methodologies Requirements Engineering for Real-Time Systems, ,

Unit 5 : Software Design Approaches (07)

Qualities of Real-Time Software, Software Engineering Principles, Procedural Design Approach, Object-Oriented Design Approach, Life Cycle Models, Performance Analysis Techniques, Real-Time Performance Analysis

Unit 6 : Real-Time Communication (07)

Examples and basic concepts of real time communication (RTC), RTC in LAN, Soft and Hard RTC in LAN, RTC over internet, QoS models, Real-Time Databases (RTDB) Examples, basic concepts of RTDB, Temporal data, concurrency control in RTDB, Commercial RTDB

Internal Continuous Assessment (ICA) :

Minimum 8-10 assignments on the above topics.

Text Books:

1. Real-time systems Design and analysis Tools for the practitioner, Fourth edition, Phillip a. Laplante, Seppo j. Ovaska, IEEE Press
2. Real Time Systems: Theory and Practice by R Mall, Pearson Education

Reference Books :

1. Real Time Systems by C M Krishna and K G Shin, TATA McGrawHill Education Private Limited
2. Real Time Systems by Jane Liu, Pearson Education
3. Real-Time Systems Scheduling by Maryline Chetto, ISTE Wiley

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR
Final Year B.Tech. (COMPUTER SCIENCE & ENGINEERING)
SEMESTER - I
CS416 : WEB TECHNOLOGY

Teaching Scheme	**Examination Scheme**
Lectures : 2 Hours /week, 2 credits	ISE : 25 Marks
Practical: 2 Hours/ week, 1 credit	ICA: 25 Marks
	POE: 50 Marks

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1. Design web pages using HTML, CSS and Javascript.
2. Analyze client/server side scripting technologies to meet requirements of web application and choose an appropriate one.
3. Develop web application using client/server side scripting technologies for a given problem.

SECTION – I

Unit 1: UI Design **(5)**

HTML5: Features of HTML5, Designing frontend using HTML5, Designing Graphics using Canvas API, Web storage (Session and local storage).
CSS3: Features of CSS3 – Styling frontend using CSS3
JavaScript : Syntax and Semantics of JavaScript, Document Object Model, Event Handling, Browser Object Model, Form handling and validations. Object-Oriented Techniques in JavaScript.
XML, JSON –Introduction to AJAX. Introduction to JQuery and D3 JS

Unit 2:REACT JS **(5)**

Introduction, Fundamentals of React JS, Working with Lists and Conditionals, Styling React Components and Elements, Debugging React apps, Understanding Http Requests in React in context of AJAX

Unit 3: Electron JS **(5)**

Introduction, Fundamentals of Electron JS, Creating cross platform applications, Deployment of Electron JS application

SECTION – II

Unit 4: RESTful Web Services **(5)**

REST and the Rebirth of HTTP, RESTful Architectural Principles, The Object Model, Model the URIs, Defining the Data Format, Assigning HTTP Methods, JAX-RS.

Unit 5: Introduction to Server-side JS Framework – Node.js **(5)**

Introduction - What is Node JS – Architecture – Feature of Node JS - Installation and setup - Creating web servers with HTTP (Request & Response) – Event Handling - GET & POST implementation - Connect to Data storage using Node JS – Implementation of CRUD operations.

Unit 6: PHP and MySQL **(5)**

Introduction to PHP 5 and PHP 6, variables and constants, program flow, functions, arrays and files and directories, Forms and Databases, integration with MySQL applications on PHP

ISE Evaluation: ISE Evaluation for the course will consists of three programming (hands on) tests.

Internal Continuous Assessment (ICA) :

1. Minimum 12 assignments based on above topics.
2. Objective of assignments should be to test students' understanding and assess their ability to put into practice the concepts and terminologies learned.
3. Assignments must be of nature, which require students to identify the use case scenarios for using technologies mentioned in the syllabus.

Text Books /Reference Books:

1. Ben Frain ,"Responsive Web Design with HTML5 and CSS3", Packt Publication
2. Jon Duckett, "JavaScript and JQuery: Interactive Front-End Web Development"
3. Official documentation of OpenAPI standard http://spec.openapis.org/oas/v3.0.3
4. Official documentation of Electron JS https://www.electronjs.org/docs
5. Official documentation of React JS https://reactjs.org/docs/getting-started.html
6. Official documentation of PHP https://www.php.net/docs.php
7. Godbole, Khate, "Web Technologies" McGraw Hill publication

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR
Final Year B.Tech. (COMPUTER SCIENCE & ENGINEERING)
SEMESTER - II
CS421 : MANAGEMENT INFORMATION SYSTEM

