D. Y. Patil College of Engineering and Technology,

Kasaba Bawada, Kolhapur

(An Autonomous Institute)

NBA Accredited

Accredited by NAAC with 'A' Grade

Structure and Syllabus

of

Final Year B. Tech. in Computer Science and Engineering

Department of Computer Science and Engineering

Effective from Academic year 2023-24

D. Y. PATIL COLLEGE OF ENGINEERING & TECHNOLOGY, KOLHAPUR
Teaching and Evaluation Scheme from Year 2023-24
Final Year B. Tech. - Computer Science & Engineering
SEMESTER-VII

Sr. No	Course Code	Course Type	Name of the Course	Lecture	Tutorial	Practical	Credits	Total Marks	Type	Max. Mark	Min. for Passing	
1	201CSL401-404	PEC	Professional Elective-III	3	-	-	3	100	ISE	20	20	40
									MSE	30		
									ESE	50	20	
2	201CSL405-408	PEC	Professional Elective-IV	3	-	-	3	100	ISE	20	20	40
									MSE	30		
									ESE	50	20	
3	201CSL409-410	OEC	Open Elective-II	3	1	-	4	100	ISE	20	20	40
									MSE	30		
									ESE	50	20	
4	201CSP411	PCC	Advanced Programming Laboratory - II	2	-	4	4	100	ISE	50	20	40
									ESE-POE	50	20	
5	201CSP412-419	PEC	Professional Elective Laboratory - I	-	-	4	2	50	ISE	50	20	20
6	201CSP420	PROJ	Internship	-	1$	-	4	100	-	-	-	-
7	201CSP421	PROJ	Project - IV	-	-	6*	3	100	ISE	50	20	40
									ESE-OE	50	20	
Total				11	2	14*	23	550				220

Professional Elective-III		
Sr. No	Course Code	Course Name
1	201CSL401	Advanced Database Systems
2	201CSL402	Data Mining
3	201CSL403	High Performance Computing
4	201CSL404	Social Media Analytics

Professional Elective-IV		
Sr. No	Course Code	Course Name
1	201CSL405	Software Architectures
2	201CSL406	Machine Learning
3	201CSL407	Cyber Security and Digital Forensics
4	201CSL408	Block chain Technology

Open Elective-II

- **List Attached**

Note -

- Practical batch size should be considered as 15 students per batch.
- * - For Project - IV, consider the workload of 2 hours per week for each project group consisting of 5 students.
- $ - Faculty workload of 1 hour for batch of 10 students per week will be considered for Internship to evaluate the work done during Internship after ESE of Sem.-IV/ Sem.-VI.
- The elective should be offered by the department, if the minimum number of students opting for a particular elective is 15 students and it should be taught by the concerned teacher.
- ISE: In Semester Evaluation, MSE: Mid Semester Examination, ESE: End Semester Examination

Open Elective II Course List:

Open elective courses are offered to gain the knowledge of multidisciplinary areas. Students must choose one open elective course from the list of courses offered by other departments (excluding open elective courses offered by their department). Following is the list of Open Elective-II courses. The detailed syllabus is available on to the college website under academic tab.

Sr. No.	Department	Course Code	Course Name
1	Electronics & Telecommunication Engineering	201ETL409	Biomedical Instrumentation
2		201ETL410	Electronic Automation
3	Civil Engineering	201CEL415	GPS & Remote Sensing
4		201CEL416	Smart Cities
5	Mechanical Engineering	201MEL406	Industrial Management
6		201MEL407	Computer Integrated Manufacturing System
7	Chemical Engineering	201CHL405	Fuel Cell Technology
8		201CHL406	Industrial Behavior and Practices
9	Data Science	201DSL404	Business Intelligence & Analytics
10		201DSL405	Data Visualization and Storytelling
11	Artificial Intelligence & Machine Learning	201AIMLL405	AI For Everyone
12		201AIMLL406	Machine Learning with Python
13	Architecture	201AR408-A	Low Cost Housings
14		201AR408-B	Sustainable Community Living

Semester-VIII

Student can choose any one track for the **Semester-VIII** from the following –

1. Regular Academic Track –

- This is the regular academic track where lectures, practical and project – V work will be conducted regularly as per the time table in the department and college campus.
- Practical batch size should be considered as 15 students per batch
- * - For Project - V, consider the workload of 2 hours per week for each project group consisting of 5 students.
- The elective should be offered by the department, if the minimum number of students opting for a particular elective is 15 students and it should be taught by the concerned teacher.
- ISE: In Semester Evaluation, MSE: Mid Semester Examination, ESE: End Semester Examination

<table>
<tr><td colspan="14">D. Y. PATIL COLLEGE OF ENGINEERING & TECHNOLOGY, KOLHAPUR
Teaching and Evaluation Scheme from Year 2023-24
Final Year B. Tech.- Computer Science & Engineering SEMESTER-VIII – Regular Track</td></tr>
<tr><td rowspan="2">Sr. No</td><td rowspan="2">Course Code</td><td rowspan="2">Course Type</td><td rowspan="2">Name of the Course</td><td colspan="4">Teaching Scheme per Week</td><td rowspan="2">Total Marks</td><td colspan="4">Evaluation Scheme</td></tr>
<tr><td>Lecture</td><td>Tutorial</td><td>Practical</td><td>Credits</td><td>Type</td><td>Max. Marks</td><td colspan="2">Min. for Passing</td></tr>
<tr><td rowspan="3">1</td><td rowspan="3">201CSL422-425</td><td rowspan="3">PEC</td><td rowspan="3">Professional Elective-V</td><td rowspan="3">3</td><td rowspan="3">-</td><td rowspan="3">-</td><td rowspan="3">3</td><td rowspan="3">100</td><td>ISE</td><td>20</td><td rowspan="2">20</td><td rowspan="3">40</td></tr>
<tr><td>MSE</td><td>30</td></tr>
<tr><td>ESE</td><td>50</td><td>20</td></tr>
<tr><td rowspan="3">2</td><td rowspan="3">201CSL426-429</td><td rowspan="3">PEC</td><td rowspan="3">Professional Elective-VI</td><td rowspan="3">3</td><td rowspan="3">-</td><td rowspan="3">-</td><td rowspan="3">3</td><td rowspan="3">100</td><td>ISE</td><td>20</td><td rowspan="2">20</td><td rowspan="3">40</td></tr>
<tr><td>MSE</td><td>30</td></tr>
<tr><td>ESE</td><td>50</td><td>20</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">201CSP430</td><td rowspan="2">PCC</td><td rowspan="2">Advanced Programming Laboratory - III</td><td rowspan="2">2</td><td rowspan="2">-</td><td rowspan="2">4</td><td rowspan="2">4</td><td rowspan="2">100</td><td>ISE</td><td>50</td><td>20</td><td rowspan="2">40</td></tr>
<tr><td>ESE-POE</td><td>50</td><td>20</td></tr>
<tr><td>4</td><td>201CSP431-438</td><td>PEC</td><td>Professional Elective Laboratory - II</td><td>-</td><td>-</td><td>4</td><td>2</td><td>50</td><td>ISE</td><td>50</td><td>20</td><td>20</td></tr>
<tr><td>5</td><td>201CSP439</td><td>PCC</td><td>Trending Techno Laboratory</td><td>-</td><td>1</td><td>2</td><td>2</td><td>50</td><td>ISE</td><td>50</td><td>20</td><td>20</td></tr>
<tr><td rowspan="2">6</td><td rowspan="2">201CSP440</td><td rowspan="2">PROJ</td><td rowspan="2">Project - V</td><td rowspan="2">-</td><td rowspan="2">-</td><td rowspan="2">6*</td><td rowspan="2">3</td><td rowspan="2">100</td><td>ISE</td><td>50</td><td>20</td><td rowspan="2">40</td></tr>
<tr><td>ESE-OE</td><td>50</td><td>20</td></tr>
<tr><td colspan="4">Total</td><td>8</td><td>1</td><td>16*</td><td>17</td><td>500</td><td></td><td></td><td></td><td>200</td></tr>
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<table>
<tr><td colspan="3">Professional Elective-V</td><td colspan="3">Professional Elective-VI</td></tr>
<tr><td>Sr. No</td><td>Course Code</td><td>Course Name</td><td>Sr. No</td><td>Course Code</td><td>Course Name</td></tr>
<tr><td>1</td><td>201CSL422</td><td>Software Project Management</td><td>1</td><td>201CSL426</td><td>Service Oriented Architecture</td></tr>
<tr><td>2</td><td>201CSL423</td><td>Semantic Web</td><td>2</td><td>201CSL427</td><td>Big Data Analytics</td></tr>
<tr><td>3</td><td>201CSL424</td><td>Deep Learning</td><td>3</td><td>201CSL428</td><td>Natural Language Processing</td></tr>
<tr><td>4</td><td>201CSL425</td><td>UI Design</td><td>4</td><td>201CSL429</td><td>Search Engine Optimization</td></tr>
</table>

2. Professional Track –

<table>
<tr>
<td colspan="14">D. Y. PATIL COLLEGE OF ENGINEERING & TECHNOLOGY, KOLHAPUR
Teaching and Evaluation Scheme from Year 2023-24
Final Year B. Tech- Computer Science & Engineering
SEMESTER-VIII –Professional Track</td>
</tr>
<tr>
<td rowspan="3">Sr. No</td>
<td rowspan="3">Course Code</td>
<td rowspan="3">Course Type</td>
<td rowspan="3">Name of the Course</td>
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<td rowspan="3">Total Marks</td>
<td colspan="4">Evaluation Scheme</td>
</tr>
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<td rowspan="2">Lecture</td>
<td rowspan="2">Tutorial</td>
<td rowspan="2">Practical</td>
<td rowspan="2">Credits</td>
<td rowspan="2">Type</td>
<td rowspan="2">Max. Marks</td>
<td colspan="2">Min. for Passing</td>
</tr>
<tr>
</tr>
<tr>
<td rowspan="3">1</td>
<td rowspan="3">201CSP441</td>
<td rowspan="3">PROJ</td>
<td rowspan="3">Professional Skills Development **</td>
<td rowspan="3">-</td>
<td rowspan="3">1</td>
<td rowspan="3">26</td>
<td>3</td>
<td>100</td>
<td>ISE-I</td>
<td>100</td>
<td rowspan="2">120</td>
<td rowspan="3">200</td>
</tr>
<tr>
<td>8</td>
<td>200</td>
<td>ISE-II</td>
<td>200</td>
</tr>
<tr>
<td>6</td>
<td>200</td>
<td>ESE-OE</td>
<td>200</td>
<td>80</td>
</tr>
<tr>
<td colspan="4">Total</td>
<td>-</td>
<td>1</td>
<td>26</td>
<td>17</td>
<td>500</td>
<td></td>
<td></td>
<td></td>
<td>200</td>
</tr>
</table>

Guidelines for Professional Track:

1. Student must submit his/her willingness for this track before the term end of semester – VII.

2. Head of the department will appoint one faculty coordinator to coordinate Professional Track Committee (PTC) work and manage all activities concerned with this track like assigning mentors to the students, organising PTC meetings, monitoring the entire process concerned with Professional Track, etc.

3. Student can apply the Professional Track in following scenarios provided he/she obtains a letter accordingly from the concerned authority while applying for this track –

   a. If student is selected in the company with PPO (Pre-Placement Offer) program through the college TPO.

   b. If student has an opportunity to work on the sponsored projects in industry/Research Institute for a period of 3-5 months.

   c. If student is getting onsite Internship offer for a period of 3-5 months.

   d. If student is getting Company Training program of 3-5 months.

   e. If student wants to do Innovation/Entrepreneurial activities for a duration of 3-5 months.

4. Students should submit the application along with all communication details to Professional Track faculty coordinator before the term end of semester – VII.

5. The work concerned with this track should be worth 400-500 hours and completed during semester-VIII.

6. All formalities of getting offer letter/permission of working in concerned organization (a-e) are to be completed from the concerned authority (a-e) in writing before starting of ESE of Semester– VII.

7. Student should submit his/her application to the Professional Track Committee (PTC) along withdetails of communication done with the concerned authorities for its approval.

8. Professional Track Committee (PTC) comprises of HoD, Department T & P coordinator, T & P officer, faculty coordinator and two, third-party experts from Industry / Research Institute / Entrepreneur. The role of PTC is confined to assessment and approval of applications only.

9. Professional Track Committee (PTC) will assess the applications based on the communications, kind of work that is expected to be done by the student in concerned organization (a-e), allocation of concerned organization (a-e) supervisor, depth of the technical exposure, student's development and feasibility of work. Committee will accordingly approve application satisfying the guidelines for professional track and the decision of the committee will be final.

10. There should be a proper written communication between the concerned organisation, TPO, department T & P Coordinator and faculty coordinator mentioning the details clearly as per the syllabus structure.

11. Professional Track faculty coordinator should declare the list of students approved for, undertaking Professional Track before end of ESE of semester-VII.

12. It is mandatory for a student and his/her parent to submit an undertaking, mentioning completion of Professional Track as per concerned organisation requirements and guidelines as per syllabus structure.

13. If the student fails to complete above Professional Track as per the guidelines within the stipulated period of semester-VIII, he/she will be declared as FAIL. Such candidate has to complete the said work in subsequent 3-5 months period and then ESE-OE examination will be conducted during the regular examination schedule of the college.

**

Following are the evaluation guidelines for Professional Skills Development Course -

i. The evaluation of the **Professional Skills Development** will be based on the work done by the student in concerned organisation.

ii. The faculty mentor assigned will be responsible for monitoring and assessment of the student on continuous basis.

iii. Every faculty mentor will be assigned workload of 1 hour per week for every student.

iv. The ISE marks are to be given based on the continuous assessment done by the concerned organisation (a-e) supervisor and faculty mentor.

v. Students must present their work to the faculty mentor every month in an online mode or onsite (Minimum 3 presentations) in coordination with concerned organisation (a-e) supervisor for 100 marks taken together for all presentations and demonstration under ISE with 3 credits.

vi. Concerned organisation (a-e) should provide certificate of completion of assigned task along with marks under ISE head for 200 marks with 8 credits, in coordination with the faculty mentor before the conduct of ESE-OE exam.

vii. ESE-OE is to be conducted for 200 marks with 6 credits in the concerned organisation (a-e) where the student is doing his/her work. The ESE-OE will be conducted by both, faculty mentor and concerned organisation (a-e) supervisor.

viii. Students may complete **Professional Global Certification** either assigned by the concerned organisation (a-e) supervisor based on his/her assigned work or on his/her own, like Palo-Alto, AWS, Blue prism, Java Certifications, etc.

ix. All credits will be earned by the student on completion of ISE and ESE-OE.

Course Plan

Course Title : Professional Elective-III : Advanced Database Systems	
Course Code: 201CSL401	Semester: VII
Teaching Scheme: L-T-P: 3-0-0	Credits: 3
Evaluation Scheme: ISE+ MSE Marks:20 + 30	ESE Marks: 50

Course Description:

This course focuses on different database systems like parallel databases, distributed databases and object relational databases. It also focuses on NoSQL, Database Administration and Security.

Course Objectives:

1. To acquire knowledge on parallel and distributed databases and its applications.
2. To understand the fundamentals of object oriented databases.
3. To design and develop databases using NoSQL.
4. To understand and perform common database administration, security tasks and advanced transactionmanagement.

Course Outcomes (COs):

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

C401.1	Learn and identify issues arising from parallel and distributed processing of data.
C401.2	Apply the knowledge of object oriented databases in their applications.
C401.3	Compare and Contrast NoSQL databases with each other and Relational Database Systems.
C401.4	List database administration tasks and security measures and understand advancedtransaction management.

Prerequisite:	**Database Engineering**: The student should know the basic concepts such as RDBMS, E-R Model, SQL, Indexing, Transaction management and recovery techniques etc.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs		BTL
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
C401.1	3	-	1	-	-		-	-	-	-	-	-	-	-	L-2
C401.2	3	-	-	-	-	-	-	-	-	-	-	-	-	-	L-3
C401.3	2	-	2	-	-	-	-	-	-	-	-	-	2	-	L-4
C401.4	-	2	2	-	-	-	-	-	-	-	-	-	-	-	L-2

Content	Hours
Unit 1: Parallel Databases Database System Architectures: Centralized and Client – Server Architectures –Server System Architectures – Parallel Systems Parallel Databases: I/O Parallelism – Inter and Intra Query Parallelism – Inter and Intra operation Parallelism – Design of Parallel Systems	6
Unit 2: Distributed Databases Distributed Systems, Homogeneous and Heterogeneous Databases, Distributed Data Storage, Distributed Transactions, Commit Protocols, Distributed Query Processing.	6
Unit 3: Object Oriented Databases Overview, Complex Data Types, Structure Types and Inheritance in SQL, Table Inheritance, Arrays and Multiset Types in SQL, Object-Identity and Reference Types in SQL, Implementing O-R Features, Persistent Programming Languages, Object Relational Mapping, Object-Oriented versus Object-Relational	6
Unit 4: NoSQL Databases Motivations for NoSQL Databases, Data management with distributed databases, ACID and BASE, NoSQL Types: Key-Value Database, Document Database, Column Family Database and Graph Database, Comparison of relational databases and NoSQL databases, Querying MongoDB	7

Unit 5: Database Administration and Security The Need for and Role of a Database in an Organization, Database Administration Function, Database Administration Tools-Data dictionary, CASE tools, Database Security-Security policies, vulnerabilities and measures	5
Unit 6: Advanced Transaction Processing Transaction-Processing Monitors, Transactional Workflows, Main-Memory Databases, Real-Time Transaction Systems, Long-Duration Transactions	6

Text Books:

1. A. Silberschatz, H.F. Korth, S. Sudarshan, "Database System Concepts", 6th Edition, McGrawHill Education. (Unit 1, 2, 3, 6)

2. Raghu Ramkrishnan, Johannes Gehrke, " Database Management Systems", Fourth Edition, McGraw Hill Education.(Unit 3)

3. Dan Sullivan, "NoSQL for Mere Mortals", 1st Edition, Pearson Education (Unit 4)

4. Coronel-Morris- Rob, "Database Systems, Design, Implementation, and Management", Cengage Learning, Ninth Edition (Unit 5)

Reference Books:

1. Pramod J.Sadalage and Marin Fowler, "NoSQL Distilled: A brief guide to merging world of Polyglot persistence", Addison Wesley, 2012.

2. Kevin Roebuck, "Storing and Managing Big Data - NoSQL, HADOOP and More", Emereo Pty Limited, 2011,ISBN 1743045743, 9781743045749

3. Elmasri and Navathe, " Database Systems", 5th edition, Pearson Education

Online Resources:

1. NoSQL-https://nptel.ac.in/courses/106104189

Course Plan

Course Title :Professional Elective-III : Data Mining	
Course Code: 201CSL402	Semester: VII
Teaching Scheme: L-T-P: 3-0-0	Credits: 3
Evaluation Scheme: ISE+ MSE Marks:20 + 30	ESE Marks: 50

Course Description:

Data mining is study of algorithms for finding patterns in large data sets. It introduces the basic concepts, principles, methods, implementation techniques, and applications of data mining, with a focus on two major data mining functions: pattern discovery and cluster analysis. It will explain the basic algorithms like data preprocessing, association rules, classification, clustering, sequence mining and visualization.

Course Objectives:

1. To introduce basic applications, concepts of data mining.
2. To understand different methodologies used in data mining.
3. To understand business intelligence concepts.

Course Outcomes (COs):

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

C402.1	Explain the concepts of data mining.
C402.2	Describe data warehousing and OLAP
C402.3	Understand and apply various classification techniques.
C402.4	Apply various clustering and association rule techniques.
C402.5	Describe the concepts of Business Intelligence and its applications.