Teaching Scheme	**Examination Scheme**
Lectures : 4 Hours /Week, 3 Credits	ESE – 70 Marks
	ISE – 30 Marks

COURSE OUTCOME:

1) Student can elaborate basic infrastructure and strategies used in information systems.
2) Student can apply professional ethical codes of conduct as appropriate to industry and organizational environments
3) Students can design information systems using principles of Communication Technologies.
4) Students will be able to develop secure information systems

SECTION-I

Unit 1 - Information Systems in Global Business Today
(09)

The Role of Information Systems in Business Today,
How information systems are transforming business, What is new in information system.
Business Processes and Information systems, Systems for collaboration and social business, Tools and technologies for collaboration and social business

Unit 2 - Information Systems, Organizations, and Strategy
(08)

Organizations and it's features, How Information Systems Impact on Organizations, Competitive strategies using information systems, Challenges posed by strategic information systems

Unit 3 - Ethical and Social Issues in Information Systems
(08)

Understanding Ethical, Social, political issues raised by information systems, principles for conduct in ethical decisions, Contemporary information systems technology. Challenges to the protection individual privacy and intellectual property.

SECTION-II

Unit 4 - IT Infrastructure and Emerging Technologies (08)

IT Infrastructure, Infrastructure Components, Contemporary Hardware Platform Trends, Contemporary Software Platform Trends, Management Issues

Unit 5 - Foundations of Business Intelligence: Databases and Information Management (10)

Organizing Data in a Traditional File Environment, Major Capabilities of Database Management Systems, Using Databases to Improve Business Performance and Decision Making, Managing Data Resources, Telecommunications, the internet, and Wireless Technology: Principles Components of Telecommunications Network & Ket Networking Technologies, Different types of networks, principle technologies and standards for wireless networking, communication, internet access.

Unit 6 - Security Management of Information Technology (09)

Introduction, Tools of Security Management, Internetworked Security Defenses, Encryption, Firewalls, Denial of Service Attacks,, E-mail Monitoring, Other Security Measures, security codes, Security Monitors, Fault Tolerant Systems, and Disaster Recovery, System Control & Audits, Information Systems Controls, Auditing IT Security.

Unit 7 - E-commerce: Digital Markets, Digital Goods (08)

Features of e-commerce. Digital Markets, Digital Goods**,** principles ecommerce business and revenue models, e-commerce transformed marketing, e-commerce business-to-business transaction, Role of M-commerce in business & its applications, issues related building e-commerce.

Text Book:

1. Management Information Systems : Managing the Digital Firm, 15th Edition by Kenneth C. Laudon and Jane Laudon, Pearson Education
2. Management Information Systems: James A O'Brien, George M Marakas, Ramesh Behi. (Tenth Edition), McGraw Hill Publication.

Reference Books:

1. Information Technology for Management: Transforming Organizations in the Digital Economy, Efraim Turban,6th Edition, Wiley Edition
2. Management Information Systems: Shubhalakshmi Joshi, Smita Vaze, Biztantra

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR
Final Year B.Tech. (COMPUTER SCIENCE & ENGINEERING)
SEMESTER - II
CS422 : INFORMATION & CYBER SECURITY

Teaching Scheme	**Examination Scheme**
Lectures : 4 Hours /Week, 3 Credits	ESE – 70 Marks
Practical : 2 Hours / Week, 2 Credits	ISE – 30 Marks
	ICA – 25 Marks
	POE – 50 Marks

COURSE OUTCOME:

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

1. Apply security technologies and policies to protect digital information.
2. Identify & evaluate Information security threats &vulnerabilities in information system and apply security measures to real time scenario.
3. Demonstrate the use of standards and cyber laws to enhance information security in the development process and infrastructure protection.
4. Understand emerging abstract models for Blockchain Technology.

SECTION – I

Unit 1 : Symmetric Ciphers (07)

Overview – Services, Mechanism and Attacks, OSI Security Architecture, A model for Network security, Classical Encryption techniques – Symmetric Cipher model, Substitution. Techniques, Transposition techniques, Rotor Machines.

Unit 2 : Block Cipher and Data Encryption Standard (07)

Simplified DES, Block Cipher principles, The Data Encryption Standard, The strength of DES, Differential and Linear Cryptanalysis, Block Cipher design principles, Block Cipher Mode of Operation.

Unit 3 : Public Key Cryptography (08)

Public Key Cryptography and RSA – Principles of Public Key Cryptosystems, The RSA Algorithm, Key management - Other public key cryptosystems – Key Management, Diffie- Hellman Key Exchange.

Unit 4 : Message Authentication and HASH Functions (08)

Authentication requirements, Authentication Functions, Message Authentication Codes, Hash Functions, security of Hash Functions and MACS Digital Signatures. Authentication Protocols– Digital Signatures, Authentication Protocols, Digital Signature Standard.

SECTION – II

Unit 5 : IP Security and E-Mail Security (07)

IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security payload, Combining Security Associations, Key Management, Secure Socket Layer and Transport Layer Security. Electronic Mail Security – Secure Electronic Transaction, Pretty Good Privacy, S/MIME

Unit 6 : Introduction to block chain (10)

Introduction, Advantage over conventional distributed database, Blockchain Network, Mining Mechanism, Distributed Consensus, Merkle Patricia Tree, Gas Limit, Transactions and Fee, Anonymity, Reward, Chain Policy, Life of Blockchain application, Soft & Hard Fork, Private and Public blockchain.

Distributed Consensus : Nakamoto consensus, Proof of Work, Proof of Stake, Proof of Burn, Difficulty Level, Sybil Attack, Energy utilization and alternate.

Unit 7 : Bitcoin **(06)**

Wallet - Blocks - Merkley Tree - hardness of mining - transaction verifiability - anonymity - forks - double spending - mathematical analysis of properties of Bitcoin

Unit 8 : Cyber law and forensic **(07)**

Introduction, Cyber security regulation, role of International law, the state and private sector in cyberspace, cyber security standards, the Indian cyberspace, Introduction to forensic, cyber evidence, web attack investigation, internet crime investigation, internet forensics.

Internal Continuous Assessment (ICA) :

It should consist of the 08 practical based on following guidelines

1. Implementation of Substitution Cipher
2. Implementation of Poly alphabetic Cipher (Vigenere Cipher and Vernam Cipher)
3. Implementation of Transposition Cipher
4. Implementation of Play fair Cipher
5. Implementation of Secure file transfer in Client/Server environment (use any one of above method for encryption and decryption)
6. Write a program to simulate RSA algorithm
7. Install and understand docker container
8. Create and deploy a block chain network
9. Study different cybercrimes and implement a system to detect any one cyber crime

Text Book:

1. Williams Stallings–Cryptography and Network security principles and practices. Pearson Education (LPE) (Unit 1 to 5)
2. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press (July 19, 2016).
3. Melanie Swan : Blockchain : Blueprint for a New Economy : 2015
4. Neena Godbole, Information System Security"

Reference Books:

1. Behroz A. Forozan, Debdeep Mukhopadhyay, "Cyber and Network Security" McGraw Hill Education, 2nd Edition.
2. Atul Kahate, "Cyptography and Network Security" McGraw Hill Education 3rd Edition
3. Schneir, Bruce, "Applied Cryptography: Protocols and Algorithms"

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR
Final Year B.Tech. (COMPUTER SCIENCE & ENGINEERING)
SEMESTER - II
CS423A : ELECTIVE – IV : BIG DATA ANALYTICS

Teaching Scheme	**Examination Scheme**
Lectures: 3 Hours /Week, 3 credits	ESE - 70 Marks
Practical: 2 Hour/Week, 1 credit	ISE - 30 marks
	ICA - 25 marks

COURSE OUTCOMES:

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

1. Comprehend limitations of conventional DBMS and recognize need for Big Data Analytics.
2. Compare Big data processing technologies and choose appropriate one for a given scenario.
3. Use Various Big data technologies for Big data analytics
4. Write Map Reduce program to process Big Data.

SECTION – I

Unit 1: Introduction to Types of Digital Data (4)

Classification of Digital Data, Structured Data, Sources of structured data, Ease with Structured data, Semi-Structured data, sources of semi-structured data, Unstructured data, sources of unstructured data, Issues with terminology, Dealing with unstructured data, Place me in the basket.

Unit 2: Introduction to Big Data (4)

Big data, What is big data? Why big data?, Other characteristics of data which are not definitional traits of big data, Challenges with big data, Big data stack, Exercises - Puzzle, Fill in the blanks.

Unit 3: Big Data Analytics (6)

Big Data Analytics, Analytics 1.0, Analytics 2.0, Analytics 3.0, Traditional BI vs. Big Data Environment, Terminologies used in Big Data Environment, Big Data Technology Landscape, NoSQL Databases, NoSQL Vs. RDBMS, NewSQL, Hadoop, Hadoop 1.0 vs. Hadoop 2.0, Exercises, Data Science is multidisciplinary, Data Scientist - Your new best friend.