Prerequisite:	Database Engineering

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs		BTL
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
C402.1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	L-2
C402.2	2	2	-	-	-	-	-	-	-	-	-	-	-	-	L-2
C402.3	2	-	1	1	-	-	-	-	-	-	-	-	1	-	L-3
C402.4	3	2	-	1	-	-	-	-	-	-	-	-	1	-	L-3
C402.5	2	-	-	-	-	-	-	-	-	-	-	-	-	-	L-2

Content	Hours
Unit 1: Introduction Basic Data Mining Tasks, Data Mining Versus Knowledge Discovery in Data Bases, Data Mining Issues, Data Mining Metrics, Social Implications of Data Mining, Data Mining from Data Base Perspective.	5
Unit 2: Related Concepts Database/OLTP systems, Information retrieval, Decision support systems, Data warehousing, OLAP, Machine learning, Pattern matching	6
Unit 3: Data Warehousing and Online Analytical Processing Data Warehouse: Basic Concepts, Data Warehouse Modeling: Data Cube and OLAP, Data Warehouse Design and Usage, Data Warehouse Implementation, Data Generalization by Attribute-Oriented Induction	6
Unit 4:Classification Introduction, statistics based algorithms, distance based algorithms, decision tree based algorithms, neural network based algorithms, rule based algorithms and combining techniques	6
Unit 5: Clustering and Association rules Clustering: Introduction, similarity and distance measures, outliers, hierarchical algorithms, partitional algorithms, clustering large databases, clustering with categorical attributes, comparison Association rules: Introduction - Large Item Sets, Basic Algorithms, Parallel & Distributed Algorithms, Comparing Approaches	7

Unit 6: Business Intelligence definitions and concepts BI Component framework, Who is BI for?, BI users, BI applications, BI roles and responsibilities, best practices in BI/DW, popular BI tools	6

Text Books:

1. Margaret H. Dunham, "Data Mining Introductory and Advanced Topics", Pearson Education 2003 (Unit 1, 2, 4, 5)

2. Jiawei Han, Michelina Kamber, Jian Pei, "Data Mining Concepts and Techniques", 3rd Edition, Morgan Kaufmann Publication (Unit 3)

3. R N Prasad, Seema Archarya, "Fundamentals of Business Analytics", Wiley India (Unit 6)

Reference Books:

1. Arun K. Pujari – Data Mining Techniques, Universities Press (India) Pvt. Ltd., 2013 Kindle Edition.

Online Resources:

1. https://nptel.ac.in/courses/106105174/

Course Plan

Course Title :Professional Elective-III : High Performance Computing	
Course Code: 201CSL403	**Semester: VII**
Teaching Scheme: L-T-P: 3-0-0	**Credits: 3**
Evaluation Scheme: ISE+ MSE Marks:20 + 30	**ESE Marks: 50**

Course Description:

This course focuses on optimization techniques for serial code, Parallel Computing Paradigms, Parallel Programming using OpenMP, MPI and CUDA.

Course Objectives:

1. To introduce software tools and techniques needed to implement parallel programs.
2. To demonstrate different parallel programming paradigms (i.e. languages and libraries).

Course Outcomes (COs):

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

C403.1	Understand parallel algorithm design and taxonomy of parallel architecture.
C403.2	Understand OpenMP and MPI directives and libraries to implement parallel program.
C403.3	Design different parallel algorithms.
C403.4	Analyze performance of parallel algorithms designed using Open MP, MPI and CUDA.
C403.5	Learn different HPC libraries to implement parallel programs.

Prerequisite:	C/C++, Computer Organization and Architecture, Design Analysis and Algorithms

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs		BTL
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	
C403.1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	L-2
C403.2	2	2	-	-	-	-	-	-	-	-	-	-	-	-	L-2
C403.3	2	-	2	2	-	-	-	-	-	-	-	-	-	-	L-3
C403.4	2	3	2	-	-	-	-	-	-	-	-	-	1	-	L-4
C403.5	2	-	-	-	-	-	-	-	-	-	-	-	-	-	L-2

Content	Hours
Unit 1: Introduction Need of Ever-Increasing Performance, Building Parallel Systems, Need to Write Parallel Programs	4
Unit 2: Parallel Computing Concurrent, Parallel, Distributed Computing, Interconnection network, Processor arrays	5
Unit 3: Shared-Memory Programming with OpenMP Shared memory programming, Parallel for loop, critical section, Writing OpenMP, Programs, Compiling and running OpenMP programs, The reduction clause, The parallel for Directive	7
Unit 4: Distributed-Memory Programming with MPI Compilation and execution of MPI Programs, MPI Init and MPI Finalize, Communicators, MPI Comm size and MPI Comm rank, SPMD programs, Communication, MPI Send, MPI Recv, Message matching, Tree-structured communication , MPI All-reduce, Broadcast, Scatter, Gather, All-gather	8
Unit 5: Programming with CUDA GPGPU Architecture of NVIDIA, CUDA Model, Programming in CUDA, Examples	6
Unit 6:Application Scalability HPC Application Development, Parallel Computing libraries in python, Comparison of Serial and parallel examples.	6

Text Books:

1. Peter S. Pacheco, "An Introduction to Parallel Programming", Morgan Kaufmann, 2011 (Unit 1,2)

2. Michael J. Quinn, "Parallel Programming in C with MPI and OpenMP", Tata McGraw Hill, 2003 (Unit 3,4)

3. Shane Cook, CUDA Programming: A Developer Guide to Parallel Computing with GPUs" Elsevier, 2013 (Unit 5, 6)

Reference Books:

1. David B. Kirk and Wen-mei W. Hwu, "Programming Massively Parallel Processors", Morgan Kaufmann, 2010

2. Ananth Grama, George Karypis, Vipin Kumar, Anshul Gupta, "Introduction to ParallelComputing", Pearson Education Limited, 2003

3. Shameem Akhter and Jason Roberts , "Multi-core Programming" Intel Press, 2006

Online Resources:

1. Introduction to parallel programming with OpenMP and MPI, By Prof. Yogish Sabharwal, IIT Delhi

   https://onlinecourses.nptel.ac.in/noc22_cs21/preview

2. GPU Architectures and Programming By Prof. Soumyajit Dey , IIT Kharagpur

   https://onlinecourses.nptel.ac.in/noc20_cs41/preview

3. Parallel Computing, IIT Delhi, Dr. Subodh Kumar

   https://nptel.ac.in/courses/106102114

Course Plan

Course Title : Professional Elective - III : Social Media Analytics	
Course Code: 201CSL404	Semester : VII
Teaching Scheme: L-T-P: 3-0-0	Credits: 3
Evaluation Scheme: ISE+ MSE Marks: 20 + 30	ESE Marks: 50

Course Description:

Social media analytics is the ability to gather and find meaning in data gathered from social channels to support business decisions and measure the performance. Social media analytics is broader than metrics such as likes, follows, re-tweets, previews, clicks, and impressions gathered from individual channels. It also differs from reporting offered by services that support marketing campaigns such as LinkedIn or Google Analytics.

Course Objectives:

1. To learn the basic concept of social media analytics.
2. To develop skills required for analyzing the effectiveness of social media
3. To study different tools of social media analytics.
4. To understand and apply different visualization techniques for social media analytics.

Course Outcomes (COs):

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

C404.1	Understand the concept of social media analytics and its significance
C404.2	Interpret different social media analytics
C404.3	Apply different social media analytics tools
C404.4	Apply different effective Visualization techniques to represent social media data.

Prerequisite:	Information Security

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Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs		BTL
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
C404.1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	L-2
C404.2	2	2	-	-	-	-	-	-	-	-	-	-	-	-	L-2
C404.3	2	2	2	-	-	-	-	-	-	-	-	-	-	-	L-3
C404.4	3	2	2	-	-	-	-	-	-	-	-	-	1	-	L-3

Content	Hours
Unit 1: Social Media Analytics: An Overview Introduction, Core Characteristics of Social Media, Types of Social Media, Purpose of Social Media Analytics, Seven Layers of Social Media Analytics, Types of Social Media Analytics, Social Media Analytics Cycle, Challenges to Social Media Analytics, Social Media Analytics Tools.	6
Unit 2: Social Network Structure, Measures & Visualization: Basics of Social Network Structure - Nodes, Edges & Tie. Describing the Networks Measures Degree Distribution, Density, Connectivity, Centralization, Tie Strength & Trust Network Visualization - Graph Layout, Visualizing Network features, Scale Issues.	6
Unit 3: Social Media Text, Action & Hyperlink Analytics: Social Media Text Analytics - Types of Social Media Text, Purpose of Text Analytics, Steps in Text Analytics, Social Media Text Analysis Tools. Social Media Action Analytics - Actions Analytics, Common Social MediaActions, Actions Analytics Tools. Social Media Hyperlink Analytics - Types of Hyperlinks, Types of Hyperlink Analytics, Hyperlink Analytics Tools.	6

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Unit 4: Social Media Location & Search Engine Analytics: Location Analytics - Sources of Location Data, Categories of Location Analytics, Location Analytics and Privacy Concerns, Location Analytics Tools. Search Engine Analytics - Types of Search Engines, Search Engine Analytics, Search Engine Analytics Tools.	6
Unit 5: Social Network Analytics: Network Analytics – Common Network Terms, Common Social Media Network Types, Types of Networks, Common Network Terminologies, Network Analytics Tools.	5
Unit 6: Social Media Analytics Applications and Privacy: Social media in public sector - Analyzing public sector social media, analyzing individual users, case study. Business use of Social Media - Measuring success, Interaction and monitoring, case study. Privacy - Privacy policies, data ownership and maintaining privacy online.	7

Text Books:

1. Analyzing the Social Web 1st Edition by Jennifer Golbeck (Unit 1)
2. Seven Layers of Social Media Analytics_ Mining Business Insights from Social Media Text, Actions, Networks, Hyperlinks, Apps, Search Engine, and Location Data, Gohar F. Khan, (ISBN-10: 1507823207). (Unit 2, 3,4, 5)
3. Charu Aggarwal (ed.), Social Network Data Analytics, Springer, 201 (Unit 6)

Reference Books:

1. Social Media Analytics [2015], Techniques and Insights for Extracting Business Value Out of Social Media, Matthew Ganis, Avinash Kohirkar, IBM Press
2. Social Media Analytics Strategy_ Using Data to Optimize Business Performance, AlexGonçalves, A Press Business Team
3. Mining the Social Web_ Analyzing Data from Facebook, Twitter, LinkedIn, andOther Social Media Sites, Matthew A Russell, O'Reilly (Unit 5)
4. Social Media Data Mining and Analytics, Szabo, G., G. Polatkan, O. Boykin & A. Chalkiopoulus (2019), Wiley, ISBN 978-1-118-82485-6

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Online Resources:

1. https://nptel.ac.in/courses/106106146

2. https://7layersanalytics.com/

3. https://onlinecourses.nptel.ac.in/noc20_cs78/preview

Course Plan

Course Title :Professional Elective-IV : Software Architectures	
Course Code: 201CSL405	Semester: VII
Teaching Scheme: L-T-P: 3-0-0	Credits: 3
Evaluation Scheme: ISE+ MSE Marks: 20 + 30	ESE Marks: 50

Course Description:

Software architecture is the set of structures needed to reason about a software system and the discipline of creating such structures and systems. It functions as the blueprints for the system and the development project, which project management can later use to extrapolate the tasks necessary to be executed by the teams and people involved. Software architecture is about making fundamental structural choices that are costly to change once implemented.

Course Objectives:

1. To introduce the student regarding need of the software architectures.
2. To expose the students with the different software architecture patterns.
3. To aware the students regarding the software architecture requirements and design.
4. To strengthen the ability of the students for documenting, implementing and testing the software architecture.

Course Outcomes (COs):

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

C405.1	Understand the need and contexts of the software architectures.
C405.2	Design the software architecture by considering quality attributes and patterns.
C405.3	Design the software architecture requirement and design strategy
C405.4	Understand and implement documentation, implementation and testing of Software architecture.

Prerequisite:	Software Engineering

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

COs	POs												PSOs		BTL
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
C405.1	2	2	-	-	-	-	-	-	-	-	-	-	-	-	L-2
C405.2	1	1	1	-	-	-	-	-	-	2	-	-	-	-	L-3
C405.3	2	2	2	-	-	-	-	-	-	2	-	-	1	-	L-3
C405.4	2	2	2	-	-	-	-	-	-	-	-	-	1	-	L-3

Content	Hours
Unit 1: Introduction of Software Architecture Introduction to Software Architecture, Architectural Structures and View, ArchitecturalPatterns, Good Architecture, System's Quality Attributes, Managing Change, System Qualities, Enhancing Communication among Stakeholders, Carrying Early Design Decisions, Defining Constraints, Influencing the Organizational Structure, Enabling Evolutionary Prototyping, Improving Cost and Schedule Estimates, Reusable Model	8
Unit 2: Contexts of Software Architecture Architecture in a Technical Context, Architecture in a Project Life-Cycle Context, Architecture in a Business Context, Architecture in a Professional Context, Stakeholders, Influence on Architecture, Architectures Influence	5
Unit 3: Quality Attributes Architecture and Requirements, Functionality, Quality Attribute Considerations, Specifying Quality Attribute Requirements, Achieving Quality Attributes through tactics, Quality Design Decisions	5
Unit 4: Architectural Patterns Architectural Patterns, Patterns Catalogue, Relationships between Tactics and Patterns, Contents, Using Tactics Together	5
Unit 5: Architecture Requirements and Design Gathering, ASRs from Requirements Documents, Gathering ASRs by Interviewing Stakeholders, Gathering ASRs by Understanding the Business Goals, Capturing ASRs in a Utility Tree, Tying the Methods Together, Designing an Architecture, Design Strategy, TheAttribute-Driven Design Method	7

Unit 6: Documenting Software Architectures, Implementation, and Testing Uses and Audiences for Architecture Documentation, Notations for Architecture Documentation, Views, Choosing the Views, Combining Views, Building the Documentation Package, Documenting Behavior, Architecture Documentation and Quality Attributes, Documenting Architecture in an Agile Development Project, Architecture and Testing	**6**

Text Books:

1. Len Bass Paul Clements Rick Kazman, Software Architecture in Practice, Third Edition, Pearson Edu(2013) (Unit 1 to 6)

Reference Books:

1. The Art of Software Architecture: Stephen T. Albin, Wiley dreamtech, (2003).

2. Pattern Oriented Software Architecture Vol. I: Buschmann, F. WSE, (1996).

3. Large Scale Software Architecture: A Practical Guide Using UM: Jeff Garland, Richard Anthony, Wiley dreamtech, (2003).

4. Software Architecture - Perspectives on an Emerging Discipline: Mary Shaw & David Garlan, PHI, (1996).

5. Design Patterns: Elements of Reusable Object Oriented Software: Gamma, E. et. Al., Addison Wesley, (1995).

6. Software Engineering 7th ed.: Ian Sommerville, Addison Wesley, (2004)

Online Resources:

1. https://tecnrt.org/docs/cse/materials/SADP.pdf

Course Plan

Course Title : Professional Elective-IV : Machine Learning	
Course Code: 201CSL406	Semester: VII
Teaching Scheme: L-T-P: 3-0-0	Credits: 3
Evaluation Scheme: ISE+ MSE Marks: 20 + 30	ESE Marks: 50

Course Description:

This course consists of basic understanding of all terminologies and concepts of machine learning techniques. It consists of understanding of supervised, unsupervised and Reinforcement learning of Machine learning algorithms. This course describes about data and preparations of data to analyze, predict, forecast and optimize using different machine learning algorithms.

Course Objectives:

1. To understand the importance and significance of different types of machine learning algorithms.
2. To optimize different linear methods of regression and classification.
3. To understand different supervised classification methods of support vector machine and tree based models.
4. To understand machine learning techniques that can be used for practical applications.

Course Outcomes (COs):

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

C406.1	Explain terminologies and comprehend different types of machine learning techniques.
C406.2	Apply supervised algorithms of ML for Classification and Regression problems.
C406.3	Apply unsupervised algorithms of ML to solve defined problems.
C406.4	Use machine learning algorithms to solve real world problems.

Prerequisite:	Statistics, Probability Theory, Algorithms, Linear Algebra

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs		BTL
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
C406.1	2	1	-	-	-	-	-	-	-	-	-	-	-	-	L-2
C406.2	3	2	2	-	-	-	-	-	-	-	-	-	-	-	L-3
C406.3	3	2	2	-	-	-	-	-	-	-	-	-	-	-	L-3
C406.4	1	2	2	2	-	-	-	-	-	-	-	-	1	-	L-3

Content	Hours
Unit No 1: Introduction to Machine Learning Introduction to Probability and Statistics. Machine Learning: Definition and Terminologies, Need of Machine Learning, Architecture, Process, Life Cycle Learning Methods: Supervised Learning, Unsupervised learning, Reinforcement learning, Application of Machine Learning, Steps in developing a Machine Learning Application. Tools, preprocessing Libraries, Data Visualization.	6
Unit No 2: Supervised Learning: Linear Model of Regression Introduction to Simple Linear Regression, cost function, Evaluation of hypothesis, hyper parameters: Learning with Gradient Decent, Learning Rate, and Implementation of Simple Regression algorithm. Multivariate Linear Regression: Evaluation of hypothesis for multivariate data, Gradient Decent for multiple variables. Feature scaling, polynomial regression analysis.	6
Unit No 3: Logistics and Naïve Bayes Logistic Regression: Definition, Hypothesis, Cost function, Gradient Decent for Logistic Regression multi class classification. Regularization: concepts of Training Error, Generalization error, over fitting, under fitting, BiasVariance trade-off. Regularize Simple Linear Regression, Logistic Regression. Naive Bayes (Classifying with Bayesian decision theory, conditional probability, classifying with conditional probabilities, Document classification with Naïve Bayes).	6
Unit No 4: Classification Algorithms Decision Trees: Definition and Terminologies, Types of Decision Trees, Constructing and understanding Decision Trees, example of Random Forest algorithm. Support Vector Machine: SVM basic concepts, separating data with maximum margin, finding maximum margin, efficient optimization with the SMO algorithm, Basics of Kernel trick.	6

Unit No 5: Unsupervised algorithm Clustering: Introduction to K-Means Clustering algorithm, Hierarchical Risk Parity, and Association Rule mini Algorithm, Preprocessing of data. Performance Metrics: Confusion Matrix, Precision, Recall, F-measure.	6
Unit No 6: Semi Supervised and Reinforcement Learning The learning task, Q learning, temporal difference learning, generalizing from Examples, Examples of Reinforcement learning. Introduction to Neural network, Definition of Neural Network, Data representation for neural network, Architecture of NN, Feed Forward and Back Propagation Neural Network architecture.	6

Case Studies:

Sr. No	Name of Assignments	S/O	Hours
1	Case Study on Classification Algorithms	O	1
2	Case Study on Clustering Algorithms	O	1

Text Book:

1. Anuradha Srinivasaraghvan Vincy Joseph," Machine Learning", Wiley,2019

   (Unit 1 to 6)

Reference Books:

1. Ethem Alpaydın, "Introduction to Machine Learning", IT Press Third Edition Year 2014

2. ShaiShalev-Shwartz, "Understanding Machine Learning from Theory toAlgorithms", Cambridge University Press.

3. Tom .M. Mitchell," Machine Learning", MacGraw Hill First Edition Year 1997.

Online Resources:

1. https://www.docdroid.net/Z87gYoF/machine-learning-with-python

2. Machine Learning Cook Book

Course Plan

Course Title : Professional Elective-IV : Cyber Security and Digital Forensics	
Course Code : 201CSL407	Semester : VII
Teaching Scheme : L-T-P : 3-0-0	Credits : 3
Evaluation Scheme : ISE +MSE Marks : 20+30	ESE Marks : 50

Course Description:

The Cyber Security course teaches the students how to identify the computer system vulnerabilities, to recognize digital exploitation and also prevent damage such as loss of data, loss of money through viruses. In the Digital Forensics course, students will learn about legal considerations applicable to computer forensics and how to identify, collect and preserve digital evidence.

Course Objectives:

1. To gain knowledge of cyber security so as to secure digital data and secure computer networks and understand different cyber crimes.

2. To identify the essential and up-to-date concepts, methodology and tools of Computer Forensics

3. To understand key terms and provisions in I.T. ACT.

Course Outcomes (COs):

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

C407.1	Understand and use basic concepts of cyber security.
C407.2	Distinguish between different cyber crimes and threats.
C407.3	Avoid the cyber security vulnerabilities and make use of appropriate prevention techniques.
C407.4	Explore the concepts of digital forensics in various cyber crimes.
C407.5	Use IT ACT in their day-to-day life.