Unit 4: Introduction to Hadoop (10)

Introducing Hadoop, Why not RDBMS, Distributed Computing Challenges, A Brief History of Hadoop, Hadoop Overview, Hadoop Components, High Level Architecture of Hadoop, Hadoop Distributed File System, HDFS Architecture, Daemons Related to HDFS, Working with HDFS Command, Special Features of Hadoop, Processing Data With Hadoop, Introduction How Map Reduce Works, Map Reduce Example, Word Count Example using Java Managing Resources and Applications with YARN Introduction, Limitation of Hadoop 1.0, Hadoop 2: HDFS, Hadoop 2: YARN, Interacting with Hadoop EcoSystem Hive, Pig, HBase, Sqoop.

SECTION – II

Unit 5: Introduction to MongoDB (4)

Recap of NoSQL databases, MongoDB – CRUD, MongoDB- Arrays, Java Scripts, Cursors, Map Reduce Programming, Aggregations.

Unit 6: Introduction to Cassandra (4)

Features of Cassandra, CQLSH - CRUD, Collections, Counter, List, Set, Map, Tracing.

Unit 7: Introduction to Hive (8)

What is Hive? History of Hive and Recent Releases of Hive, Hive Features, Hive Integration and Work Flow, Hive Data Units, Hive Architecture, Hive Primitive and Collection Data Types, Hive

File Format, Hive Query Language(HQL)–Statements – DDL,DML. Hive Partitions – Bucketing, Views, Sub Query, Joins, Hive User Defined Function, Aggregations in Hive, Group by and Having, Serialization and Deserialization, Hive Analytic Functions.

Unit 8: Introduction to Pig (4)

Introducing Pig, History and Anatomy of Pig, Pig on Hadoop, Pig Philosophy, ETL Processing, Pig Latin Overview, Word count example using Pig.

Internal Continuous Assessment (ICA) :

- Objective of assignments should be to test students understanding and assess their ability to put into practice the concepts and terminologies learned.
- Assignments must be of nature, which require students to identify the use case scenarios for using technologies mentioned in syllabus.
- It should consist of the 08-10 practical based on following guidelines

1. Basic big data operations using NumPy, SciPy & Pandas.
2. Implementation of Plotting, Filtering and Cleaning a CSV File Data Using NumPy & Pandas.
3. Linear Regression using WEKA.
4. Implement multidimensional visualization by adding variables such as color, size, shape, and label by using Tableau.
5. Apply Filters on Dimensions and Measures for any dataset using tableau.
6. Apply K-means Clustering on iris dataset in tableau.
7. Integrate R with tableau for data visualization.
8. Simple MongoDB and its CRUD Operations
9. Performing import, export and aggregation in MongoDB.
10. Performing CRUD operations using Cassandra.
11. Store the login details of the user such as UserID and Password. The information stored should expire in a day's time using time to live (TTL).
12. Map-Reduce Programming examples
13. Partitioning and processing using Hive.
14. Perform group by, order by, sort by, cluster by, distribute by queries using Hive.
15. Find out frequency of each word (word count) using pig.

Text Book :

1. Big Data and Analytics, Seema Acharya, Subhashini Chellappan, - Wiley India Pvt. Ltd.
2. Hadoop: The Definitive Guide, 3rd Edition, Tom White , - O'reilly Media.
3. Programming Hive, Edward Rutherglen, Dean Wampler, Jason Rutherglen, Edward Capriolo. - O'reilly Media.
4. The Definitive Guide to MongoDB: A Complete Guide to Dealing with Big Data Using MongoDB (Definitive Guide Apress) 2e by David Hows, Eelco Plugge, Peter Membrey, Tim Hawkins.
5. Programming Pig, by Alan Gates - O'reilly Media.
6. Cassandra: The Definitive Guide, Eben Hewitt - O'reilly Media.

Reference Book :

1. Big Data For Dummies, Judith Hurwitz, Alan Nugent, Dr. Fern Halper, Marcia Kaufman, Wiley Brand.
2. Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses (Wiley CIO), Michael Minelli, Michele Chambers, Ambiga Dhiraj : John Wiley & Sons.
3. Mining of Massive Datasets, Anand Rajaraman, Jure Leskovec, Jeff rey D. Ullman, Cambridge University Press.
4. Hadoop in Action, Chuck Lam, Dreamtech Press, ISBN : 978-81-7722-813-7.

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR
Final Year B.Tech. (COMPUTER SCIENCE & ENGINEERING)
SEMESTER - II
CS423B : ELECTIVE – IV : NATURAL LANGUAGE PROCESSING

Teaching Scheme	**Examination Scheme**
Lecture: 3 Hours /Week, 3 Credits	ESE – 70 Marks
Practical : 2 Hours/Week, 1 Credits	ISE – 30 Marks
	ICA - 25 Marks

COURSE OUTCOMES:

At the end of the course students will be able to

1. Demonstrate the fundamental mathematical models and algorithms in the field of NLP.
2. Apply these mathematical models and algorithms in applications of software design and implementation for NLP.
3. Use tools to analyze language resource annotation and apply to data for acquiring intended information.
4. Design and implement various NLP applications.

SECTION-I

Unit 1 Introduction (6)

Introduction to NLP, Machine Learning and NLP, Biology of Speech Processing; Place and Manner of Articulation, Word Boundary Detection, Arg-Max Computation, Lexical Knowledge Networks.

Unit 2 Word-net Theory (6)

Semantic Roles , Word Sense Disambiguation (WSD) : Word-Net, Word-net Application in Query Expansion , Wiktionary, semantic relatedness , Measures of Word-Net Similarity, Similarity Measures . Resnick's work on Word-Net Similarity, Indian Language Word-nets and Multilingual Dictionaries, Multi-linguality, Metaphors, Co references

Unit 3 Theories of Parsing (6)

Parsing Algorithms , Evidence for Deeper Structure, Top Down Parsing Algorithms, Noun Structure, Non-noun Structure and Parsing Algorithms, Robust and Scalable Parsing on Noisy Text as in Web documents Probabilistic parsing, Hybrid of Rule Based and Probabilistic Parsing sequence labeling, Training issues , Arguments and Adjuncts , inside-outside probabilities , Scope Ambiguity and Attachment Ambiguity resolution.

Unit 4 Speech (6)

Phonetics, HMM, Morphology, Morphology fundamentals; Morphological Diversity of Indian Languages; Morphology Paradigms; Finite State Machine Based Morphology; Automatic Morphology Learning; Shallow Parsing; Named Entities; Maximum Entropy Models; Random Fields.

SECTION-II

Unit 5 Graphical Models (6)

Graphical Models for Sequence, Labelling in NLP, Consonants (place and manner of articulation) and Vowels , Forward Backward probability, Viterbi Algorithm

Unit 6 Phonology (6)

Sentiment Analysis and Opinions on the Web, Machine Translation and MT Tools - GIZA++ and Moses. Text Entailment, POS Tagging. ASR, Speech Synthesis, Precision, Recall, F-score, Map.

Unit 7 Semantic Relations **(6)**

UNL, Towards Dependency Parsing, Universal Networking Language, Semantic Role Extraction, Baum Welch Algorithm, HMM and Speech Recognition. HMM training, Baum Welch Algorithm; HMM training

Unit 8 Applications **(6)**

Sentiment Analysis; Text Entailment; Robust and Scalable Machine Translation; Question Answering in Multilingual Setting; Cross Lingual Information Retrieval (CLIR)..

Internal Continuous Assessment (ICA) :

ICA shall include the following:

1. Perform sentiment analysis of tweets using logistic regression and then naïve Bayes.
2. Use vector space models to discover relationships between words and use PCA to reduce the dimensionality of the vector space and visualize those relationships,
3. Write a simple English to French translation algorithm using pre-computed word embeddings and locality sensitive hashing to relate words via approximate k-nearest neighbor search.
4. Create a simple auto-correct algorithm using minimum edit distance and dynamic programming,
5. Apply the Viterbi Algorithm for part-of-speech (POS) tagging, which is important for computational linguistics,
6. Write a better auto-complete algorithm using an N-gram language model,
7. Write your own Word2Vec model that uses a neural network to compute word embeddings using a continuous bag-of-words model.
8. Train a neural network with GLoVe word embeddings to perform sentiment analysis of tweets,
9. Generate synthetic Shakespeare text using a Gated Recurrent Unit (GRU) language model,
10. Train a recurrent neural network to perform named entity recognition (NER) using LSTMs with linear layers,
11. Use so-called ‘Siamese’ LSTM models to compare questions in a corpus and identify those that are worded differently but have the same meaning.
12. Translate complete English sentences into German using an encoder-decoder attention model,
13. Build a Transformer model to summarize text,
14. Use T5 and BERT models to perform question-answering
15. Build a chatbot using a Reformer model.

Text Books:

1. Allen, James, “Natural Language Understanding”, Second Edition, Benjamin/Cumming, 1995.
2. Charniack, Eugene, “Statistical Language Learning”, MIT Press, 1993.
3. Jurafsky, Dan and Martin, James, Speech and Language Processing, Second Edition, Prentice Hall, 2008.
4. Manning, Christopher and Heinrich, Schutze, Foundations of Statistical Natural Language Processing, MIT Press, 1999.