Prerequisite:	Fundamental knowledge of Data Communication, Networking and Information Security.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs		BTL
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
C407.1	2	2	-	-	-	-	-	-	-	-	-	-	-	-	L-2
C407.2	2	3	-	-	-	-	-	-	-	-	-	-	-	-	L-4
C407.3	2	3	2	-	-	-	-	2	-	-	-	-	-	1	L-3
C407.4	2	2	-	-	-	-	-	2	-	-	-	-	-	1	L-2
C407.5	2	2	-	-	-	-	-	1	-	-	-	-	-	2	L-3

Content	Hours
Unit 1: Cyber Space &Security Defining Cyberspace ,Architecture of cyberspace, Concept of cyber security, Cyber security increasing threat landscape, Cyber security terminologies- Cyberspace, attack, attack vector, attack surface, threat, risk, vulnerability, exploit, exploitation, hacker., Non-state actors, Cyber terrorism, Protection of end user machine, Critical IT and National Critical Infrastructure, Cyber warfare.	**6**
Unit 2: Cyber Crime Classification of cyber crimes, Common cyber crimes- cyber crime targeting computers and mobiles, cyber crime against women and children, financial frauds, social engineering attacks, malware and ransom ware attacks, zero day and zero click attacks, Online scams and frauds- email scams, Phishing, Vishing, Smishing, Online job fraud, Online sextortion, Debit/ credit card fraud, Online payment fraud, Cyber bullying, website defacement, Cybersquatting, Pharming, Cyber espionage, Crypto jacking, Dark net- illegal trades, drug trafficking, human trafficking., Social Media Scams & Frauds- impersonation, identity theft, job scams, misinformation, cyber stalking.	7
Unit 3: Cyber security Management Compliance and Governance Cyber security Plan- cyber security policy, cyber crises management plan., Business continuity, Risk assessment, Types of security controls and their goals, Cyber security audit and compliance, National cyber security policy and strategy	6
Unit 4: Computer Forensics Computer Forensics Definition and Cardinal Rules Types of Computer Forensics Technology – Types of Computer Forensics Systems – Vendor and Computer Forensics Services. Computer forensics evidence and capture: Data Recovery – Evidence Collection and Data Seizure-Duplication and Preservation of Digital Evidence-Computer Image Verification and Authentication.	**7**

Unit 5: Forensic Tools and Processing of Electronic Evidence Introduction to Forensic Tools, Usage of Slack space, tools for Disk Imaging, Data Recovery, Vulnerability Assessment Tools, Encase and FTK tools, Anti Forensics and probable counters, retrieving information, process of computer forensics and digital investigations, processing of digital evidence, digital images, damaged SIM and data recovery, multimedia evidence, retrieving deleted data: desktops, laptops and mobiles, retrieving data from slack space, renamed file, ghosting, compressed files.	7
Unit 6: I.T. ACT Introduction, Cyber Security Regulations, Roles of International Law, the state and Private Sector in Cyberspace, Cyber Security Standards. The INDIAN Cyberspace, I.T. Act, Intellectual Property, IP Theft, Copyright, Trademark, Privacy and Censorship	6

Text Books:

1. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Sumit Belapure and Nina Godbole, Wiley India Pvt. Ltd. (Unit 1 to3)

2. John R. Vacca, "Computer Forensics: Computer Crime Scene Investigation", Cengage Learning, 2nd Edition, 2005 (Unit 4)

3. C. Altheide & H. Carvey Digital Forensics with Open Source Tools, Syngress, 2011. ISBN: 9781597495868 (Unit 5)

4. CYBER LAW-The Indian Perspective, Pawan Duggal (2009) (Unit 6)

Reference Books:

1. Computer Security Fundamentals - Chuck Easttom, Pearson, third edition.

2. Jason Luttgens, Matthew Pepe, Kevin Mandia, Incident Response & Computer Forensics, McGraw-Hill Osborne Media, 3rd edition , 2014.

3. Keith J. Jones, Richard Bejtlich, Curtis W. Rose, Real Digital Forensics: Computer Security and Incident Response, Paperback – Import, 2005.

4. 7 Years of Indian Cyber Laws, Rohas Nagpal (2008)

Online Resources:

1. https://legalserviceindia.com

2. https://infosecawareness.in/cyber-laws-of-india

3. https://onlinecourses.nptel.ac.in/noc23_cs127/preview

Course Plan

Course Title : Professional Elective-IV : Blockchain Technology	
Course Code :201CSL408	Semester :VII
Teaching Scheme : L-T-P: 3-0-0	Credits :3
Evaluation Scheme : ISE+MSE Marks : 20+30	ESE Marks : 50

Course Description:

This course is designed to give a broad overview for aspiring Blockchain professionals. It describes about Blockchain and its working. The course mainly focuses on concepts such as mining, hashing, proof-of-work, public key cryptography, the double- spend problem, etc. It covers seven design principles for Blockchain technology, and the challenges facing the people developing it.

Course Objectives:

1. To understand the history, types and applications of Blockchain
2. To understand the importance of consensus.
3. To learn various cryptocurrencies and different Blockchain platforms.
4. To study and design smart contracts.

Course Outcomes (COs):

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

C408.1	To learn the basics of Blockchain and apply cryptographic algorithms.
C408.2	To understand and use various consensus mechanism in Blockchain.
C408.3	Explore the basics of cryptocurrencies.
C408.4	Understand and apply Blockchain and smart contracts.

Prerequisite:	Programming, Information Security and Computer Networks

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs		BTL
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
CSL408.1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	L-2
CSL408.2	3	2	2	-	-	-	-	-	-	-	-	-	-	-	L-3
CSL408.3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	L-2
CSL408.4	3	2	2	1	-	-	-	-	-	-	-	-	1	-	L-3

Content	Hours
Unit 1: Introduction Distributed DBMS – Limitations of Distributed DBMS, Byzantine Fault Tolerance (BFT), Introduction to Block chain – History, Definition, Cryptography: Hash function, Digital Signature - ECDSA, Distributed Ledger, Types of Blockchain, Blockchain Network and Nodes, Mining Mechanism, Generic elements of Block chain, Features of Blockchain.	6
Unit 2: Blockchain Architecture & Cryptography Block chain Architecture – Block, Hash, Structure of Blockchain, Mining Mechanism, Distributed Ledger Technology (DLT), Introduction to cryptography, Encryption and Decryption, Types of Cryptography, Hashing algorithms	6
Unit 3: Consensus Mechanism Consensus mechanism: Nakamoto Consensus, Proof of Work (PoW), Proof of Stake (PoS),Proof of Burn, Proof of Activity, Proof of Weight, Proof of Authority (PoA) and Proof of Elapsed Time (PoET), , Merkle Patricia Tree, Gas Limit, Transactions and Fee, Anonymity, Reward, Chain Policy, Soft & Hard Fork, Life of Blockchain application.	7
Unit 4: Cryptocurrencies and Bitcoin Cryptocurrency: History, Roots of Bitcoin, Creation of coins, Payments and double spending, Bitcoin – Digital Signatures as Identities – eWallets – Personal Crypto security - Bitcoin Mining – Mining Hardware – Energy Consumption – Mining Pools – Mining Incentives and Strategies, Advantages and Disadvantages of Bitcoin.	6
Unit 5: Ethereum Introduction of Ethereum, Ethereum virtual machine, Components of Ethereum Transaction, DApps, Smart Contract, Hyperledger, Solidity, Web 3.0, Truffle, Ganache	6
Unit 6: Applications In Blockchain Introduction to Block chain Business Models-Need for Blockchain business models, Traditional business models-Types of Blockchain Business Models, case study: IoTA, Supply chain management, Healthcare	5

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Text Books:

1. William Stallings, "Cryptography and Network security Principles and Practices", Pearson/PHI,2007 (Unit 1)

2. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Millerand Steven Goldfeder, "Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction" Princeton University Press (July19, 2016). (Unit 2,3,4)

3. Mastering Blockchain: A deep dive into distributed ledgers, consensus protocols, smart contracts, DApps, cryptocurrencies, Ethereum, and more, 3rd Edition, Imran Bashir, Packt Publishing, 2020 (Unit 3,5)

4. S. Shukla, M. Dhawan, S. Sharma, S. Venkatesan, "'Blockchain Technology: Cryptocurrency and Applications" Oxford University Press, 2019. (Unit 6)

Reference Books:

1. Josh Thompson, "Blockchain: The Blockchain for Beginnings, Guide to Blockchain Technology and Blockchain Programming" Create Space Independent Publishing Platform, 2017.

Online Resources:

1. Hyperledger Tutorials - https://www.hyperledger.org/use/tutorials
2. Ethereum Development Resources - https://ethereum.org/en/developers
3. https://onlinecourses.nptel.ac.in/noc22_cs44/
4. https://www.coursera.org/specializations/blockchain
5. https://www.udemy.com/course/build-your-blockchain-az/
6. https://www.udemy.com/course/blockchain-and-bitcoin-fundamentals/
7. https://www.udemy.com/course/build-blockchain/

Course Plan

Course Title : Open Elective-II : Security and Privacy in Social Networks	
Course Code : 201CSL409	Semester : VII
Teaching Scheme : L-T-P : 3-1-0	Credits : 4
Evaluation Scheme : ISE +MSE Marks : 20+30	ESE Marks : 50

Course Description:

This course introduces students to a variety of existing, new and emerging concepts, strategies, and technologies utilized in today's online environment. It covers various social networking platforms, content and related security and privacy issues in social media. Students will learn how to use social media to reach personal and professional goals.

Course Objectives:

1. To gain knowledge of social network framework and its problems.
2. To understand web based social networks.
3. To understand Security and Privacy Issues in Mobile Social Networks.

Course Outcomes (COs):

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

C409.1	Understand social network framework.
C409.2	Identify the threats and defense mechanisms of social network.
C409.3	Use privacy and trust management in social networks.
C409.4	Avoid threats and vulnerabilities from web based social networks.
C409.5	Resolve Security and Privacy Issues in Mobile Social Networks.

Prerequisite:	Basic knowledge of Networking and Information Security and Social Sites.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs		BTL
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
C409.1	-	2	-	-	-	-	-	1	-	-	-	-	-	-	L-2
C409.2	2	3	-	-	-	2	-	2	-	-	-	3	1	1	L-2
C409.3	2	2	-	1	-	-	-	-	-	-	-	-	-	-	L-3
C409.4	2	2	-	-	-	1	-	-	-	-	-	2	-	1	L-4
C409.5	2	2	-	1	-	1	-	2	-	-	-	2	1	1	L-3

Content	Hours
Unit 1: Introduction to Security and Privacy in Social networks What Is a Social Network? , Online Social Networks, How to Represent a Social Network?, Social Network Data: Opportunities and Challenges, Social Network Analysis: Measures and Threats, Link Mining: Tasks and Threats, Open Challenges	**7**
Unit 2: Online Social Networks: Privacy Threats and Defense Definitions of Privacy, Privacy Threat: Users' Limitations, Design Flaws and Limitation, Defence Mechanism: Usable Privacy Through Visual and Interactive Flow of Information.	6
Unit 3: Privacy Preserving Reputation Management in Social Networks Characteristics of Social Relationships, Strength of Social Relationships, Modeling Trust, Characteristics of Trust, Inferring Trust, Privacy Preserving Reputation Systems, Centralized Privacy Preserving Reputation Systems, Decentralized Privacy Preserving Reputation Systems.	6
Unit 4: User-Managed Access Control in Web Based Social Networks Access Control Models, Access Control Mechanisms, Conceptualization of WBSNs, Analysis of Web Based Social Network**.**	7
Unit 5: Security and Privacy Issues in Mobile Social Networks Introduction, Security and Privacy Issues in Online Social Networks, Privacy Issues in Context-Aware MSNs, Security and Privacy Support in MSNs Middleware.	7

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Chapter 6: Case Studies	6
Types of data privacy setting, User privacy policy models and Trust Management.	

List of Assignments			
Ass. No.	**Name of Assignment**	**S/O**	**Hours**
1.	Implementation of privacy and Security in social media.	O	1
2	List few Security threats that every individual face in social media accounts.	O	1
3	Differences between social marketing and social media marketing.	O	1
4	Difference between Data privacy and Data Security.	O	1
5	Minimum four ways for maintaining privacy online.	O	1
6	Different ways to use Social media in a right way.	O	1
7	Security and privacy issues in social networks and their solutions.	O	1
8	Safety rules for using the Internet.	O	1
9	It should consist of minimum 4-5 assignments on recent social sites like Instagram, Face book, and Snap chat so on.	O	3
10	It should consist of minimum 2 assignments on any case studies based on the recent happenings on social media.	O	1

❖ **S-STUDY, O-OPERATIONAL**

❖ **Note:** Some marks can be assigned to few tutorials on completion, so same can be considered as ISE II.

Text Books:

1. Security and Privacy Preserving in Social Networks by Richard Chbeir Bechara Al Bouna Editors, 2013. (Unit 1 to 6)

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Reference Books:

1. Social Media Security - Leveraging Social Networking While Mitigating Risk by Michael Cross, Paperback 1st Edition.

2. Security and Trust in Online Social Networks by Barbara Carminati Elena Ferrari Marco Viviani , Morgan & Claypool Publishers

Online Resources:

1. https://www.coursera.org/lecture/social-network-analysis
2. https://www.mooc-list.com/tags/social-network-analysis
3. https://onlinecourses.nptel.ac.in/noc23_cs13/preview

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Course Plan

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Course Title : Open Elective – II : Web Applications Development	
Course Code : 201CSL410	Semester : VII
Teaching Scheme : L-T-P : 3-1-0	Credits : 4
Evaluation Scheme : ISE +MSE Marks : 20+30	ESE Marks : 50

Course Description:

This course provides the knowledge about web application development. It includes the web basics, HTML and CSS. The course also includes designing of own web application with the help of HTML and CSS. This course will help to gain the skills needed for web developer career.

Course Objectives:

1. To introduce the basics of the web.
2. To understand the basics of XHTML and create a web application using XHTML.
3. To apply the CSS and JavaScript to the web applications.
4. To create the web application using the WordPress.

Course Outcomes (COs):

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

C410.1	Understand the web basics and its uses
C410.2	Learn XHTML and develop the web applications using the XHTML.
C410.3	Design and develop the web applications using CSS and JavaScript.
C410.4	Design and develop the web applications using WordPress.

Prerequisite:	The prerequisite of this course includes the basic knowledge of the Internet and web browsing.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs		BTL
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
C410.1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	L-2
C410.2	2	2	1	-	-	-	-	-	-	-	-	-	2	-	L-3
C410.3	3	1	1	-	-	-	-	-	-	-	-	-	1	-	L-3
C410.4	2	1	1	-	1	-	-	-	1	-	-	-	2	-	L-6

Content	Hours
Unit 1: Web Essentials Clients, Servers, and Communication The Internet, Basic Internet Protocols : overview of TCP/IP, UDP, DNS, and Domain Names, Higher-Level Protocols, The World Wide Web : Hypertext Transport Protocol, HTTP Request Message: Overall Structure, HTTP Version, Request-URI, Request Method, Header Fields and MIME Types , HTTP Response Message: Response Status Line, Response Header Fields, Cache Control, Character Sets, Web Clients: Basic Browser Functions, URLs, User-Controllable Features, Additional Functionality, Web Servers: Server Features, Server History, Server Configuration and Tuning, Defining Virtual Hosts, Logging, Access Control, Secure Servers	7
Unit 2: Markup Languages - XHTML An Introduction to HTML, HTML's History and Versions, Basic XHTML Syntax and Semantics: Document Type Declaration, White Space in Character Data, Unrecognized Elements and Attributes, Special Characters, Attributes, Some Fundamental HTML Elements: Headings: h1 and Friends, Spacing: pre and br, Formatting Text Phrases: span, strong, tt, etc. Horizontal Rule: hr, Images: The img Element, Links: The a Element, Comments, Nesting Elements	6
Unit 3: Frames and Forms Relative URLs, Lists, Tables, Frames, Forms, Creating HTML Documents	5
Unit 4: Style Sheets: CSS Introduction to Cascading Style Sheets, Cascading Style Sheet Features, CSS Core Syntax: Selector Strings, At-Rules, Style Sheets and HTML, Contents, Style Rule Cascading and Inheritance: Rule Cascading, Style Inheritance, Text Properties: Font Families, Length Specifications in CSS, Font Properties, Line Boxes, Text Formatting and Color, CSS Box Model: Basic Concepts and Properties, Box Model Shorthand Properties, Background Colors and Images, Normal Flow Box Layout: Basic Box Layout, The display Property,	7

Margin Collapse, Block Box Width and Height, Simple Inline Boxes, Nested Inline Boxes, Beyond the Normal Flow: Properties for Positioning, Relative Positioning, Float Positioning, Absolute Positioning, Positioning-Related Properties, Some Other Useful Style Properties: Lists, Tables, Cursor Styles	
Unit 5: Client-Side Programming: The JavaScript Language History and Versions of JavaScript, Introduction to JavaScript, JavaScript in Perspective: Scripting Languages, Writing and Testing JavaScript Programs, Basic Syntax, Variables and Data Types, Statements, Operators: Precedence, Contents, Contents, Type Conversion, Bit Operators, Literals, Functions	6
Unit 6: WordPress A Little Bit of History, What is WordPress? Some of the Features That Make WordPress Great, WordPress.com v WordPress.org, WordPress.com, Do you still want to use WordPress.com?, WordPress.org, The Costs of Owning A Site, The Website Domain, Website Hosting, Registrar & Web Hosts, The Domain Name, The domain TLD, Tasks to Complete Domain, Host, Registrar & Installing WordPress ,Tasks to Complete Log In and Out of Your Dashboard, Tasks to Complete, WordPress Web Pages, Pre-Installed WordPress Themes, An Overview of the Dashboard, The Sidebar Screen Options, Help, Profile & Logout The Main Screen Tasks to Complete.	5

List of Assignments			
Ass. No.	**Name of Assignment**	**S/O**	**Hours**
1	Study of web Basics.	S	2
2	Study of HTML basics.	S	2
3	Implementation of different HTML tags	O	2
4	Implement a program designing student registration form using the HTML forms	O	2
5	Implement a program for frames	O	2
6	Implementation of a program table	O	2
7	Implementation of a program applying the text CSS properties to HTML.	O	2
8	Implement a program to demonstrate for using positioning CSS properties	O	2
9	Implement a program to demonstrate JavaScript.	O	2
10	Implement a program to demonstrate JavaScript operators	O	2

11	Implement a program to demonstrate JavaScript function	O	2
12	Design and create the free WordPress website	O	2
13	Design the blog using the Blogger/WordPress	O	2

❖ **S-STUDY, O-OPERATIONAL**

❖ **Note: Minimum of 10 Experiments to be performed from the list**

Text Books:

1. ACHYUT GODBOLE, ATUL KAHATE "Web Technologies: TCP/IP, Architecture, and Java Programming", Second Edition, TMH (1-5 unit)

2. Dr. Andy Williams, "WordPress for Beginners 2021" A Visual Step-by-Step Guide to Mastering WordPress (6 unit)

Reference Books:

1. N. P. GOPALAN, T. A. ADIKESAVAN, "WEB TECHNOLOGY: A DEVELOPER'S PERSPECTIVE, Second Edition, PHI

2. Brian Messenlehner, Jason Coleman, Building Web Apps with WordPress, 2nd Edition, 2019, O'Reilly Media, Inc

Online Resources:

1. https://wordpress.com/

2. https://www.w3schools.com/

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Course Plan

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Course Title : Advanced Programming Laboratory-II	
Course Code : 201CSP411	Semester : VII
Teaching Scheme : L-T-P : 2-0-4	Credits : 4
Evaluation Scheme : ISE Marks : 50	ESE-POE Marks : 50

Course Description:

This course provides the knowledge about creation of static, dynamic and interactive web application with the help of Node.js, Express.js and React.js. These technologies can be used for developing the client-side, server-side web pages for their specific web applications. This course helps to gain the skills and project-based experience needed for entry into web application and development careers.

Course Objectives:

1. To introduce MERN stack concepts and tools.
2. To expose different Node.js modules and its use.
3. To build the foundations of web development using Express.js and React.js.
4. To develop real life web applications using MongoDB.

Course Outcomes (COs):

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

C411.1	Understand the MERN stack and use the tools for developing the Web applications.
C412.2	Develop the web applications using the Node.js modules.
C413.3	Design and develop the web application using Express.js and React.js.
C414.4	Develop the web application with MongoDB database.