Reference Books:

1. Jurafsky, D., and Martin, J.H. (2008). “Speech and Language Processing” (2nd Edition). Upper Saddle River, NJ: Prentice Hall
2. Bird, S., Klein, E., Loper, E. (2009). “Natural Language Processing with Python”. Sebastopol, CA: O'Reilly Media.
3. Radford, Andrew et. al., “Linguistics, An Introduction”, Cambridge University Press, 1999.

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR
Final Year B.Tech. (COMPUTER SCIENCE & ENGINEERING)
SEMESTER - II
CS424A : ELECTIVE – V : CLOUD COMPUTING

Teaching Scheme	**Examination Scheme**
Lectures: 3 Hours /Week, 3 credits	ESE - 70 Marks
Practical: 2 Hour/Week, 1 credit	ISE - 30 marks
	ICA - 25 marks

COURSE OUTCOME:

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

1. Choose a cloud service delivery model suitable for an organization's hardware & software needs.
2. Choose a cloud deployment model suitable for an organization's hardware & software needs.
3. Determine financial implications for selecting a cloud computing platform.
4. Determine technological implications for selecting a cloud computing platform.
5. Address Security and Privacy concerns for a given cloud application scenario.

SECTION I

Unit 1: Overview of Cloud Computing (5)

History of Cloud Computing, Evolution of Cloud Computing, Traditional vs. Cloud Computing. Why Cloud Computing, Cloud service models (IaaS, PaaS & SaaS). Cloud deployment models (Public, Private, Hybrid and Community Cloud), Benefits and Challenges of Cloud Computing, Role of virtualization in Cloud Computing.

Unit 2: Working with Private Cloud (10)

Private Cloud Definition, Characteristics of Private Cloud, Private Cloud deployment models, CloudStack: architecture and its compute, storage, networking, and IAM services, OpenStack: architecture and its compute, storage, networking, and IAM services. Designing elastic, highly available, and resilient infrastructure using OpenStack and CloudStack for varied application scenarios. Financial and technological implications of running an application on private cloud.

Unit 3: Working with Public Clouds (10)

What is Public Cloud, Why Public Cloud, When to opt for Public Cloud, Public Cloud Service Models, and Public Cloud Vendors and offerings (IaaS, PaaS, SaaS). Basic compute, storage, networking and IAM services of AWS, Microsoft Azure and Google Cloud platform. Designing elastic, highly available, and resilient infrastructure for varied application scenarios on AWS, Microsoft Azure and Google Cloud platform. Financial and technological implications of running an application on public cloud.

Unit 4: Overview of Cloud Security (8)

Explain the security concerns in Traditional IT, Introduce challenges in Cloud Computing in terms of Application Security, Server Security, and Network Security. Security reference model, Abuse and Nefarious Use of Cloud Computing, Insecure Interfaces and APIs, Malicious Insiders, Shared Technology Issues, Data Loss or Leakage, Account or Service Hijacking, Unknown Risk Profile, Shared security model between vendor and customer in IAAS/PAAS/SAAS.

Unit 5 : Cloud Computing for Business **(7)**

Why Cloud, business perspective? Establishing your Cloud Vision, Buying Cloud Services Understanding Cloud Risk, Building ROI from Cloud Computing, The Challenge, Cloud Computing in Use.

Unit 6 : Migration to Cloud **(5)**

When and not to migrate to Cloud, Migration paths for cloud, Selection criteria for cloud deployment, Issues/risks in migrating to cloud computing.

Internal Continuous Assessment (ICA):

Minimum 15 assignments. Assignments must be of higher cognitive levels than the cognitive levels addressed in course outcomes.

Text Book:

1. Cloud Computing: Principles and paradigms By Raj Kumar Buyya, James Broberg, Andrezei M.Goscinski, 2011 Cloud Computing, By Michael Miller, 2008.
2. The Open Group Cloud Computing publications http://www.opengroup.org/cloud/cloud/index.htm (eResource)
3. Official documentation of OpenStack, CloudStack, AWS, Microsoft Azure, Google Cloud Platform.

Reference Book :

1. Cloud Security, A comprehensive Guide to Secure Cloud Computing by Krutz, Ronald L.; Vines, Russell Dean
2. Cloud computing: Implementation, management and security By Rittinghouse, John, W.
3. Mastering Cloud Computing, Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, McGraw Hill, 2013
4. Cloud Computing for dummies, By Judith Hurwitz, Robin Bllor, Marcia Kaufman, Fern Halper, 2009.
5. Cloud Computing: A Practical Approach, By Anthony T. Velte, Toby J. Velte, and Robert Elsenpeter, McGraw Hill, 2010.

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR
Final Year B.Tech. (COMPUTER SCIENCE & ENGINEERING)
SEMESTER - II
CS424B : ELECTIVE – V : DEEP LEARNING

Teaching Scheme	**Examination Scheme**
Lectures: 3 Hours /Week, 3 credits	ESE - 70 Marks
Practical: 2 Hour/Week, 1 credit	ISE - 30 marks
	ICA - 25 marks

Course Outcomes:

1) Students will be able to describe the deep neural network.
2) Students will be able to design a deep neural network for a given problem.
3) Students will be able to design a convolutional neural network for a given problem.
4) Students will be able to design a recurrent neural network for a given problem.
5) Students will be able to choose appropriate deep neural network architecture for a given problem.

SECTION - I

Unit 1 **(07)**

Historical trends in deep learning – Machine Learning basics, Learning algorithms – Supervised and Unsupervised Training, Linear Algebra for machine learning, Testing - Cross Validation, Dimensionality Reduction, Over fitting /Under Fitting, Hyper parameters and validation sets Estimators – Bias – Variance, Loss Function—Regularization, Biological Neuron – Idea of Computational units, McCulloch-Pitts units and Thresholding logic, Linear Perceptron, Perceptron Learning Algorithm, Convergence theorem for Perceptron Learning Algorithm, Linear Separability Multilayer perceptron –The first example of network with Keras code, Backpropagation

Unit 2 **(10)**

Introduction to Simple DNN, Platform for Deep Learning, Deep Learning Software Libraries, Deep Feed Forward Networks Introduction, Learning XOR, Gradient-Based Learning, Various Activation Functions, ReLU, Sigmoid – Error Functions. Architecture Design, Differentiation Algorithms, Regularization methods for Deep Learning, Early Stopping, Drop Out, Difficulty of training deep neural networks, Greedy layer wise training, Optimization methods for Neural Networks-Adagrad, Adam

Unit 3 **(10)**

Convolution Neural Networks Introduction, Convolution Operation, Motivation, Pooling, Normalization, Applications in Computer Vision – ImageNet, Sequence Modelling –VGGNet, LeNet, Recurrent Neural Networks, RNN topologies- Difficulty in Training RNN, Long Short Term Memory, Bidirectional LSTMs, Bidirectional RNNs, Application case study -Handwritten digits recognition using deep learning.

SECTION - II

Unit 4 **(10)**

Encoder, Decoder, Auto Encoders Introduction, Auto Encoders, Under Complete Auto Encoder, Regularized Auto Encoder, Stochastic Auto Encoder, Denoising Auto Encoder, Contractive Auto Encoder, Auto Encoder Applications, Dimensionality Reduction and Classification using Auto encoders, Recommendation, Optimization for Deep Learning-Optimizers–RMS prop for RNNs, SGD for CNNs, Application case study – Image dimensionality reduction using encoders.

Unit 5 **(08)**

Deep Architectures in Vision, AlexNet to ResNet, Transfer Learning, Siamese Networks, Metric Learning, Ranking / Triplet Loss, RCNNs with Keras, CNN-RNN, Application case study – Image recognition using RCNN and transfer learning.

Internal Continuous Assessment (ICA):

Minimum 15 assignments requiring students to design, implement and validate deep learning based machine learning models using openly available deep learning libraries or any other machine learning toolkits. The assignment's objective should align with course's outcomes and focus on higher order bloom's cognitive levels.

Textbooks:

1. Deep Learning by Ian Goodfellow, Yoshua Bengio and Aaron Courville, MIT Press.
2. Machine Learning A Probabilistic Perspective by Kevin P. Murphy, MIT Press.
3. Deep Learning Methods and Applications by Li Deng and Dong Yu, NOW Publishers.
4. Keras: The Python deep learning API https://keras.io/ (eResource)

Reference Books:

1. Deep Learning by Rajiv Chopra, 2nd edition, Khanna Publishing.

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR
Final Year B.Tech. (COMPUTER SCIENCE & ENGINEERING)
SEMESTER - II
CS425 PROGRAMMING IN C#.NET

Teaching Scheme	**Examination Scheme**
Lectures – 2 Hours/week, 2 Credits	ISE – 25 Marks
Practicals – 2 Hour/week,1 Credit	ICA – 25 Marks
	POE – 50 Marks

Introduction :

This course introduces C# programming language. C# is an elegant and type-safe object-oriented language that enables developers to build a variety of secure and robust applications that run on the .NET Framework. You can use C# to create Windows client applications, XML Web services, distributed components, client-server applications, database applications, and much, much more. Visual C# provides an advanced code editor, convenient user interface designers, integrated debugger, and many other tools to make it easier to develop applications based on the C# language and the .NET Framework.