Prerequisite:	The prerequisite for the course includes basic knowledge of the HTML, CSS and JavaScript. The basics of the database concepts are required.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs		BTL
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
C411.1	2	-	-	-	1	-	-	-	-	-	-	-	-	-	L-2
C411.2	2	2	1	-	-	-	-	-	1	-	-	-	2	-	L-6
C411.3	3	1	1	-	-	-	-	-	1	-	-	-	1	-	L-6
C411.4	2	1	1	-	-	-	-	-	1	-	-	-	2	-	L-6

Content	Hours
Unit 1: Introduction of MERN Stack What is MERN stack, Why should we choose MERN Stack for building Mobile and Web applications, Architectural Structure of MERN Stack and its working, Major Components of MERN Stack: MongoDB, Express JS, React, Node.JS, Advantages of MERN Stack.	3
Unit 2: Introduction of Node.js What is Node.js, Features of Node.js, Concept of Node.js, Installation, Node.js example: Console based, web based Node.js, Node.js Console, Node.js REPL, Node.js Package Manager, Node.js –Callbacks	5
Unit 3: Node.js Modules Event Loop, Event Emitter, Buffers, Streams, File System, Global Objects, Utility Modules Web Module	5
Unit 4: Express.js What is Express.js, Installation, Express.js Example, Request, Response, Get, Post, Cookies, File Upload and Template.	4
Unit 5: React JS Introduction, Installation, creating react app, Components, forms, events, Conditional formatting, React CSS, React Tables.	4

Unit 6:MongoDB	
Create Connection, Create Database, Create Collection, MongoDB Insert, MongoDB Select, MongoDB Query.	3

List of Experiments			
Exp. No.	**Name of Experiment**	**S/O**	**Hours**
1	Study of MERN stack basics.	S	2
2	Installation and Configuration of Node.js.	S	2
3	Implementation of console based Node.js application.	O	2
4	Implementation of web based Node.js application.	O	2
5	Implement a program for demonstrating Node.js Callbacks.	O	2
6	Implement a program for demonstrating Node.js events.	O	2
7	Implement a program for demonstrating Node.js file system.	O	2
8	Implement a program for demonstrating Node.js web module.	O	2
9	Study of Express.js basics along with installation.	S	2
10	Implement a program for demonstrating Express.js request and response.	O	2
11	Implement a program for demonstrating Express.js GET and POST.	O	2
12	Implement a program for demonstrating Express.js template.	O	2
13	Study of React.js basics along with installation.	S	2
14	Implement a program for demonstrating React.js forms	O	2
15	Implement an application that demonstrating MongoDB.	O	2
16	Implement a program for the conversion of the legacy technologies to the MERN stack.	O	2
17	Design and develop the mini project for solving the different real time problems using MERN stack in the group of 4-5 students.	O	4

❖ **S-STUDY, O-OPERATIONAL**

❖ **Note: Minimum of 15 Experiments to be performed from the list**

Text Books:

1. Nabendu Biswas, "MERN Projects for Beginners: Create Five Social Web Apps Using MongoDB, Express.js, React, and Node", Apress, 2021

2. Ethan Brown, "Web Development with Node and Express", ORILLIY, 2014

3. David Gutman, "Fullstack Node.js: The Complete Guide to Building Production Apps with Node.js", 2019.

4. KirupaChinnathambi, "Learning React", Paperback

5. Jason Krol, "Web Development with MongoDB and Node.js", 2014, Packt Publishing

Reference Books:

1. Greg Lim, "Beginning MERN Stack: Build and Deploy a Full Stack MongoDB, Express, React, Node.js App", 2021

2. Andrew Mead, "Learning Node.js Development", Packt

Online Resources:

1. https://nodejs.org/en
2. https://expressjs.com/
3. https://react.dev/
4. https://www.mongodb.com/

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Course Plan

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Course Title : Professional Elective Laboratory-I : Advanced Database Systems	
Course Code: 201CSP412	Semester: VII
Teaching Scheme: L-T-P : 0-0-4	Credits: 2
Evaluation Scheme: ISE Marks:50	ESE Marks: NA

Course Description:

This course is designed to develop advanced database management and administration skills. It provides practical knowledge of OODB and NoSQL databases, parallel and distributed database transactions, database security.

Course Objectives:

1. To acquire knowledge on parallel and distributed databases and its applications.
2. To understand the fundamentals of object oriented databases.
3. To design and development databases NoSQL.
4. To provide an introduction to database administration and security

Course Outcomes (COs):

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

C412.1	Implement basic algorithms of parallel and distributed databases.
C412.2	Create data types using object oriented database concepts.
C412.3	Formulate queries using MongoDB/ Apache Cassandra
C412.4	Demonstrate database administration and security.

Prerequisite:	The student should have knowledge of Relational databases and programming languages.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs		BTL
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
C412.1	3	2	1	-	-	-	-	-	-	-	-	-	-	-	L-3
C412.2	3	2	-	-	-	-	-	-	-	-	-	-	-	-	L-3
C412.3	2	-	2	-	-	-	-	-	-	-	-	-	2	-	L-3
C412.4	2	-	1	-	-	-	-	-	-	-	-	-	-	-	L-3

❖ **Minimum 8 experiments to be performed from following list:**

Exp. No.	List of Experiments	S/O	Hours
1	Implement vertical or horizontal fragmentation in distributed DBMS.	O	2
2	Implement semi join in distributed DBMS.	O	2
3	Create structured data types of ORDBMS and perform operations- create table using structured data types, insert data and solve queries.	O	2
4	Study of Open Source NOSQL Database: MongoDB / Apache Cassandra (Installation, Basic CRUD operations, Execution)	O	2
5	Design and Develop MongoDB Queries using CRUD operations. (Use CRUD operations, SAVE method, logical operators)	O	2
6	Implement aggregation with suitable example using MongoDB	O	2
7	Demonstrate database administration by creating users and roles	O	2
8	Implementation of security policies-Discretionary Access Control (DAC)	O	2
9	Develop miniproject using MongoDB/Apache Cassandra for any database system (e.g Library, Inventory etc.)	O	4

❖ **S-STUDY, O-OPERATIONAL**

Text Books:

1. Database System Concepts, A. Silberschatz, H.F. Korth, S. Sudarshan, 6th Edition, McGraw Hill Education

2. Database Management Systems, Raghu Ramkrishnan, Johannes Gehrke, Fourth Edition, McGraw Hill Education

3. NoSQL for Mere Mortals- Dan Sullivan- 1st Edition, Pearson Education

4. Database Systems, Design, Implementation, and Management Coronel-Morris- Rob, Cengage Learning, Ninth Edition

5. Database Systems - Elmasri and Navathe 5th edition, Pearson Education

Reference Books:

1. NoSQL Distilled: A brief guide to merging world of Polyglot persistence, Pramod J. Sadalage and Marin Fowler, Addison Wesley, 2012.

2. Kevin Roebuck, "Storing and Managing Big Data - NoSQL, HADOOP and More", Emereo Pty Limited, 2011,ISBN 1743045743, 9781743045749

Online Resources:

1. NoSQL-https://nptel.ac.in/courses/106104189

Course Plan

Course Title :Professional Elective Lab –I: Data Mining	
Course Code: 201CSP413	Semester: VII
Teaching Scheme: L-T-P: 0-0-4	Credits: 2
Evaluation Scheme: ISE Marks: 50	ESE Marks : NA

Course Description

It covers implementation of Data Mining algorithms related to prediction and forecasting, and generally improve their performance through interaction with data. Special emphasis will be given to the Machine Learning methods as they provide the real knowledge discovery tools. Important related technologies, as data warehousing and on-line analytical processing (OLAP) will be also discussed. Weka can be used to solve data mining problems.

Course Objectives:

1. To apply data preprocessing techniques and tools to solve business problems.
2. To understand data mining techniques and algorithm in business analytics.

Course Outcomes (COs):

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

C413.1	Implement the concept of classification on data.
C413.2	Apply the concept of association rule mining.
C413.3	Apply the concepts of Business Intelligence and Data Mining.
C413.4	Implement prediction using data mining tools.

Prerequisite:	Database Engineering

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs		BTL
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
C413.1	2	-	3	-	-	-	-	-	-	-	-	-	-	-	L-3
C413.2	2	2	2	-	-	-	-	-	-	-	-	-	-	-	L-3
C413.3	2	-	2	-	-	-	-	-	-	-	-	-	1	-	L-3
C413.4	2	3	2	-	2	-	-	-	-	-	-	-	-	-	L-3

❖ **Minimum 8 experiments to be performed from following list:**

List of Experiments			
Exp. No.	**Name of Experiment**	**S/O**	**Hours**
1	Implementation of Decision Tree Algorithm.	O	2
2	Implementation of Support Vector Machine algorithm.	O	2
3	Implement OLAP Queries.	O	2
4	Implementation of Association Rule Mining.	O	2
5	Implementation of K means Clustering Algorithm.	O	2
6	Implementation of K Nearest Neighbor Algorithm.	O	2
7	Build a BI Framework for Decision Making using Weka.	O	2
8	Build a BI Framework to display graphs using Weka.	O	2
9	Use of Weka tool for prediction.	O	2
10	Use of Weka tool for outlier detection.	O	2

❖ **S-STUDY, O-OPERATIONAL**

Text Books:

1. Margaret H. Dunbam, "Data Mining Introductory and Advanced Topics", Pearson Education 2003.

2. Jiawei Han & Micheline Kamber, "Data Mining Concepts & Techniques", 2011, 3rd Edition.

3. Ian H. Witten and Eibe Frank – Data Mining Practical Machine Learning Tools and Techniques, Morgan Kaufmann Publication – 2016 4th Edition.

4. Rajiv Sabherwal "Business Intelligence" Wiley Publications, 2012.

Reference Books:

1. Arun K. Pujari – Data Mining Techniques, Universities Press (India) Pvt. Ltd., 2013 Kindle Edition.

Online Reference:

1. https://nptel.ac.in/courses/106105174/

Course Plan

Course Title : Professional Elective Laboratory –I : High Performance Computing	
Course Code : 201CSP414	Semester : VII
Teaching Scheme : L-T-P : 0-0-4	Credits : 2
Evaluation Scheme : ISE Marks : 50	ESE Marks: -NA

Course Description:

This course focuses on Optimization of serial code by using Parallel Programming paradigms such as OpenMP, MPI and CUDA.

Course Objectives:

1. To introduce software tools and techniques needed to implement parallel programs.
2. To demonstrate different parallel programming paradigms (i.e. languages and libraries).

Course Outcomes (COs):

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

C414.1	Design parallel algorithm and taxonomy of parallel architecture
C414.2	Develop different parallel programs
C414.3	Analyze performance of parallel algorithms designed using Open MP, MPI and CUDA
C414.4	Apply HPC libraries to implement parallel programs

Prerequisite: C/C++, Computer Organization and Architecture, Design and Analysis of Algorithms

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs		BTL
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
C414.1	2	-	3	-	-	-	-	-	-	-	-	-	-	-	L-3
C414.2	2	-	2	-	-	-	-	-	-	-	-	-	-	-	L-3
C414.3	2	3	2	-	2	-	-	-	-	-	-	-	-	-	L-4
C414.4	2	-	2	-	-	-	-	-	-	-	-	-	1	-	L-3

D.Y. PATIL COLLEGE OF ENGINEERING & TECHNOLOGY
KASABA BAWADA KOLHAPUR-416006
(An Autonomous Institute)
Final Year B. Tech. Computer Science & Engineering

SEM-VII (Academic Year-2023-24)

❖ **Minimum 8 experiments to be performed from following list:**

List of Experiments			
Exp. No.	**Name of Experiment**	**S/O**	**Hours**
1	Study of processor architecture and networking.	S	2
2	Analytical modeling of sequential algorithm.	S	2
3	Feasibility study of parallel approach.	S	2
4	Problem statements on Open MP Programming – Vector addition	O	2
5	Problem statements on Open MP Programming – Matrix multiplication	O	2
6	Problem statement on MPI Programming – Send , Receive	O	2
7	Problem Statements on CUDA - Vector addition	O	2
8	Problem Statements on CUDA - Matrix multiplication	O	2
9	Implementation of advanced parallel libraries tools like Tensorflow, Digits, CuDNN	O	2
10	Implementation of advanced parallel libraries tools like CUPY, Pytorch, Keras.	O	2

❖ **S-STUDY, O-OPERATIONAL**

Text Books:

1. Michael J. Quinn, "Parallel Programming in C with MPI and OpenMP", Tata McGraw Hill, 2003

2. Peter S. Pacheco, "An Introduction to Parallel Programming", Morgan Kaufmann, 2011

3. David B. Kirkand Wen-meiW. Hwu, "Programming Massively Parallel Processors", Morgan Kaufmann, 2010

Reference Books:

1. Implement &benchmark parallel programming in C using MPI, OpenMP, and CUDA.

D.Y. PATIL COLLEGE OF ENGINEERING & TECHNOLOGY
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2. Ananth   Grama, George Karypis, Vipin Kumar, Anshul Gupta, "Introduction to ParallelComputing", Pearson Education Limited, 2003

3. Shane Cook, CUDA Programming: A Developer Guide to Parallel Computing with GPUs" Elsevier, 2013

4. Shameem Akhter and Jason Roberts , "Multi-core Programming" Intel Press, 2006

Online Resources:

1. Introduction to parallel programming with OpenMP and MPI, By Prof. Yogish Sabharwal, IIT Delhi

   https://onlinecourses.nptel.ac.in/noc22_cs21/preview

2. GPU Architectures and Programming By Prof. Soumyajit Dey, IIT Kharagpur

   https://onlinecourses.nptel.ac.in/noc20_cs41/preview

3. Parallel Computing, IIT Delhi, Dr. Subodh Kumar

   https://nptel.ac.in/courses/106102114

Course Plan

Course Title : Professional Elective Lab-I : Social Media Analytics	
Course Code : 201CSP415	Semester : VII
Teaching Scheme: L-T-P : 0-0-4	Credits: 2
Evaluation Scheme: ISE Marks:50	ESE Marks : -NA

Course Description:

The social media analytics lab helps in understanding the characteristics and types of social media networks and use of social media analytics tools for the business. It also helps individual to analyze and visualize the data from different types of social media platforms and one can make business decision.

Course Objectives:

1. To understand the fundamental concepts of social media networks and various social media analytics tools and evaluation metrics.
2. To analyze and visualize social media data.
3. To demonstrate social media analytics models.
4. To design and build a social media analytics application

Course Outcomes (COs):

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

C415.1	Use social media analytics tools for business.
C415.2	Identify and collect social media data.
C415.3	Analyze and visualize social media data from multiple platforms.
C415.4	Design and develop content and structure based social media analytics models.
C415.5	Design and implement social media analytics applications for business.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs		BTL
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
C415.1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	L-2
C415.2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	L-2
C415.3	2	-	2	-	-	-	-	-	-	-	-	-	-	-	L-4
C415.4	3	-	2	-	-	-	-	-	-	-	-	-	-	-	L-4
C415.5	3	-	2	-	2	-	-	-	-	-	-	-	1	-	L-3

❖ **Minimum 8 experiments to be performed from following list:**

List of Experiments			
Exp. No.	**Name of Experiment**	**S/O**	**Hours**
1	Study various - i) Social Media platforms ii) Social Media analytics tools iii) Applications of Social media analytics for business.	O	2
2	Data Collection-Select the social media platforms of your choice (Twitter, Facebook, LinkedIn, YouTube, Web blogs etc), connect to and capture social media data for business (scraping, crawling, parsing).	O	2
3	Data Cleaning and Storage- Pre-process, filter and store social media data for business (Using Python, MongoDB, R, etc)	O	2
4	Exploratory Data Analysis and visualization of Social Media Data for business.	O	2
5	Develop Content (text, emoticons, image, audio, video) based social media analytics model for business. (e.g. Content Based Analysis :Topic , Issue ,Trend, sentiment/opinion analysis, audio, video, image analytics)	O	2
6	Develop Structure based social media analytics model for any business. (e.g. Structure Based Models -community detection, influence analysis)	O	2
7	Develop a dashboard and reporting tool based on real time social media data.	O	2

8	Design the creative content for promotion of your business on social media.	O	2
9	Analyze competitor activities using social media data	O	2
10	Develop social media text analytics models for improving existing product/ service by analyzing customer's reviews/comments.	O	2

❖ **S-STUDY, O-OPERATIONAL**

Text Books:

1. Seven Layers of Social Media Analytics_ Mining Business Insights from Social Media Text, Actions, Networks, Hyperlinks, Apps, Search Engine, and Location Data, Gohar F. Khan,(ISBN-10: 1507823207).

2. Analyzing the Social Web 1st Edition by Jennifer Golbeck

3. Mining the Social Web_ Analyzing Data from Facebook, Twitter, LinkedIn, and Other Social Media Sites, Matthew A Russell, O'Reilly

4. Charu Aggarwal (ed.), Social Network Data Analytics, Springer

Reference Books:

1. Social Media Analytics [2015], Techniques and Insights for Extracting Business ValueOut of Social Media, Matthew Ganis, Avinash Kohirkar, IBM Press

2. Social Media Analytics Strategy_ Using Data to Optimize Business Performance, AlexGonçalves, A Press Business Team

3. Social Media Data Mining and Analytics, Szabo, G., G. Polatkan, O. Boykin & A.Chalkiopoulus (2019), Wiley, ISBN 978-1-118-82485-6

Online Resources:

1. https://nptel.ac.in/courses/106106146

2. https://7layersanalytics.com/

3. https://onlinecourses.nptel.ac.in/noc20_cs78/preview

Course Plan

Course Title : Professional Elective Lab-I : Software Architectures	
Course Code : 201CSP416	Semester : VII
Teaching Scheme: L-T-P : 0-0-4	Credits: 2
Evaluation Scheme: ISE Marks:50	ESE Marks : - NA

Course Description:

Software architecture lab is the hands on how to develop software system structures and architectures. It includes software requirements, designing, quality attributes, design pattern, views, documentation, implementation and testing.

Course Objectives:

1. To expose the students with the different software architecture patterns.
2. To design the software architecture requirements and design.
3. To develop documentation and testing the software architecture.

Course Outcomes (COs):

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

C416.1	Design ASR from software requirement specification.
C416.2	Construct software architecture by using modern tools.
C416.3	Build design patterns in software architectures.
C416.4	Develop documentation and test the software architecture.

Prerequisite:	Software Engineering

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs		BTL
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
C416.1	2	2	2	-	-	-	-	-	-	-	-	-	-	-	L-3
C416.2	2	2	2	-	2	-	-	-	-	-	-	-	-	-	L-3
C416.3	2	2	2	-	-	-	-	-	-	-	-	-	1	-	L-3
C416.4	2	2	-	-	2	-	-	-	-	-	-	-	-	-	L-3

❖ **Minimum 7 experiments to be performed from following list:**

List of Experiments			
Exp. No.	Name of Experiment	S/O	Hours
1	Design ASRs by using requirement document of project.	O	2
2	Write a program for design pattern generation .	O	2
3	Implementation of any two design patterns in java.	O	2
4	Design of the Logical View of the Weather Mapping System.	O	2
5	Design software architecture on any Agile development project.	O	2
6	Design software architecture for Uber application using UML.	O	2
7	Develop the documentation testing environment for software architecture.	O	2
8	Develop a simple application using design patterns.	O	2

❖ **S-STUDY, O-OPERATIONAL**

Text Book:

1. Len Bass Paul Clements Rick Kazman, Software Architecture in Practice, Third Edition, Pearson Edu (2013)

Reference Books:

1. The Art of Software Architecture: Stephen T. Albin, Wiley dreamtech, (2003).
2. Pattern Oriented Software Architecture Vol. I: Buschmann, F. WSE, (1996).
3. Large Scale Software Architecture: A Practical Guide Using UM: Jeff Garland, Richard Anthony, Wiley dreamtech, (2003).
4. Software Architecture - Perspectives on an Emerging Discipline: Mary Shaw & David Garlan, PHI, (1996).
5. Design Patterns: Elements of Reusable Object Oriented Software: Gamma, E. et. Al., Addison Wesley, (1995).
6. Software Engineering 7th ed.: Ian Sommerville, Addison Wesley, (2004)

Online Resources:

1. https://tecnrt.org/docs/cse/materials/SADP.pdf

Course Plan

Course Title : Professional Elective Lab –I : Machine Learning	
Course Code: 201CSP417	Semester: VII
Teaching Scheme: L-T-P: 0-0-4	Credits: 2
Evaluation Scheme: ISE Marks: 50	ESE Marks : NA

Course Description:

This course consists of understanding of basic terminologies and concepts of machine learning techniques. It consists of understanding and implementation of supervised, unsupervised and Reinforcement learning algorithms to classify, cluster, predict and optimize dataset of different domains. This course helps to learn about visualization and measuring performance metrics of the developed model.

Course Objectives:

1. To understand various supervised and unsupervised algorithms.
2. To develop classification models using supervised machine learning algorithms.
3. To develop clustering models using unsupervised algorithms.
4. To analyze data, visualize and measure performance metrics of the developed model.

Course Outcomes:

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

C417.1	Apply different data preprocessing methods, visualization methods, performance metrics and hyper parameters to use and improve the model.
C417.2	Implement different types of supervised machine learning algorithms to solve regression problems.
C417.3	Demonstrate various supervised machine learning algorithms to solve classification problems.
C417.4	Implement different types of supervised machine learning algorithms to solve clustering problems.

Prerequisite:	Statistics, Probability Theory, Algorithms, Linear Algebra, Python

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs		BTL
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
C417.1	2	1	-	-	-	-	-	-	-	-	-	-	-	-	L-3
C417.2	2	2	2	-	-	-	-	-	-	-	-	-	-	-	L-3
C417.3	2	2	2	-	-	-	-	-	-	-	-	-	-	-	L-3
C417.4	1	2	2	2	1	-	-	-	-	-	-	-	1	-	L-3

❖ **Minimum 7 experiments to be performed from following list:**

Exp. No	Name of Experiment	S/O	Hours
	List of Experiments		
1	Installation of tools used to implement machinelearning algorithms.	O	2
2	Introduction to different data sets and preparation of data set for data analysis using preprocessing libraries of python.	O	2
3	Design and develop linear/multi regression model.	O	2
4	Design and develop logistic regression model with simple dataset.	O	2
5	Design and develop classification model using SVM/Decision Tree with real time dataset.	O	2
6	Design and develop K-Means Clustering algorithm and	O	2
7	Design and develop Hierarchical Risk Parity algorithm to Optimize the given problem.	O	2
8	Apply various hyper parameter tuning to improve performance of the model and measure performance metrics.	O	2

❖ **S-Study   O-Operational**

Text Book:

1. Anuradha Srinivasaraghvan Vincy Joseph," Machine Learning", Wiley,2019

Reference Books:

1. Ethem Alpaydın, "Introduction to Machine Learning", IT Press Third Edition Year 2014

2. Shai Shalev-Shwartz, "UNDERSTANDING MACHINE LEARNING from Theory to Algorithms", Cambridge University Press.

3. Tom M. Mitchell, " Machine Learning", McGraw Hill First Edition Year 1997.

Online Resources:

1. https://www.docdroid.net/Z87gYoF/machine-learning-with-python

2. https://github.com/hemansnation/Data-Science-ML-Full-Stack-2022

<div style="text-align:center">**Course Plan**</div>

Course Title : Professional Elective Lab-I : Cyber Security and Digital Forensics	
Course Code : 201CSP418	Semester : VII
Teaching Scheme : L-T-P : 0-0-4	Credits : 2
Evaluation Scheme : ISE Marks : 50	ESE Marks : NA

Course Description:

Data has become an essential aspect of organizations, and protecting it has become a very crucial task. Small or big, every organization can be affected by the data breaches due to lack of awareness and lack of capability to invest in protecting their data. The Cyber Security and Digital Forensics Lab is designed to give a practical perspective of the subject to the students.

Course Objectives:

1. To learn about digital and forensics tools.
2. To study operating system utilities.
3. To understand the hardware and software key loggers and network monitoring tools.

Course Outcomes (COs):

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

C418.1	Observe the working of different digital analytics and forensics tools.
C418.2	Demonstrate different operating system utilities.
C418.3	Demonstrate the working of key loggers.
C418.4	Use different network monitoring tools.

Prerequisite:	Fundamental knowledge of Data Communication, Networking and Information Security.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs		BTL
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
C418.1	2	2	-	-	1	-	-	1	-	-	-	-	-	-	L-2
C418.2	2	3	-	-	-	-	-	-	-	-	-	-	-	1	L-2
C418.3	2	3	-	-	2	-	-	2	-	-	-	-	-	2	L-3
C418.4	2	2	-	-	2	-	-	1	-	-	-	-	-	1	L-3

❖ **Minimum 7 experiments should be performed from following list.**

List of Experiments			
Exp. No.	**Name of Experiment**	**S/O**	**Hours**
1	Study of forensic tools such as a. The Sleuth Kit b. Autopsy	S	2
2	Download and analyze the working of any 3 tools from the list: a. Adobe Analytics b. Content square c. Full Story d. Google Analytics e. Heap f. Looker g. Mix panel h. Pendo	O	2
3	Difference between financial frauds & scams and social media frauds & scams.	O	2
4	Information on key loggers, its types and implementation of one of the key logger.	O	2
5	Perform operating system utilities like Net Stat, FC, open files.	O	2
6	Perform some open source tools for network monitoring.	O	2
7	Minimum 2 Case Studies based on recent tools on ethical hacking.	O	2

❖ **S-STUDY, O-OPERATIONAL**

Text Books:

1. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Sumit Belapure and Nina Godbole, Wiley India Pvt. Ltd.

2. John R. Vacca, "Computer Forensics: Computer Crime Scene Investigation", Cengage Learning, 2nd Edition, 2005

3. C. Altheide & H. Carvey Digital Forensics with Open Source Tools, Syngress, 2011. ISBN: 9781597495868

4. CYBER LAW-The Indian Perspective, Pawan Duggal (2009)

Reference Books:

1. Computer Security Fundamentals - Chuck Easttom, Pearson, third edition.

2. Jason Luttgens, Matthew Pepe, Kevin Mandia, Incident Response & Computer Forensics, McGraw-Hill Osborne Media, 3rd edition , 2014.

3. Keith J. Jones, Richard Bejtlich, Curtis W. Rose, Real Digital Forensics: Computer Security and Incident Response, Paperback – Import, 2005.

4. 7 Years of Indian Cyber Laws, Rohas Nagpal (2008)

Online Resources:

1. https://legalserviceindia.com

2. https://infosecawareness.in/cyber-laws-of-india

3. https://onlinecourses.nptel.ac.in/noc23_cs127/preview

Course Plan

Course Title : Professional Elective Lab-I : Blockchain Technology	
Course Code :201CSP419	Semester :VII
Teaching Scheme : L-T-P: 0-0-4	Credits: 2
Evaluation Scheme : ISE Marks: 50	ESE Marks : NA

Course Description:

This course is designed to give a broad overview for aspiring Blockchain professionals. Students will get hands-on experience of creation of block, Blockchain, smart contract, ledgers etc.

Course Objectives:

1. To understand working of Blockchain.
2. To develop smart contract.
3. To apply Blockchain technology on real time problem.
4. To understand and use security features in Blockchain technology.

Course Outcomes (COs):

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

C419.1	Understand and use of varoius Blockchain framework.
C419.2	Develop Blockchain based solutions and write smart contract.
C419.3	Implement Blockchain technology for various domain.
C419.4	Apply the security features in Blockchain technology.

Prerequisite:	Programming language.

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Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs		BTL
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
C419.1	3	-	-	-	-	-	-	-	-	-	-	-	-	-	L-2
C419.2	3	-	2	-	2	-	-	-	-	-	-	-	-	-	L-3
C419.3	3	2	2	-	-	-	-	-	-	-	-	-	1	-	L-3
C419.4	3	2	2	-	-	-	-	-	-	-	-	-	1	-	L-3

❖ **Minimum 8 experiments to be performed from following list:**

List of Experiments			
Exp. No.	Name of Experiment	S/O	Hours
1	Installation and configuration of Ethereum framework	O	2
2	Installation and configuration of Hyperledger Fabric framework	O	2
3	Implement Merkle tree and create block.	O	2
4	Create your own wallet for crypto currency using any Blockchain Platforms.	O	2
5	Implement consensus algorithm.	O	2
6	Implement Smart Contract using Ethereum frameworks.	O	2
7	Implement Smart Contract using Hyperledger Fabric framework	O	2
8	Installation of solidity and ganache.	O	2
9	Mini project based on blockchain application.	O	2

Text Books:

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Millerand Steven

2. Goldfeder, "Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction" Princeton University Press (July19,2016).

3. Mastering Blockchain: A deep dive into distributed ledgers, consensus protocols, smart contracts, DApps, cryptocurrencies, Ethereum, and more, 3rd Edition, Imran Bashir, Packt Publishing, 2020

Reference Books:

1. S. Shukla, M. Dhawan, S. Sharma, S. Venkatesan, "'Blockchain Technology: Cryptocurrency and Applications" Oxford University Press, 2019.

2. Josh Thompson, "Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming" Create Space Independent Publishing Platform, 2017.

3. William Stallings, "Cryptography and Network security Principles and Practices", Pearson/PHI,2007

Online Resources:

1. Hyperledger Tutorials - https://www.hyperledger.org/use/tutorials

2. Ethereum Development Resources - https://ethereum.org/en/developers

3. https://onlinecourses.nptel.ac.in/noc22_cs44/

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Course Plan

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Course Title : Internship	
Course Code :201CSP420	Semester : VII
Teaching Scheme : L-T-P : 0-1-0	Credits : 4
Evaluation Scheme : ISE Marks : NA	ESE Marks : - NA

Course Description:

This course encourages students to get experiential learning benefits by doing internship. An internship experience can offer students, the important benefit of career exploration and be an excellent resume builder, but it is important to remember that academic credit is awarded for the learning achieved, not for the work experience alone. The primary purpose of doing internship is to better understand the theories, ideas, and practices of your discipline by actively engaging in a "hands-on," work-based, learning experience. In addition, an internship can be a very exciting way to learn. Students can discover new knowledge and understanding for themselves by being curious explorers and investigators during an internship. Most organizations and internship sites are looking for student interns who are enthusiastic, quick learners, personable, reliable, and capable of working on their own. They will provide job-related tasks and responsibilities and offer you an opportunity and environment in which to learn. Part of the process a student goes through when negotiating and developing an internship is learning how to learn from experience.

Course Objectives:

The course is designed to expose the students to the industry environment and to take up on-site assignment as interns.

Course Outcomes (COs):

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

C420.1	Have an exposure to industrial practices and to work in teams.
C420.2	Understand the impact of engineering solutions in a global, economic, environmental and societal context.
C420.3	Develop the ability to engage in research and to involve in life-long learning.

Prerequisite:	The student should have knowledge of programming languages, database software, security, networking

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs		BTL
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
C420.1	1	1	1	-	-	-	1	2	2	2	-	-	-	-	L-3
C420.2	1	2	2	-	2	2	-	-	-	-	-	-		-	L-2
C420.3	-	-	-	-	-	-	-	-	-	-	-	2		-	L-3

Internship Guidelines

The students are expected to undergo **4 to 6 weeks Internship** in the industry and work on the relevant area as assigned by the industry either after semester IV or semester VI. The evaluation of which will be done in semester VII. The work done should be monitored and evaluated by the concerned industry expert based on the report prepared by the student. The department has to assign faculty mentors to a student who has to communicate with the industry and monitor the entire internship-related work periodically.

The scheme of evaluation will be as under: -

 a. **Industry expert/ supervisor: - 70%**

   (Evaluation Parameters: Involvement, Individual and teamwork, Technical skills,

   Communication, Additional skills acquired)

 b. **Department & Faculty mentor: - 30%**

   (Evaluation Parameters: Presentation, Communication, Technical Domain and Key

   Takeaways from the internship, Questions and Answers, Report)

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It consists of presentation and submission of report to the department at the beginning of the subsequent semester

1. The Internship can be availed by the students during the summer vacations after completion of semester IV or VI.

2. The Credit of the Internship will be considered in semester VII.

3. The Industry experts/ supervisor are expected to assign the work worth minimum 100 to 120 hours for 4 weeks duration and should monitor and evaluate periodically.

4. At the completion of Internship work, the student is expected to prepare a report on the work done and get it certified from the industry expert.

Course Plan

Course Title : Project –IV	
Course Code : 201CSP421	Semester : VII
Teaching Scheme : L-T-P : 0-0-6	Credits : 3
Evaluation Scheme : ISE Marks : 50	ESE- OE Marks : 50

Course Description:

B.Tech Project helps to explore and strengthen the practical knowledge by doing hands-on real-time projects as learning by doing encourages active involvement. Projects are the gateway for students to show their skills and stand apart from others and become productive engineers. The projects fulfill the purpose of synthesizing the knowledge acquired during the years and demonstrating the student's aptitude by applying the knowledge. This course also acts as an aid in understanding the domain through proper modeling and analysis using the state-of art technology and then applying relevant software engineering principles to develop modular and robust applications through the use of Standards and various tools.

Course Objectives:

1. To Understand Software Development Life Cycle and prepare project proposal.
2. To understand the problem identification, formulation and Design steps.
3. To apply technical knowledge for selected project topic and function effectively on teams and to communicate effectively.
4. To illustrate the output in written and oral form.

Course Outcomes (COs):

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

C421.1	Explain the need of a software project for the society.
C421.2	Undertake problem identification, formulation and solution.
C421.3	Identify requirement analysis like functional and technical requirements for the project.
C421.4	Communicate with engineers and community at large in written and oral forms.

Prerequisite:	Software Engineering, Programming Languages, Database Engineering, Project –II, III

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes(POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs		BTL
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
C421.1	3	2	1	2	-	-	-	1	3	-	1	-	1	-	L-4
C421.2	2	3	3	3	-	-	1	1	3	-	-	-	3	-	L-6
C421.3	-	3	-	-	3	2	-	1	3	-	2	2	-	1	L-5
C421.4	-	-	-	-	-	2	-	1	3	3	-	-	1	2	L-3

Content
1. The project work is to be carried out in two semesters of Final Year Computer Science and Engineering. The project should be undertaken preferably by group of 5 students who will jointly work and implement the project in the two semesters.
2. In Semester VII, the group will select a project with the approval of the Guide (staff member) and submit the Name of the project with a synopsis of the proposed work of not more than 04 to 08 pages before second week of August in the academic year.
3. Students should maintain a project log book containing weekly progress of the project.
4. The group is expected to complete detailed system design, analysis, data flow design, procurement of hardware and/or software, implementation of a, most modules of the proposed work at the end of semester –VII as a part of the term work submission in the formof a joint report.
5. The term work assessment will be done jointly by teachers appointed by Head of the Institution.
6. Students have to complete maximum of the project work (70%) in the VII semester.
7. Project IV evaluation is based on the continuous basis by the project guide.
8. The oral examination will be conducted by an internal and external examiner.

Note:

1. Project work should be continually evaluated based on the contributions of the group members, originality of the work, innovations brought in, research and developmental efforts, depth and applicability, etc.

2. Two mid-term evaluations should be done, which includes presentations and demos of the work done.

3. Care should be taken to avoid copying and outsourcing of the project work.

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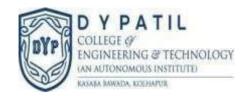**KASABA BAWADA KOLHAPUR-416006**
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Course Plan

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Course Title : Professional Elective-V: Software Project Management	
Course Code : 201CSL422	Semester : VIII
Teaching Scheme : L-T-P : 3-0-0	Credits : 3
Evaluation Scheme : ISE+MSE Marks :20+30	ESE Marks : 50

Course Description:

The course provides multidimensional management of software projects. The primary focus is on the management of basic components of software project management i.e. Time, Cost and Quality. This course extends the scope with the practical approach of project management using different software tools.

Course Objectives:

1. To provide basic understanding of project management principles and practices.
2. To learn the basics of Project Planning and Scheduling.
3. To understand the importance of Time, Cost and Quality attributes in project management.
4. To learn the agile development practices and an agile approach to software development.

Course Outcomes (COs):

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

C422.1	Identify project characteristics and various stages of a project management.
C422.2	Apply the concept of project planning and scheduling to meet the goals of project management.
C422.3	Understand the importance of scope, time and cost attributes in project management.
C422.4	Use and apply the fundamental concepts of agile methodology and agile development practices in project management.

Prerequisite:	Software Engineering

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs		BTL
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
C422.1	2	-	-	-	-	-	-	1	-	-	2	-	-	-	L-2
C422.2	2	1	-	-	-	-	-	-	-	-	1	-	1	-	L-3
C422.3	2	2	-	-	-	-	-	-	-	-	-	-	-	-	L-2
C422.4	2	1	1	-	-	-	-	1	1	-	2	-	1	-	L-3

Content	Hours
Unit 1: Introduction to Project management What is Project?, Three Goals of a Project, Project Life Cycle, Selecting projects to meet Organizational goals, Project Portfolio Process, Roles of a Project manager, Responsibilities, Selection of a Project manager, Project Management as a Profession.	6
Unit 2: Project Planning and Budgeting Project Plan, Planning Process Overview, Work Break Down Structure (WBS), Multidisciplinary Teams, Methods of Budgeting, Cost Estimating and Improvement, Risk Management in Budget.	6
Unit 3: Scheduling, Monitoring and Controlling the Project PERT and CPM Networks, Project Uncertainty and Risk Management, The Gantt Chart, Extensions to PERT/CPM, The Plan Monitor Control Cycle, Data Collection and Reporting, Earned Value, Project Control, Control System Design, Scope Creep and Change Control.	6
Unit 4: Evaluating and Terminating the Project Evaluation, Project Auditing, Termination.	6
Unit 5: Agile Agile Development, Classification of Methods, The Agile Manifesto and Principles, Agile Project management, Simple Practices and Project Tools, Empirical Vs Defined and Prescriptive Process, Principle based Vs Rule Based, Agile Hype, Specific Agile Methods.	6
Unit 6: Scrum & Extreme Programming Scrum- Method Overview, Life Cycle, Work Products, Roles and practices, Values, Common Mistakes and Misunderstanding, Sample Projects, Process mixtures, Adoption Strategies, Strengths Vs Other. Extreme Programming- Method Overview, Life Cycle, Work Products, Roles and practices, Values, Common Mistakes and Misunderstanding, Sample Projects, Process mixtures, Adoption Strategies, Strengths Vs Other.	6

Text Books:

1. Project Management Core Text Book By Samual Mantel Jr., Jack Meredith, Sutton, M. R. Gopalan, Scott Shafer, Wiley India, First Indian Edition.(Unit 1 to 4)

2. Agile & Iterative Development-A managers Guide By Craig Larman Pearson Education. (Unit 5 and 6).

Reference Books:

1. Information Technology Project Management, Kathy Schwalbe, Cengage Learning

2. Software Project Management, Bob Huges, Mike Cotterell, Rajib Mall, McGraw Hill Education.

Online Resources:

1. ASANA -Manage your team's work, projects, & tasks online • Asana

2. Slack -https://slack.com

3. JIRA- Jira suite of products | How teams do great work - together (atlassian.com)

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Course Plan

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Course Title : Professional Elective-V : Semantic Web	
Course Code: 201CSL423	Semester: VIII
Teaching Scheme: L-T-P: 3-0-0	Credits: 3
Evaluation Scheme: ISE+ MSE Marks:20 + 30	ESE Marks: 50

Course Description:

The course will cover knowledge modeling concepts such as metadata, ontologies, description logics, rules. It also covers important Web standards for representing data and knowledge including the Semantic Web languages RDF and OWL, technologies for extracting information from text and databases.

Course Objectives:

1. To understand the structure of the semantic web technology.
2. To learn the fundamentals of Ontology, RDF and RDFS.
3. To introduce SPARQL and OWL.
4. To understand the ontology engineering approaches.

Course Outcomes (COs):

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

C423.1	Understand the concepts of semantics of knowledge and resource, ontology, RDF, RDFS.
C423.2	Apply SPARQL in Semantic Web.
C423.3	Describe semantics and inference with OWL.
C423.4	Use ontology engineering approaches in semantic applications.