Course Prerequisite :

C# programming is very much based on C and C++ programming languages, Students must have a basic understanding of C or C++ programming, then it will be fun to learn C#. To start with C#, first install Visual Studio.

COURSE OUTCOMES:

At the end of this course students will be able to

1. Implement Object Oriented Programming paradigm using C# language.
2. Exhibit the ability to use .net runtime library APIs to provide a solution to a given problem.
3. Test and debug a C# program for a given problem.

SECTION-I

Unit-1 : Introduction to .NET Framework (03)

The .NET architecture, The common language runtime (CLR), the, Microsoft intermediate Language code (MSIL), Just in time Compliers, The framework class library, The common language specification, common language type system (CTS), Introduction to Visual Studio .NET IDE.

Unit-2: C# Application Basics and Language fundamentals (04)

Creating and compiling C# programs using command line compiler (csc.exe), Creating applications using IDEs, Namespaces, the "using" keyword , Basic data types, Operators, Flow control and conditional statements, loops, Arrays ,Classes and Objects, Constructor overloading, Methods, Fields, Properties, Access Modifiers and Accessibility Levels, Static methods and fields, Garbage Collection, Structures, Nested Classes, String Manipulations, Naming Conventions, Java vs. C#.

Unit-3 : Object Oriented Concepts and Exception Handling using C# (06)

Objects and Reference Types, Inheritance, Interfaces and Abstract Classes, Polymorphism, the "virtual" and "override" keyword, the "base " keyword, the "sealed " keyword, The Object Class, the"new" keyword in context of method overriding, Type Casting: Up casting and Down casting, the "is" and "as" keywords, Boxing and Unboxing, Need for Exceptions, Exception Hierarchy, HandlingExceptions using try-catch-finally blocks, creating and defining Custom Exceptions, the "throw" keyword.

Unit-4 : Delegates Events and Multithreading (**04**)

Events and Delegates in C#, Multicast Delegate, Event Handling What is Multithreading, Multithreading in C#, Static and Instances members of Thread Class, Basic Thread operations, Thread priorities, Thread Synchronization.

SECTION II

Unit-5 : File System and Streams, Generics (**04**)

Streams and System.IO namespace, Console IO, Reading writing and updating files and directories, System.IO.FileInfo Class, Serialization and Deserialization.

Generics: Introduction to Generics, Benefits of Generics, Generic Type Parameters, Constraints on Type Parameters, Generic Classes, Generic Interfaces, Generic Methods, Generics and Arrays Generic Delegates

Unit-6 : GUI Programming in C# (**04**)

Windows Forms and System.Windows.Form namespace, Building Windows Forms Applications using IDE, Windows Form controls , Event Handling , List Box , Combo Box, Tree View, File Dialog, Tool Bar, Windows standard Dialog Boxes, Menu Bar.

Unit-7 : Data access using ADO.NET (**04**)

Introduction to ADO.NET, System.Data namespace, DataSet, DataTable, DataRow, DataColumn and other prominent classes, Accessing and Updating Data using ADO.NET

Unit-8 : Introduction ASP.NET and MVC (**06**)

Introduction to ASP.NET , State management in ASP.NET,ASP.NET Web Forms, Server Controls, Web application configuration. Creating Web applications using ASP.NET and C#. Web Applicationusing MVC Pattern, Razor View, Controller, Model

ISE Evaluation: ISE Evaluation for the course will consists of three programming (hands on) tests.

Internal Continuous Assessment (ICA):

Students will be expected to successfully complete a group of C# projects. The projects will include the following:

1. Windows application using windows controls and events
2. Web application (ASP.NET)
3. ADO.NET database application
4. Building and using classes, events, methods, properties.

Text Books:

1. Professional C#, 3rd Edition -Simon Robinson, Christian Nagel, Karli Watson, Jay Glynn,Morgan Skinner, Bill Evjen, Wrox Press - Wiley India.
2. Programming in C#: A Primer 3 Edition -E Balagurusamy, Tata McGraw - Hill Education

Reference Books:

1. C# Language Specification Version 5.0 Microsoft. (E-Resource available athttp://www.microsoft.com)
2. C# Programming Guide MSDN, Microsoft. (http://msdn.microsoft.com/en-US/)
3. Microsoft Visual C# Step by Step 2010 - John Sharp, Microsoft Press.