Prerequisite:	Students should have basic knowledge of databases, compilers, automata theory, SQL, data mining and natural language processing.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs		BTL
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
C423.1	2	-	1	-	-	-	-	-	-	-	-	-	-	-	L-2
C423.2	3	2	1	-	-	-	-	-	-	-	-	-	2	-	L-3
C423.3	2	-	-	-	-	-	-	-	-	-	-	-	2	-	L-2
C423.4	2	2	2	-	-	-	-	-	-	-	-	-	-	-	L-3

Content	Hours
Unit 1: Introduction to Semantic Web Technologies Introduction, Current web vs Semantic Web, Semantic Web Technologies, A layered approach	3
Unit 2: Describing Web Resources: RDF Introduction , RDF: Data Model, RDF Syntaxes, RDFS: Adding Semantics, RDF Schema: The Language, RDF and RDF Schema in RDF Schema, An Axiomatic Semantics for RDF and RDF Schema, A Direct Inference System for RDF and RDFS	7
Unit 3: Querying the Semantic Web SPARQL Infrastructure, Basics: Matching Patterns, Filters, Constructs for Dealing with an Open World, Organizing Result Sets, Other Forms of SPARQL Queries, Querying Schemas, Adding Information with SPARQL Update	7
Unit 4: Web Ontology Language: OWL Introduction, Requirements for Ontology Languages, Compatibility of OWL2 with RDF/RDFS, The OWL Language, OWL2 Profiles.	6
Unit 5: Logic and Inference rules Introduction, Example of Monotonic Rules: Family Relationships, Monotonic Rules: Syntax, Monotonic Rules: Semantics, OWL2 RL: Description Logic Meets Rules, Rule Interchange Format: RIF, Semantic Web Rules Language (SWRL), Rules in SPARQL: SPIN , Nonmonotonic Rules: Motivation and Syntax, Example of Nonmonotonic Rules: Brokered Trade, Rule Markup Language (RuleML) .	7
Unit 6: Ontology Engineering Introduction, Constructing Ontologies Manually, Reusing Existing Ontologies, Semiautomatic Ontology Acquisition, Ontology Mapping, Exposing Relational Databases, Semantic Web Application Architecture	6

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SEM-VIII (Academic Year-2023-24)

Text Book:

1. A Semantic Web Primer by Grigoris Antoniou Frank van Harmelen, The MIT Press Cambridge (Unit 1 to 6).

Reference Books:

1. Foundation of Semantic Web Technologies, Pascal Hitzler, Markus and Sebastian

2. Semantic Web for Dummies, by J. Pollock, 2009.

3. John Davies, Rudi Studer, and Paul Warren John, "Semantic Web Technologies: Trends and Research in Ontology-based Systems", Wiley and Son's, 2006.

Online Resources:

1. Apache Jena and Fuseki are two excellent open source packages for creating and using RDF triple stores

   https://jena.apache.org/

   https://jena.apache.org/documentation/fuseki2/

2. Protege is the most popular application for creating, editing and viewing semantic web ontologies and data

   https://protege.stanford.edu/

3. Pubby is a linked data frontend for SPARQL endpoints.

   https://github.com/cygri/pubby

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Course Plan

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Course Title : Professional Elective-V: Deep Learning	
Course Code : 201CSL424	Semester : VIII
Teaching Scheme : L-T-P : 3-0-0	Credits : 3
Evaluation Scheme : ISE+MSE Marks :20+30	ESE Marks : 50

Course Description:

This course consists of introduction to the architecture of Deep Neural Network and introduction to generative deep learning models. It focuses on Convolution Neural Network, Recurrent Neural Network, Long Short Term Memory and GRU on real time data sets.

Course Objectives:

1. Understand the basic concepts of deep learning networks.
2. Introduce different models of deep learning to work with various types of inputs.
3. Learn effects of different parameters and hyper-parameters on deep learning model output.

Course Outcomes (COs):

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

C424.1	Understand the architectures of neural network and deep learning networks.
C424.2	Apply preprocessing techniques on data and study tuning of various hyper parameters.
C424.3	Understand various neural network operations and visualize the models.
C424.4	Illustrate Keras sequential API and Functional API.

Prerequisite:	Statistics, AI, Machine Learning.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs		BTL
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
C424.1	2	2	-	-	-	-	-	-	-	-	-	-	-	-	L-2
C424.2	3	2	2	-	-	-	-	-	-	-	-	-	-	-	L-3
C424.3	2	-	-	-	-	-	-	-	-	-	-	-	2	-	L-2
C424.4	2	-	-	-	-	-	-	-	-	-	-	-	2	-	L-2

Content	Hours
Unit 1: Neural Network and Deep Learning Introduction to AI, ML and Deep Learning, A brief history of neural network, Basics of neural network, Data representation for neural network, anatomy of neural network. Introduction to Deep Learning: Building blocks of deep neural network, backward and forward propagation, Parameters vs. Hyper parameters, analyze the major trends of deep learning.	6
Unit 2: Tensor flow, Keras, Hyper parameter Tuning and Interpretability Introduction of Tensor flow, The computation graph, Modeling cyclic dependencies, Building and running visualization, Computing graph and distribution, Simple math operation and distribution, Tensors, Rank of tensors, Tensor math, Tensor flow example, Keras: Introduction, Models, Layers, Pre processing, Deep Learning case studies, Introduction to Hyper Parameter Tuning: Batch Normalization, Tuning process, Normalizing, Weighted averages, Adam Optimizer ,Activation Functions in Network, Learning Rate, No of iterations, hidden layers, hidden units, momentum, mini batch size Gradient decent, Over fitting and under fitting, regularization.	8
Unit 3: Convolutional Neural Networks (CNN) Foundation of CNN: Computer Vision, The convolution operation: Edge Detection Example, Padding, Strided Convolution, The pooling operation: max pooling, average pooling, Relu layer, fully connected operation (Dense layers), Training a convnet from scratch on a small dataset, Using pre-trained convnet, Visualizing what convnet learn.	6

Unit 4: Sequence Models Introduction, Notations, Univariate dataset, Scaling data, label encoding and One hot encoding, A recurrent layer in Keras, Vanishing Gradients with RNN's: LSTM and GRU layers, Example of LSTM in Keras, Advanced use of Recurrent Neural Network 6	6
Unit 5: Keras Functional API: Introduction to Keras functional API, Multivariate dataset, Layer sharing, Inspecting and monitoring deep learning models using Keras callbacks: Early Stopping, Tensor Board, Learning Rate Scheduler , Getting the most out of your models	5
Unit 6: Generative Deep Learning: Introduction to Generative Learning using auto encoder: autoregressive, Reversible, auto encoder and variation auto encoder architecture. Example on Text generation with LSTM, Generating images with variation auto encoders, Introduction to generative adversarial network.	5

Text Books:

1. Fundamentals of Deep Learning, First Edition, Nikhil Buduma,O'Reilly,2017 (Unit 1,2)
2. Visual Introduction to Deep Learning, Meor Amer, K Dimension (Unit 3 to 6)

Reference Books:

1. Deep Learning Cook Book 1st Edition, Douwe Osinga O'Reilly,2017
2. Deep Learning Methods and Applications, 1st edition, by Deng &Yu, Now Publications,2017
3. Generative Deep Learning, First Edition, David Foster,O'Reilly,2019
4. Deep Learning using Python First Edition, Dr. S. Lovelyn Rose, Dr. L Ashok Kumar, Dr. D. Karthika, Renuka,Wiley,2019

Online Resources:

https://onlinecourses.nptel.ac.in/noc20-CS62

Course Plan

Course Title : Professional Elective-V: User Interface Design	
Course Code : 201CSL425	**Semester : VIII**
Teaching Scheme : L-T-P : 3-0-0	**Credits : 3**
Evaluation Scheme : ISE+MSE Marks : 20+30	**ESE- Marks : 50**

Course Description:

This course includes basics of user interface design. The course will emphasize on understanding of user experience and cognition, which are the key factor to achieve user-friendly Interface Design. It gives details about different windows/mobile components and applications.

Course Objectives:

1. To acquaint the knowledge of user centered design.
2. To explore user centered methods in design, graphic design on screens, simulation and prototyping techniques.
3. To provide usability testing methods and interface technologies.

Course Outcomes (COs):

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

C425.1	Understand the user interface design process and business function.
C425.2	Explain the various user interface design methods.
C425.3	Understand the user interface testing strategies.
C425.4	Design User Interface Applications.

Prerequisite:	Software Engineering, Java, Web Technology

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes(POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs		BTL
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
C425.1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	L-2
C425.2	2	2	-	-	-	-	-	-	-	-	-	-	-	-	L-2
C425.3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	L-2
C425.4	2	3	2	-	-	-	-	-	-	-	-	-	1	-	L-3

Content	Hours
Unit 1: Importance of User Interface Introduction, Overview, The importance of user interface – Defining the user interface, The importance of Good design, Importance of good design - Benefits of good design. A brief history of Screen design, The graphical user interface popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user - Interface popularity, characteristics- Principles of user interface.	6
Unit 2: The User Interface Design process The User Interface Design process- Obstacles, Usability, Human interaction with computers, Importance of human characteristics, Human consideration, Human Interaction speeds, Understanding business Functions, Design standards.	6
Unit 3: Interface and Screen Design Screen and Web Page Meaning and Purpose Organizing Elements Clearly and Meaningfully Ordering of Data and Content, Navigation and Flow Visually Pleasing Composition, Focus and Emphasis Presenting Information Simply and Meaningfully Technological Considerations in Interface Design – Graphical User Interface (GUI), Web User Interface(WUI), Voice User Interfaces (VUI), Tangible User Interfaces (TUI), Ubiquitous User Interfaces(UUI. Next generation of user interfaces.	6
Unit 4: Interface Design Methods Characteristics of a GUI. Information presentation. Interaction styles. Direct manipulation. Direct manipulation advantages. Indirect manipulation. Command interfaces. Problems with command interfaces. Command languages. Natural language interfaces. User interface design process. Lifecycle models. A simple interaction design model. Traditional 'waterfall' lifecycle. A lifecycle for RAD (Rapid Applications Development). The Star lifecycle model. Usability engineering lifecycle model: features. Menu systems. Problems with menu systems. Multiple user interfaces. Help and message system. Guidelines for error messages. Task analysis and modeling. Content analysis. Work environment analysis.	6
Unit 5: Implementation of Graphical User Interfaces Correctly designed software. Software layers. Widgets, buttons, callbacks. Working principles of widgets. Project plan. UI design. Low-level prototypes. Evaluation: user-centered. Users' steps. Evolving user understanding. Result. Colors. Layout. Alignment on grids. I/O. Dialogs. Dialogs and storyboards. Input prototyping and design. Checks for inputs. Output. Data visualization. Examples. Challenges of visualization. Error messages.	6

Unit 6:Testing and Usability Assessment User interface evaluation. Guiding principles for evaluation. Simple evaluation techniques. Process of evaluation. Approaches to evaluation. User observation. Preparing for user observation. Advantages of observation. Disadvantages of observation. Observation research tips. Importance of usability. Usability testing. Usability testing methods. Qualitative vs. quantitative observation. Usability attributes. Testing. Formal vs. informal testing. Testing basics process. Case studies in UI Design.	6

Text Books:

1. Wilbert O Galitz, "The essential guide to user interface design" 2nd Edition; Wiley DreamTech, 2011 (Unit 1 to 6)

Reference Books:

1. Brian Fling, Mobile Design and Development", O'Reilly, 2003
2. Alan Dix, "Human - Computer Interaction", Pearson Education, 2003
3. Ben Shneidermann, "Designing the user interface", Pearson Education, 2009
4. Prece, Rogers and Sharps, "Interaction Design", Wiley 2011

Online Resources:

User Interface Design By Prof. Saptarshi Kolay, IIT Roorkee:

https://onlinecourses.nptel.ac.in/noc21_ar05/preview

Course Plan

Course Title : Professional Elective-VI : Service Oriented Architecture	
Course Code: 201CSL426	Semester: VIII
Teaching Scheme: L-T-P: 3-0-0	Credits: 3
Evaluation Scheme: ISE+ MSE Marks:20 + 30	ESE Marks: 50

Course Description:

The course focuses on key ideas and design principles behind successfully adopting service-oriented computing. It also provides challenges, risks and trade-offs that are in the way of adopting SOA in the real-world.

Course Objectives:

1. To understand service-oriented computing.

2. To describe service-orientation design paradigm.

3. To document specific design characteristics realized by the application of individual design principles.

4. To observe effect of each design principle on other design principle.

Course Outcomes (COs):

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

C426.1	Understand service oriented design fundamentals.
C426.2	Learn service oriented computing.
C426.3	Apply principles in service design.
C426.4	Understand service abstraction, autonomy and discoverability

Prerequisite:	Server-client Architecture, Distributed Architecture, Computational Architectures.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs		BTL
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
C426.1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	L-2
C426.2	2	2	-	-	-	-	-	-	-	-	-	-	-	-	L-2
C426.3	3	2	2	-	-	-	-	-	-	-	-	-	-	-	L-3
C426.4	2	2	2	-	-	-	-	-	-	-	-	-	1	-	L-2

Content	Hours
Unit 1: Design Fundamentals Design Characteristic, Design Principle, Design Paradigm, Design Pattern, Design Pattern Language, Design Standard, Best Practice.	4
Unit 2: Introduction to Service-Oriented Computing Service-Oriented Architecture, Services, and Service-Oriented Solution Logic, Service Compositions, Service Inventory, Understanding Service-Oriented Computing Elements, Service Models, SOA and Web Services, Service Inventory Blueprints, Service-Oriented Analysis and Service Modelling, Service-Oriented Design, Introduction to Service-Orientation.	6
Unit 3: Understanding Design Principles Principle Profiles, Principles and Design Granularity, Design Pattern References, Principles and Service Implementation Mediums. Service Contracts Types of Service Contract Standardization, Contracts and Service Design, Risks Associated with Service Contract Design. Service Coupling Service Contract Coupling Types, Service Consumer Coupling Types, Service Loose Coupling and Service Design.	7
Unit 4: Service Abstraction Types of Meta Abstraction, Measuring Service Abstraction, Service Abstraction and Service Design. Service Reusability Measuring Service Reusability and Applying, Service Reuse in SOA, Service Reusability and Service Design.	6

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Unit 5: Service Autonomy Types of Service Autonomy, Measuring Service Autonomy, Autonomy and Service Design. **Service Statelessness** Types of State, Measuring Service Statelessness, Statelessness and Service Design.	6
Unit 6: Service Discoverability Types of Discovery and Discoverability, Measuring Service Discoverability, Discoverability and Service Design. **Service Composability** Composition Concepts and Terminology, The Complex Service Composition, Measuring Service Composability and Composition Effectiveness Potential, Composition and Service Design.	7

Text Book:

1. Thomas Erl - Service Oriented Architecture_ Principles of Service Design (The Prentice HallService-Oriented Computing Series) (Unit 1 to 6)

Reference Books:

1. (For Dummies) Judith Hurwitz, Robin Bloor, Carol Baroudi, Marcia Kaufman - Service Oriented Architecture For Dummies (For Dummies (Computer_Tech))-For Dummies (2006)

2. (SOA, Service-Oriented Architecture) Eric A. Marks, Mark J. Werrell - Executive's Guide to Web Services-Wiley (2003)

3. Guido Schmutz, Daniel Liebhart, Peter Welkenbach - Service Oriented Architecture_ An Integration Blueprint (2010)

Course Plan

Course Title : Professional Elective-VI : Big Data Analytics	
Course Code : 201CSL427	Semester : VIII
Teaching Scheme : L-T-P : 3-0-0	Credits : 3
Evaluation Scheme : ISE+MSE Marks : 20+30	ESE- Marks : 50

Course Description:

This course provides a basic knowledge, corresponding tools and technologies used in big data. This course provides in depth knowledge of R and Hadoop integration and focuses on advanced concepts in big data like Apache spark and machine learning.

Course Objectives:

1. To understand several key technologies used in manipulating, storing, and analyzing big data.
2. To acquire understanding and integration of R & Hadoop.
3. To acquire understanding of Hadoop Streaming and its importance.
4. To apply tools and techniques to analyze Big Data.

Course Outcomes (COs):

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

C427.1	Understand key technologies in big data.
C427.2	Interfacing R with Hadoop.
C427.3	Understanding of Hadoop Streaming with R.
C427.4	Apply tools and techniques to analyze Big Data.

Prerequisite:	Database Engineering

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

CO	PO												PSO		BTL
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
C427.1	3	-	-	-	-	-	-	-	-	-	-	-	-	-	L-2
C427.2	3	3	-	-	-	-	-	-	-	-	-	-	-	-	L-2
C427.3	3	3	-	-	-	-	-	-	-	-	-	-	-	-	L-2
C427.4	3	3	2	-	2	-	-	-	-	-	-	-	1	-	L-3

Content	Hours
Unit 1: Introduction To Big Data Big Data and its Importance – Four V's of Big Data – Drivers for Big Data –Introduction to Big Data Analytics – Big Data Analytics applications, Architecture Components, Massively Parallel Processing (MPP) Platforms, Unstructured Data Analytics and Reporting, Big Data and Single View of Customer/Product, Data Privacy Protection, Real-Time Adaptive Analytics and Decision Engines.	6
Unit 2 : Introduction to R and Hadoop Getting Ready to Use R and Hadoop, Installing R, Installing R Studio, Understanding the features of R language, Installing Hadoop, Understanding Hadoop features, Learning the HDFS and MapReduce architecture, Introducing Hadoop MapReduce, Understanding the Hadoop MapReduce fundamentals, Hadoop Ecosystem, Hadoop YARN, Hbase, Hive, Pig and Pig latin, Sqoop, ZooKeeper, Flume, Oozie.	6
Unit 3 : Integration of R and Hadoop Integrating R and Hadoop, Introducing RHIPE, Understanding the architecture of RHIPE, Understanding RHIPE samples, Understanding the RHIPE function reference, Introducing RHadoop, Understanding the architecture of RHadoop, Understanding RHadoop examples, Understanding the RHadoop function reference	6

Unit 4 : Hadoop Streaming with R Using Hadoop Streaming with R - Introduction, Understanding the basics of Hadoop Streaming, Understanding how to run Hadoop streaming with R, Understanding a MapReduce application, Exploring the Hadoop Streaming R package	6
Unit 5 : Data Analytics with R and Hadoop Understanding the data analytics project life cycle – Introduction, Identifying the problem, Designing data requirement, Preprocessing data, Performing analytics over data, Visualizing data, Understanding data analytics problems, Exploring web pages categorization Case Studies: Computing the frequency of stock market change	6
Unit 6 Spark for Data Analytics The advent of Spark, Limitations of Hadoop, Overcoming the limitations of Hadoop, Theoretical concepts in Spark: Resilient distributed datasets, Directed acyclic graphs, SparkContext, Spark DataFrames, Actions and transformations, Spark deployment options, Spark APIs, Core components in Spark: Spark Core, Spark SQL, Spark Streaming, GraphX, MLlib, The architecture of Spark	6

Text Books:

1. Arvind Sathi, "Big Data Analytics: Disruptive Technologies for Changing the Game", IBM Corporation, 2012. (Unit 1)

2. Vignesh Prajapati, "Big Data Analytics with R and Hadoop", Packt Publishing 2013. (Unit 2,3,4,6)

3. Nataraj Dasgupta, "Practical Big Data Analytics", Packt Publishing 2018. (Unit 5)

Reference Books:

1. Michael Minelli, Michehe Chambers, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business", Ambiga Dhiraj, Wiely CIO Series, 2013.

2. Sridhar Alla P, "Big Data Analytics with Hadoop 3", Packt Publishing, 2018.

3. Jovan Pehcevski, "Big Data Analytics: Methods and Applications", Arcler Press

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc20_cs92/preview

2. https://www.coursera.org/learn/introduction-to-big-data-with-spark-hadoop

Course Plan

Course Title : Professional Elective-VI : Natural Language Processing	
Course Code : 201CSL428	Semester : VIII
Teaching Scheme : L-T-P : 3-0-0	Credits : 3
Evaluation Scheme : ISE+ MSE Marks : 20 +30	ESE Marks : 50

Course Description:

This course is about how to build systems that analyze unstructured natural language texts and extract useful information from them. The course will cover the technical methodology to apply these frameworks in an informed way, and to make current research accessible.

Course Objectives:

1. To introduces the fundamental concepts and techniques of natural language processing (NLP).
2. To acquire the knowledge of Morphological, Syntactic & Semantic NLP tasks.
3. To use appropriate tools & techniques to solve real world applications in NLP domain.
4. To describe Machine translation & information retrieval.

Course Outcomes (COs):

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

C428.1	Describe Fundamental concept of NLP.
C428.2	Use the concept of Morphological, Syntax & Semantics of NLP.
C428.3	Demonstrate the use of NLP tools & techniques
C428.4	Integrate NLP techniques for machine translation & information retrieval task.

Prerequisite:	Discrete Mathematics, Theory of Computation, Data Science & Big data analytics

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs		BTL
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
C428.1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	L-2
C428.2	2	2	1	-	-	-	-	-	-	-	-	-	-	-	L-3
C428.3	3	1	1	-	-	-	-	-	-	-	-	-	1	-	L-3
C428.4	2	1	1	-	-	-	-	-	-	-	-	-	-	-	L-3

Content	Hours
Unit 1: **Introduction** Introduction & Origin of natural language processing, Language & Knowledge Ambiguities and challenges in processing various natural languages. The different levels of natural language processing. Representation & understanding of natural language processing. Introduction to Real life applications of NLP.	6
Unit 2: Language Modelling &Word Level Analysis Introduction of language models. Grammar Based Language Models, Statistical language model, Regular expressions, Finite-State Automata, Morphological Parsing, Spelling Error Detection & Correction, Word & word Classes, Part of Speech Tagging, unknown words, named entities, multi word expressions.	8
Unit 3: Syntactic Analysis & Semantic Analysis Introduction, Context-Free Grammars, Constituency, Parsing Probabilistic parsing, Indian Languages. Introduction to Semantic Analysis, Meaning Representation, Lexical Semantics, Ambiguity, Word sense Disambiguation.	6
Unit 4: Discourse Processing & NLG Introduction, Cohesion, Reference resolution, Discourse coherence and Structure, what is Natural language generation? Architecture of NLG system, Generation Task and representations, applications of NLG	6

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Unit 5: Machine Translation & Information Retrieval Problems in Machine Translation, MT approaches, Direct machine translation, Rule-Based Machine Translation, Corpus Based Machine Translation, Knowledge-based Machine Translation, Introduction of Information Retrieval, Design feature of information retrieval system.	5
Unit 6: NLP Tools & Techniques Lexical Knowledge Networks, Wordnet, Indian Language, Wordnet, Verbnets, PropBank, Treebank, Universal Dependency Treebank, Natural Language Toolkit, spacy, Textblob, Gensim etc. Sentiment Analysis, Question answering, Recent Trends in NLP.	5

Text Book:

1. "Natural language processing and Information Retrieval" Tanveer Siddiqui, U.S. Tiwary Oxford, 2008 (Unit 1 to 6)

Reference Books:

1. James Allen 2e, "Natural language Understanding", Pearson Education,1994
2. Bharati A., Sangat R., Chaitanya V.."Natural language processing": a Paninian perspective, PHI, 2000
3. "Speech and Language Processing" Daniel Jurafsky and James H Martin 2E, Pearson Education, 2009

Online Resources:

1. https://nlp-iiith.vlabs.ac.in/
2. https://nptel.ac.in/courses/106101007
3. https://nptel.ac.in/courses/106106211

Course Plan

Course Title : Professional Elective-VI : Search Engine Optimization	
Course Code : 201CSL429	Semester : VIII
Teaching Scheme : L-T-P : 3-0-0	Credits : 3
Evaluation Scheme : ISE+MSE Marks :20+30	ESE Marks : 50

Course Description:

Search engines are an integral part of the World Wide Web. Search Engine Optimization provides optimized and efficient way of online content searching. It helps the user to get the desired web contents in minimized efforts. It also provides an effective design methodology to Web Designers which results a growth in site users and followers.

Course Objectives:

1. To provide conceptual understanding of fundamentals of Search Engine Optimization.
2. To understand the search engine processes, components and classification of ranking.
3. To understand the concept of keyword research and its strategy.
4. To understand the concept of link building and Social Media Marketing.

Course Outcomes (COs):

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

C429.1	Understand the basic concept of SEO and its significance.
C429.2	Understand the basic components of SEO process and the importance of ranking process in commercial web design.
C429.3	Understand and apply the concept of keyword research and its effect on SEO strategies.
C429.4	Understand and apply the concept of Link Building and Social media marketing.

Prerequisite:	Web Design and Development (Web Technology)

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs		BTL
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
C429.1	2	-	-	-	-	-	-	-	-	-	-	-	1	-	L-2
C429.2	2	1	1	-	-	-	-	-	-	-	-	-	1	-	L-2
C429.3	2	1	1	-	-	-	-	-	-	-	-	-	1	-	L-3
C429.4	2	1	1	-	-	-	-	-	-	-	-	-	-	-	L-3

Content	Hours
Unit 1: Introduction to SEO What Is SEO, Benefits of SEO, Challenges in SEO, Black-Hat SEO vs. White-Hat SEO, On-Page and Off-Page SEO, Evolution of Search Engines, Search Engine Processes and Components, How Search Engines Work.	6
Unit 2: Ranking in SEO **On-Page SEO-** Title Tag Optimization, Meta Keywords and Meta Descriptions ,Heading Tags (h1, h2, h3, h4, h5, and h6,Engaging Content ,Image Optimization and Interactive Media ,Outbound and Internal Links . **On-Site SEO -** URL Optimization, Site Maps, Domain Trust and Local Domains, Mobile Site Optimization and Responsive Websites, Site-Loading Speed. **Off-Page SEO -** Social Media, Blogging, Localization and Citations, Inbound Links.	6
Unit 3: Keyword Research and Strategy Types of Keywords, Sources of Keywords, Sizing Up the Competition, Boosting Your On-Page SEO Using Keywords and Long-Tail Term.	6
Unit 4: Link Building Important Factors for Link Building, Link-Building Resources and Utilities, Link-Building Tools	6
Unit 5: Content Considerations Content Consideration Factors and Subsequent Implementation, Tools Used for Content Consideration and Curation.	6

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| **Unit 6 Social Media Marketing and SEO** | 6 |
| Implementing Social Media Marketing (SMM), Popular Social Media Networks. | |

Text Book:

1. Introducing SEO Your quick-start guide to effective SEO practices, Aravind Shenoy and Anirudh Prabhu, A press Publication. (Unit 1 to 6)

Reference Books:

1. Search Engine Optimization with PHP -A Developer's Guide to SEO, Jaimie Sirovich, Cristian Darie,Wiley Publishing Inc.
2. Search Engine Optimization ALL-IN-ONE for Dummies, Bruce Clay, Susan Esparza, Wiley Publishing Inc.

Online Resources:

1. https://backlinko.com/hub/seo
2. https://ahrefs.com/blog/seo-for-beginners-book/
3. https://learningseo.io/

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Course Plan

Course Title : Advanced Programming Laboratory –III	
Course Code : 201CSP430	Semester : VIII
Teaching Scheme : L-T-P : 2-0-4	Credits : 4
Evaluation Scheme : ISE Marks : 50	ESE-POE Marks : 50

Course Description:

This course provides the knowledge about creation of Android Mobile Applications using the JAVA and XML. This can be used for developing the different android applications with activities and fragments. The course also includes designing of own applications with the help of XML and database applied to various domains. This course will help to gain the skills and project-based experience needed for mobile application and development career.

Course Objectives:

1. To introduce the android basics and tools for developing android applications.
2. To create an android application using the intent and fragments.
3. To design the android applications user interfaces using different input controls.
4. To create the android application using SQLite database.

Course Outcomes (COs):

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

C430.1	Understand the andriod basics and able to use the tools for developing the android applications.
C430.2	Develop the android applications using the intent and fragments.
C430.3	Design and develop the android application user interfaces using input controls.
C430.4	Develop the android application with SQLite database.

Prerequisite:	The prerequisite for this course includes the basics of the Java language, XML and SQL.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs		BTL
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
C430.1	2	-	-	-	2	-	-	-	-	-	-	-	-	-	L-2
C430.2	2	2	1	-	-	-	-	-	-	-	-	-	2	-	L-6
C430.3	3	1	1	-	-	-	-	-	1	-	-	-	1	-	L-3
C430.4	2	1	1	-	-	-	-	-	1	-	-	-	2	-	L-6

Content	Hours
Unit 1: Overview Overview of Android, History, Android Versions, Android OS stack: Linux kernel, Native Libraries/DVM, Application Framework, Applications, Activity, Activity Back Stack, Process and Threads. Android Development Environment Introduction to Android SDK, Android Emulator, creating a Project, Project Directory Structure, DDMS, Logging in Android (Logcat), Android Manifest File, Permissions.	4
Unit 2: Views and Layouts XML introduction, Android View Hierarchies, Linear Layouts, Relative Layout, Table Layout, List View, Frame Layout Sliding, Using Padding and Margins with Layouts, Activity, Activity life cycle, Fragments, Fragment Life Cycle.	5
Unit 3: Intents What Is Intent? Android Intent Messaging via Intent Objects, Types of Intents, Using Intents with Activities, Sending Intents (Telephony, SMS), Broadcast Receivers.	4
Unit 4: Input Controls, Input Events, Dialogs: Buttons, Text Fields, Checkboxes, Radio Buttons, Toggle Buttons, Spinners, Event Listeners, Event Handlers, Touch Mode, Handling Focus, Dialogs: Alerts, Rating Bar, Progress bar, Popups, Toasts.	4
Unit 5: Menus, Notification and Action Bar Menus, Options menu, Context menu, Popup menu, Handling menu click events, creating a	4

Notification, Notification actions, Notification priority, Managing Notifications, Removing notifications.	
Unit 6:Android Storage and Android Database File handling, Installing SQLite plugin, DBHelper, The Database Schema and Its Creation, Four Major Operations, Cursors, Example. **Case study –** Connecting android application with real time databases e.g. Firebase.	3

List of Experiments			
Exp. No.	**Name of Experiment**	**S/O**	**Hours**
1	Study of Android Basics.	S	2
2	Installation and Configuration Android Studio.	S	2
3	Implementation of different view layout.	O	2
4	Implement a program for demonstrating the activities.	O	2
5	Implement a program for demonstrating fragments.	O	2
6	Implementation of a program for Implicit Intent	O	2
7	Implementation of a program for explicit Intent	O	2
8	Implement a program to demonstrate Buttons, Text Fields, Checkboxes, Radio Buttons, and Toggle Buttons with their events handler.	O	2
9	Implement a program to demonstrate Spinners, Alerts, Popups, and Toasts with their events handler.	O	2
10	Implement a program to demonstrate Rating bar, Progress Bar with their events handler.	O	2
11	Implement a program to demonstrate Menus with their events handler	O	2
12	Implement a program to demonstrate notification	O	2
13	Implement an application that writes data to the internal storage	O	2
14	Implement a program to demonstrate different database operation using SQLite database	O	2

15	Implement an application that implements multi-threading.	O	2
16	Design and develop the mini project for solving the different real time problems using Android Application Development in the group of 4-5 students.	O	4

- ❖ **S-STUDY, O-OPERATIONAL**
- ❖ **Note: Minimum of 15 Experiments to be performed from the list**

Text Books:

1. Wei-Mag Lee, "Beginning Android application development", WROX

2. Marko Gargenta, "Learning Android", 2011, O'Reilly Media

3. Wallace Jackson, "Android Apps for Absolute Beginners", APRESS, SECOND EDITION

4. Lauren Darcey and Shane Conder, "Android Wireless Application Development", Pearson Education, 2nd ed.

Reference Books:

1. Mark L Murphy, "Beginning Android", Wiley India Pvt Ltd

2. James Steele, "The Android Developer's Cook book: Building Applications with the Android SDK", Paperback

3. Reto Meier, "Application Development", Wiley India

4. W.Frank Ableson, RobiSen, Chris King, C. Enrique Ortiz, "Android in Action", Third Edition

Online Resources:

1. https://developer.android.com/studio

Course Plan

Course Title : Professional Elective Lab-II : Software Project Management	
Course Code : 201CSP431	Semester : VIII
Teaching Scheme : L-T-P : 0-0-4	Credits : 2
Evaluation Scheme : ISE Marks:50	ESE Marks : NA

Course Description:

This course provides the practical approach to manage the software projects. The software project management requires hands on skills using different project management tools. In order to enhance the skill based project management practices this course is included in a final year curriculum.

Course Objectives:

1. To provide basic understanding of usage of different project management tools and its applications.
2. To use the project management software tools to complete primary cycles of project management.
3. To improve the skill based problem solving using project management tools.

Course Outcomes (COs):

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

C431.1	Understand the process of project management using different practical based experiments.
C431.2	Apply the principles of project management to solve the real time project management problems.
C431.3	Use different project management tools and can compare its appropriateness.

Prerequisite:	Software Engineering, Software Project Management.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs		BTL
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
C431.1	2	-	-	-	-	-	-	1	-	-	2	-	-	-	L-2
C431.2	2	1	-	-	-	-	-	-	-	-	1	-	1	-	L-3
C431.3	2	2	-	-	-	-	-	-	-	-	-	-	1	-	L-3

❖ **Minimum of 7 Experiments to be performed from the following list**

List of Experiments			
Exp. No.	**Name of Experiment**	**S/O**	**Hours**
1	To exploit Project Management using Jira Software	O	2
2	To exploit Project Management using Slack Software	O	2
3	To exploit Project Management using Asana Software	O	2
4	To exploit Project Management using Trello Software	O	2
5	To exploit Project Management using Gantt Chart Software	O	2

Text Books:

1. Project Management Core Text Book By Samual Mantel Jr., Jack Meredith, Sutton, M. R. Gopalan, Scott Shafer, Wiley India, First Indian Edition.(Unit I to IV)

2. Agile & Iterative Development-A managers Guide By Craig Larman Pearson Education.(UNIT V and VI).

Reference Books:

3. Information Technology Project Management, Kathy Schwalbe, Cengage Learning

4. Software Project Management, Bob Huges, Mike Cotterell, Rajib Mall, McGraw Hill Education.

Online Resources:

1. JIRA- https://www.atlassian.com/software/jira

2. Slack - https://slack.com/solutions/project-management

3. ASANA - https://asana.com/uses/project-planning

4. Trello- https://trello.com

Course Plan

Course Title : Professional Elective Lab-II : Semantic Web	
Course Code : 201CSP432	Semester : VIII
Teaching Scheme : L-T-P : 0-0-4	Credits : 2
Evaluation Scheme : ISE Marks :50	ESE Marks : NA

Course Description:

The course will cover knowledge modeling concepts such as metadata, ontologies, description logics, rules and provenance, important Web standards for representing data and knowledge including the Semantic Web languages RDF and OWL, current best practices and standards for publishing data on the Web, technologies for extracting information from text and databases; and example applications.

Course Objectives:

1. To understand the concept structure of the semantic web technology
2. To understand the fundamentals of Ontology, RDF, RDFS
3. To be aware of SPARQL and OWL.

Course Outcomes (COs):

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

C432.1	Design the ontology using RDF, RDFS
C432.2	Querying the Semantic Web using SPARQL
C432.3	Illustrate logic semantics and inference with OWL.
C432.4	Design ontology using various ontology tools

Prerequisite:	Students should have basic knowledge of databases, compilers, automata theory, SQL, data mining and natural language processing.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs		BTL
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
C432.1	2	-	1	-	-	-	-	-	-	-	-	-	-	-	L-3
C432.2	3	2	1	-	-	-	-	-	-	-	-	-	2	-	L-3
C432.3	2	2	2	-	-	-	-	-	-	-	-	-	-	-	L-3
C432.4	2	-	2	-	2	-	-	-	-	-	-	-	1	-	L-3

❖ **Minimum 7 experiments to be performed from the following list:**

Exp. No	List of Experiments	S/O	Hours
1	Design of Ontology using RDF	O	2
2	Design RDF document with different Serialization format (e.g. N-triple)	O	2
3	Design of Ontology using RDFS	O	2
4	Design of Ontology using OWL	O	2
5	RDF/OWL with Java I: Jena	O	2
6	Case study : Pizza Ontology	S	2
7	Querying Ontology using SPARQL	O	2
8	Design of any domain specific Ontology in Protégé	O	2

Text Books:
1. A Semantic Web Primer by Grigoris Antoniou Frank van Harmelen, The MIT Press Cambridge
2. John Davies, Rudi Studer, and Paul Warren John, "Semantic Web Technologies: Trends and Research in Ontology-based Systems", Wiley and Son's, 2006.

Reference Books:
1. Foundation of Semantic Web Technologies, Pascal Hitzler, Markus and Sebastian
2. Semantic Web for Dummies, by J. Pollock, 2009

Online Resources:

i. Apache Jena and Fuseki are two excellent open source packages for creating and using RDF triple stores

https://jena.apache.org

https://jena.apache.org/documentation/fuseki2/

ii. Protege is the most popular application for creating, editing and viewing semantic webontologies and data

https://protege.stanford.edu/

iii. Pubby is a linked data frontend for SPARQL endpoints.

https://github.com/cygri/pubby

Course Plan

Course Title : Professional Elective Lab-II : Deep Learning	
Course Code : 201CSP433	Semester : VIII
Teaching Scheme : L-T-P : 0-0-4	Credits : 2
Evaluation Scheme : ISE Marks: 50	ESE Marks : NA

Course Description:

This course consists of introduction to the architecture of Deep Neural Network and introduction to generative deep learning models. It focuses on Convolution Neural Network, Recurrent Neural Network, Long Short Term Memory and GRU on real time data sets.

Course Objectives:

1. To implement different parameters and hyper-parameters on deep learning model output.
2. To implement simple neural network perceptron algorithm.
3. To demonstrate simple CNN algorithms to learn image detection and classification.
4. To apply simple RNN algorithm to predict and optimize real data problems.

Course Outcomes (COs):

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

C433.1	Use tensor flow, Keras functions using numpy and pandas.
C433.2	Preprocessing of data and hyper parameters tuning.
C433.3	Develop various deep neural network operations and visualize the model
C433.4	Apply Keras sequential API and Functional API
C433.5	Develop generative adversarial network.

Prerequisite:	Statistics, AI, Machine Learning, Python

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs		BTL
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
C433.1	2	2	-	-	-	-	-	-	-	-	-	-	-	-	L-3
C433.2	2	2	-	-	-	-	-	-	-	-	-	-	-	-	L-3
C433.3	3	2	2	-	2	-	-	-	-	-	-	-	2	-	L-3
C433.4	2	2	2	-	-	-	-	-	-	-	-	-	-	-	L-3
C433.5	2	2	2	-	2	-	-	-	-	-	-	-	2	-	L-3

❖ **Minimum 8 experiments to be performed from the following list:**

Exp. No	List of Experiments	S/O	Hours
1.	Installation of Anaconda ,Google Colab, working with tensorflow and Keras	O	2
2.	Introduction to different data sets and preparation of data set for data analysis. Introduction to python libraries, Numpy, pandas, matplotlib and other preprocessing libraries.	O	2
3.	Design and develop single layer neural network.	O	2
4	Design and develop multilayer perceptron with simple dataset.	O	2
5	Design and develop algorithm for image detection using CNN	O	2
6	Design and develop Prediction model using RNN-LSTM algorithm and hyper parameter tuning to improve performance of the model.	O	2
7	Design and develop prediction model using cancer dataset and visualize using heat map.	O	2
8	Design and develop algorithm for text generation using generative deep learning.	O	2

❖ **S-Study   O- Operational**

Text Book:

1. Deep Learning using Python ,First Edition, Dr. S. Lovelyn Rose, Dr. L Ashok Kumar, Dr. D. Karthika, Renuka, Wiley, 2019

Reference Books:

1. Deep Learning Cook Book 1st Edition, Douwe Osinga O'Reilly,2017
2. Deep Learning Methods and Applications, 1st edition, by Deng &Yu, Now Publications,2017

Course Plan

Course Title : Professional Elective Lab-II : UI Design	
Course Code : 201CSP434	Semester : VIII
Teaching Scheme : L-T-P : 0-0-4	Credits : 2
Evaluation Scheme : ISE Marks:50	ESE Marks : NA

Course Description:

This course includes basics of user interface design. The course will emphasize on understanding of user experience and cognition, which are the key factor to achieve user-friendly Interface Design. It gives details about different windows/mobile components and applications.

Course Objectives:

1. To demonstrate user centered methods in graphic design on screens.

2. To develop simulation and prototyping techniques in UI design.

3. To apply usability testing methods, interface technologies and user centered design.

Course Outcomes (COs):

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

C434.1	Demonstrate various UI design tools.
C434.2	Apply the user interface design process and business function.
C434.3	Apply the user interface testing strategies
C434.4	Design and Develop User Interface Applications

Prerequisite: Software Engineering, Java, Web Technology

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs		BTL
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
C434.1	2	-	-	-	1	-	-	-	-	-	-	-	-	-	L-2
C434.2	2	2	-	-	-	-	-	-	-	-	-	-	-	-	L-3
C434.3	2	3	2	-	-	-	-	-	-	-	-	-	-	-	L-3
C434.4	2	2	-	2	2	-	-	-	-	-	-	-	1	-	L-3

❖ **Minimum 7 experiments to be performed from the following list:**

List of Experiments			
Exp. No.	**Name of Experiment**	**S/O**	**Hours**
Instruction: Start by choosing the website that you will use for the remainder of the question. This can be any site that has sufficient complexity for the user to manipulate structured information, and should be asite that you yourself use regularly enough to be familiar with its interface. You may assume that the examiner is familiar with current versions of Facebook, Wikipedia, Gmail, Hermes web mail, YouTube and Amazon. If you wish to use a site other than one of these, please provide a pictorial sketch that you can refer to in your answer. (For Exp. No. 1 - 6)			
1	Name the website that you will refer to in the rest of this question, and explain the nature of the information structure that the user creates and interacts with when using this site. Provide a pictorial sketch if necessary, as described above.	O	2
2	Describe two aspects of the visual language (marks, symbols, regions, surfaces) used in the design of this site. For each aspect, explain the nature of the correspondence between the visual appearance and its meaning or purpose within the interaction design.	O	2
3	Describe a typical activity in which the user interacts with the information structure presented by the site. You should refer to two different Cognitive Dimensions that are particularly salient in this activity, and explain what effect each of these has on the user's Experience	O	1

D.Y. PATIL COLLEGE OF ENGINEERING & TECHNOLOGY

KASABA BAWADA KOLHAPUR-416006

(An Autonomous Institute)
Final Year B. Tech. Computer Science & Engineering

SEM-VIII (Academic Year-2023-24)

4	Propose a way in which the visual design of the site might be modified, that would have an effect on one of the Cognitive Dimensions described in part (3). Consider any trade-offs that might result.	O	1
5	Describe how you could carry out an investigation to evaluate the effects predicted in part (4).	O	2
6	How would you classify the method you have described in part (5), using the distinctions between qualitative/quantitative, empirical/ analytic, and summative/formative methods?	O	2
7	You have been asked to design a programming environment for use by teachers and school children in rural India that will run on a mobile phone. (for Exp. No. 7,8,9)	O	2
8	Using the Cognitive Dimensions of Notations, describe four different usability issues that are likely to arise specifically when a user is creating and modifying programs on a mobile phone.	O	2
9	Describe techniques that you would use to research the requirements of the teachers and children.	O	2

❖ **S-STUDY, O-OPERATIONAL**

Text Books:

1. Wilbert O Galitz, "The essential guide to user interface design" 2nd Edition; Wiley DreamTech, 2011
2. Brian Fling, Mobile Design and Development", O'Reilly, 2003

Reference Books:

1. Alan Dix, "Human - Computer Interaction", Pearson Education, 2003
2. Ben Shneidermann, "Designing the user interface", Pearson Education, 2009
3. Prece, Rogers and Sharps, "Interaction Design", Wiley 2011
4. Soren Lauesen, "User Interface Design", Pearson Education, 2005
5. D. R. Olsen, "Human -Computer Interaction", 2009

Online Resource:

User Interface Design by Prof. Saptarshi Kolay, IIT Roorkee:

1. https://onlinecourses.nptel.ac.in/noc21_ar05/preview

Course Plan

Course Title : Professional Elective Lab -II : Service Oriented Architecture	
Course Code : 201CSP435	Semester : VIII
Teaching Scheme : L-T-P : 0-0-4	Credits : 2
Evaluation Scheme : ISE Marks: 50	ESE Marks :NA

Course Description:

The course focuses on key ideas and design principles behind successfully adopting service-oriented computing. It also provides challenges, risks and trade-offs that are in the way of adopting SOA in the real-world.

Course Objectives:

1. To understand service-oriented computing.
2. To describe service-orientation design paradigm.
3. To document specific design characteristics realized by the application of individualdesign principles.
4. To observe effect of each design principle on other design principle.

Course Outcomes (COs):

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

C426.1	Understand service oriented design fundamentals.
C426.2	Learn service oriented computing.
C426.3	Apply principles in service design.
C426.4	Understand service abstraction, autonomy and discoverability

Prerequisite:	Server-client Architecture, Distributed Architecture, Computational Architectures.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs		BTL
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
C426.1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	L-2
C426.2	2	2	-	-	-	-	-	-	-	-	-	-	-	-	L-2
C426.3	3	2	2	-	-	-	-	-	-	-	-	-	-	-	L-3
C426.4	2	2	2	-	-	-	-	-	-	-	-	-	1	-	L-2

❖ **Minimum 7 experiments to be performed from the following list:**

List of Experiments			
Exp. No.	**Name of Experiment**	**S/O**	**Hours**
1	Design principle for any real time application.	O	2
2	Demonstrate service abstraction for any application.	O	2
3	Demonstrate service reusability for any application.	O	2
4	Illustrate Service Autonomy and statelessness.	O	2
5	Demonstrate Service Discoverability mechanism.	O	2
6	Develop Computational service using SOA principles.	O	2
7	Develop Web service using SOA principles.	O	2

❖ **S-STUDY, O-OPERATIONAL**

Text Books:

1. Thomas Erl - Service Oriented Architecture_ Principles of Service Design (The Prentice Hall Service-Oriented Computing Series)

Reference Books:

1. (For Dummies) Judith Hurwitz, Robin Bloor, Carol Baroudi, Marcia Kaufman - Service Oriented Architecture For Dummies (For Dummies (Computer_Tech))- For Dummies (2006)

2. (SOA, Service-Oriented Architecture) Eric A. Marks, Mark J. Werrell - Executive's Guide to Web Services-Wiley (2003)

Course Plan

Course Title : Professional Elective Lab –II : Big Data Analytics	
Course Code : 201CSP436	Semester : VIII
Teaching Scheme : L-T-P : 0-0-4	Credits : 2
Evaluation Scheme : ISE Marks: 50	ESE Marks :NA

Course Description:

In this course, students will learn about the practical implementation of data analytics techniques. Students will gain an understanding about the features, benefits, limitations, and applications of some of the Big Data processing tools like Hadoop, R Studio, Apache Spark and Apache Pig.

Course Objectives:

1. To install and configure Hadoop.
2. To acquire understanding of R & Hadoop.
3. To perform data analysis using Apache Pig and Spark.

Course Outcomes (COs):

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

C436.1	Apply various commands to access HDFS.
C436.2	Demonstrate various commands of Apache Pig.
C436.3	Testing data sets using HDFS and RStudio.
C436.4	Manage Big Data and analyze it using Apache Spark.

Prerequisite:	Database Engineering, Operating Systems

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

CO	POs												PSO		BTL
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
C436.1	3	-	-	-	-	-	-	-	-	-	-	-	-	-	L-3
C436.2	2	2	-	-	2	-	-	-	-	-	-	-	-	-	L-3
C436.3	3	2	-	-	-	-	-	-	-	-	-	-	-	-	L-5
C436.4	2	2	-	-	2	-	-	-	-	-	-	-	-	-	L-4

❖ **Minimum 7 experiments to be performed from the following list:**

Exp. No.	Name of Experiment	S/O	Hours
1	Installation of Hadoop and executing simple queries on HDFS.	O	2
2	Working with operators in Pig - FOREACH, ASSERT, FILTER, GROUP, ORDERBY, DISTINCT, JOIN, LIMIT, SAMPLE, SPLIT, FLATTEN	O	2
3	Installation of R studio and demonstration of following • R basic Syntax. • Exploring basic R Data Types. • Drawing Pie chart, Bar Chart, Histogram, etc. • R array and Vector.	O	2
4	Working with R with data sets- create, read, write and R Tables- create, read, write.	O	2
5	Manipulating and processing data in R - merging datasets, sorting data, putting data into shape, managing data using matrices managing data using data frames.	O	2
6	Installation and configuration of Apache Spark on Local Machine.	O	2
7	Write an application to Read multiple text files into single RDD using Spark.	O	2
8	Mini project using R and Hadoop.	O	2

Text Books:

1. Arvind Sathi, "Big Data Analytics: Disruptive Technologies for Changing the Game", IBM Corporation, 2012.

2. Vignesh Prajapati, "Big Data Analytics with R and Hadoop", Packt Publishing 2013.

3. Nataraj Dasgupta, "Practical Big Data Analytics", Packt Publishing 2018.

Reference Books:

1. Michael Minelli, Michehe Chambers, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business", AmbigaDhiraj, Wiely CIO Series, 2013.

2. Sridhar Alla P, "Big Data Analytics with Hadoop 3", Packt Publishing, 2018.

3. Jovan Pehcevski, "Big Data Analytics: Methods and Applications", Arcler Press

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc20_cs92/preview

2. https://www.coursera.org/learn/introduction-to-big-data-with-spark-hadoop

Course Plan

Course Title : Professional Elective Lab -II : Natural Language Processing	
Course Code : 201CSP437	Semester : VIII
Teaching Scheme : L-T-P : 0-0-4	Credits: 2
Evaluation Scheme : ISE Marks: 50	ESE Marks :NA

Course Description:

This course analyzes unstructured natural language texts and extracts useful information from them. It covers common types of natural language processing (NLP) tasks, including text classification, sequence labeling, and structure prediction. It also includes implementation of classification, summarization, text-generation, translation.

Course Objectives:

1. To develop various language modeling techniques for NLP.
2. To use appropriate tools & techniques for processing natural language.

Course Outcomes (COs):

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

C437.1	Explore natural language processing (NLP) libraries in Python.
C437.2	Implement parsing & text processing in NLP.
C437.3	Apply NLP tools for text classification, summarization.
C437.4	Demonstrate NLP tools for text-generation, translation.

Prerequisite:	Programming language.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs		BTL
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
C437.1	3	-	-	-	-	-	-	-	-	-	-	-	-	-	L-2
C437.2	2	2	-	-	-	-	-	-	-	-	-	-	-	-	L-3
C437.3	2	2	-	-	2	-	-	-	-	-	-	-	1	-	L-3
C437.4	2	2	-	-	2	-	-	-	-	-	-	-	1	-	L-3

❖ **Minimum 7 experiments to be performed from the following list:**

List of Experiments			
Exp. No.	**Name of Experiment**	**S/O**	**Hours**
1	To Implement tokenization of text	O	2
2	To implement Stop word removal	O	2
3	To implement Stemming of text	O	2
4	To implement Lemmatization	O	2
5	To implement N-gram model	O	2
6	To implement POS tagging & chunking.	O	2
7	To implement Named Entity Recognition	O	2
8	Implement Mini Project in natural language processing	O	2

Text Books:

1. "Speech and Language Processing" Daniel Jurafsky and James H Martin 2E, Pearson Education, 2009

2. "Natural language processing and Information Retrieval" Tanveer Siddiqui, U.S. Tiwary Oxford, 2008.

Reference Books:

1. James Allen 2e, "Natural language Understanding", Pearson Education,1994

2. Bharati A., Sangat R., Chaitanya V.."Natural language processing": a Paninian perspective, PHI, 2000

Online Resources:

1. https://nlp-iiith.vlabs.ac.in/

2. https://nptel.ac.in/courses/106101007

3. https://nptel.ac.in/courses/106106211

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Course Plan

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Course Title : Professional Elective Lab –II : Search Engine Optimization	
Course Code : 201CSP438	Semester : VIII
Teaching Scheme : L-T-P : 0-0-4	Credits : 2
Evaluation Scheme : ISE Marks: 50	ESE Marks : NA

Course Description:

Search engines are an integral part of the World Wide Web. Search Engine Optimization provides optimized and efficient way of online content searching. The present course provides the skill based approach to solve the real time problems in area of Web Application Development and its accessibility.

Course Objectives:

1. To study and use the different Search Engine Optimization tools.
2. To conduct experiments which will clear the fundamental concepts of the search engine processes, components and ranking.
3. To apply the concept of keyword research and its strategy.
4. To apply the concept of link building and Social Media Marketing.

Course Outcomes (COs):

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

C438.1	Understand and apply the basic concept of optimization to solve the search engine problems.
C438.2	Understand the basic components of SEO process and apply the tool based ranking process in commercial web design.
C438.3	Understand and apply the concept of keyword research and its effect on SEO strategies.
C438.4	Understand and apply the concept of Link Building and Social media marketing.

Prerequisite:	Web Design and Development (Web Technology)

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs		BTL
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
C438.1	2	1	-	-	3	-	-	-	-	-	-	-	1	-	L-3
C438.2	2	1	-	-	3	-	-	-	-	-	-	-	1	-	L-3
C438.3	2	1	-	-	3	-	-	-	-	-	-	-	1	-	L-3
C438.4	2	1	-	-	3	-	-	-	-	-	-	-	1	-	L-3

❖ **Minimum 7 experiments to be performed from the following list:**

List of Experiments			
Exp. No.	**Name of Experiment**	**S/O**	**Hours**
1	To exploit a keyword research and analysis tool: Soovle	O	2
2	To exploit a keyword research and analysis tool: Word Stream.	O	2
3	To exploit a keyword research and analysis tool: Ubersuggest	O	2
4	To exploit the working of Deep Site Crawlers: Screaming FrogSpider, DeepCrawl, SEO Crawler by Rob Hammond.	O	2
5	To exploit :Link Building, Link Removal, and Link AnalysisMajestic SEO, Open Site Explorer, Rmoov.	O	2
6	To exploit GTmetrix, DareBoost tools.	O	2
7	To exploit Content Building and Optimization tools: Grammarly,Siteline, Hootsuite, BuzzSumo, WooRank.	O	2

❖ **S-STUDY, O-OPERATIONAL**

Text Books:

1. Introducing SEO Your quick-start guide to effective SEO practices, Aravind Shenoy and Anirudh Prabhu, Apress Publication.

D.Y. PATIL COLLEGE OF ENGINEERING & TECHNOLOGY
KASABA BAWADA KOLHAPUR-416006
(An Autonomous Institute)
Final Year B. Tech. Computer Science & Engineering

SEM-VIII (Academic Year-2023-24)

Reference Books:

1. Search Engine Optimization with PHP -A Developer's Guide to SEO, Jaimie Sirovich, Cristian Darie, Wiley Publishing, Inc.

2. Search Engine Optimization ALL-IN-ONE for Dummies, Bruce Clay, Susan Esparza, Wiley Publishing, Inc.

Online Resources:

1. https://backlinko.com/hub/seo
2. https://ahrefs.com/blog/seo-for-beginners-book/
3. https://learningseo.io/

Course Plan

Course Title : Trending Techno Laboratory	
Course Code : 201CSP439	Semester : VIII
Teaching Scheme : L-T-P : 0-1-2	Credits : 2
Evaluation Scheme : ISE Marks : 50	ESE Marks : NA

Course Description:

This course encourages the student for self-learning on the trending technology topics and applies that technology to develop the solutions for real-world and Industry problems.

Course Objectives:

1. To understand the trending technology based on the self-study.
2. To identify the real-world/industry /research /etc. problems.
3. To provide the solution for the problem identified using applicable technology/tools.
4. To develop the problem solving skills and abilities helpful for professional career enrichment

Course Outcomes (COs):

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

C439.1	Understand the new trending technology knowledge on their own.
C439.2	To identify the real world and industry problem statements from any domain.
C439.3	To identify optimal solution for real time problems.
C439.4	To design and develop the mini project for providing the solution for the problems.

Prerequisite:	The student should know the basics of the software engineering concepts and programming languages knowledge.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

Cos	POs												PSOs		BTL
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
C439.1	1	-	-	-	-	-	-	-	-	-	-	2	-	-	L-2
C439.2	1	-	-	-	1	-	-	-	-	-	-	2	1	-	L-3
C439.3	1	2	-	-	-	-	-	-	-	-	-	-	1	-	L-2
C439.4	1	-	2	-	1	-	-	-	-	1	-	-	1	-	L-3

Course Contents –

The trending technologies are to be learnt on their own based on self-study and practice by the students. The Mini project is to be carried out based on the new technology. However, evaluation will be carried out on the contribution made by the individual. The following are the guidelines –

1. The faculty mentor should guide the students to finalize the trending technology topics. Based on that, student should work for whole semester.

2. Every student should make the presentation based on the new trending technological topic learnt in the tutorial slots.

3. At a time of the practical, the coding practices should be done based on the part of the topic learnt.

4. Student should identify the problem statement and formulate based on real-world problems/industry-based problem etc.

5. The student should provide the solution for the above problems using the trending technology and the knowledge gained in the earlier semesters. The solution may be in the form of design of system architecture/ framework/adding patches to the existing systems using newer technology and tools. Implementing the solution, analyzing the results, writing test cases, specific observations, Pros and Cons, feasibility and advancement of knowledge, technology, tools etc. The work can be in the research track and accordingly the contributions are to be made by the students.

6. The Evaluation of the ISE will be based on the continuous assessment, presentation done at a time of tutorial, the progress of work done send report submitted. Individual student is expected to submit a report on the work done at the end of the semester.

Course Plan

Course Title : Project –V	
Course Code : 201CSP440	**Semester : VIII**
Teaching Scheme : L-T-P : 0-0-6	**Credits : 3**
Evaluation Scheme : ISE Marks: 50	**ESE OE Marks : 50**

Course Description:

Project helps to explore and strengthen the practical knowledge by doing hands-on real-time projects. Projects are the gateway to show their skills and stand apart from others and become productive engineers. Understand the domain through proper modeling and analysis using the state-of art technology. Then apply relevant Software Engineering Principles to develop modular and robust applications through the use of Standards and tools. At the end build appropriate test cases, verification and validation techniques in order to make the project reliable and maintainable.

Course Objectives:

1. To undergo project management techniques.
2. To analyze and apply emerging technologies in development of a project.
3. To test the modules in Project & demonstrate working of project.
4. To write and publish deliverable technical artifacts for the project.

Course Outcomes (COs):

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

440.1	Design and develop usable User Interface.
440.2	Analyze and apply emerging technologies in development and management of a project.
440.3	Test the modules & demonstrate working of project.
440.4	Analyze performance of developed product and Write/publish technical artifacts.

Prerequisite:	Software Engineering, Programming Languages Database Engineering, Project –II, III, IV

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs		BTL
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
440.1	2	-	2	-	-	-	-	1	2	2	-	-	-	-	L-3
440.2	2	2	-	-	2	-	-	1	2	-	2	-	-	-	L-4
440.3	2	-	-	2	-	-	-	-	3	3	2	-	2	-	L-3
440.4	2	2	-	-	2	-	-	-	2	2	-	-	2	2	L-4

Content

> The project group will continue to work on the project selected during the semester VIIand submit the completed Project work to the department at the end of semester VIII.
> Students must finalize who and how many of the group members will go for Professionaltrack.
> Remaining students in that are only in regular track have to complete the Project-V.
> After completing all modules in the project they have to test and analyze the results of the project and have to submit the final project.
> Project submission should consist of
>   1. Workable Project
>   2. Project report in embossed form consisting of Problem specification, systemdesign, system implementation, test results and reports and conclusion.
> Project guide will be responsible for assessment of student under continuous basis.
> All project group members in regular must work on the Project-V part.
> Students in regular track must meet the project guide every week in offline mode.
> The project group should participate in technical symposiums, paper presentations to demonstrate their work and findings in technical community.
> The evaluation of the Project-V based on the work done by the student in continuation of Project-IV in group.
> The ISE marks will be given based on the continuous assessment done by the project guide.
> The ESE-OE for the students will be performed based on the work done by the studentson the Project-V part.