Academic Program: PG

Academic Year 2023-24

Department of Computer Science & Engineering

Master of Technology in Computer Science and Engineering

III & IV Semester M.Tech

SHRI DHARMASTHALA MANJUNATHESHWARA COLLEGE OF ENGINEERING & TECHNOLOGY,

DHARWAD – 580 002

(An Autonomous Institution approved by AICTE & Affiliated to VTU, Belagavi)

Ph: 0836-2447465 Fax: 0836-2464638 Web: www.sdmcet.ac.in

SDM College of Engineering & Technology, Dharwad
Department of Computer Science & Engineering

College Vision and Mission

Vision:

To develop competent professionals with human values.

Mission:

1. To have contextually relevant Curricula.
2. To promote effective Teaching Learning Practices supported by Modern Educational Tools and Techniques.
3. To enhance Research Culture.
4. To involve Industrial Expertise for connecting classroom content to real life situations.
5. To inculcate Ethics and impart soft-skills leading to overall Personality Development.

SDMCET- Quality Policy

- In its quest to be a role model institution, committed to meet or exceed the utmost interest of all the stake holders.

SDMCET- Core Values

- Competency
- Commitment
- Equity
- Team work and
- Trust

Department Vision and Mission

Vision:

To develop competent professionals in the field of Computer Science and Engineering with human values.

Mission:

1. To have contextually relevant curricula in line with industry trends and body of knowledge stated by IEEE /ACM.
2. To promote OBE based effective Teaching Learning Practices supported by modern educational tools and techniques.
3. To enhance research.
4. To involve the industrial expertise for connecting classroom contents to real-life situations.
5. To inculcate ethics and soft-skills leading to overall personality development.

SDM College of Engineering & Technology, Dharwad

It is certified that the scheme and syllabus for III & IV semester M.Tech in Computer Science & Engineering is recommended by the Board of Studies of Computer Science & Engineering Department and approved by the Academic Council, SDM College of Engineering & Technology, Dharwad. This scheme and syllabus will be in force from the academic year 2023-24 till further revision.

Chairman BoS & HoD **Principal**

Program Educational Objectives (PEOs):

I. Contribute to the profession as an excellent employee or as an entrepreneur

II. Enhance their knowledge informally or by pursuing research work leading to new innovations and products

III. Work effectively in heterogeneous environment and be responsible member and leader of their communities

IV. Contribute positively to the needs of individuals and society at large by understanding the human, social and environmental context of their profession

Program Outcomes (POs):

PO1: An ability to independently carry out research / investigation and development work to solve practical problems.

PO2: An ability to write and present a substantial technical report / document.

PO3: Student should be able to demonstrate a degree of mastery over the current knowledge and technological trends in the field of Computer Science & Engineering.

PO4: Demonstrate the knowledge and understanding of the Computer Science & Engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage a project in a multidisciplinary environment in terms of identifying requirements, conceptualizing the new and innovate system, modelling and designing the system / process, transforming the system model to working system and verify and validate the correctness of the system

PO5: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

PO6: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the context of technological change.

Scheme of Teaching and Examinations – 2022
M.Tech., Computer Science and Engineering
III Semester M. Tech.

Course Code	Course Title	Teaching		Examination				
				CIE	Theory (SEE)		Practical (SEE)	
		L-T-P (Hrs/Week)	Credits	Max. Marks	*Max. Marks	Duration in hours	Max. Marks	Duration in hours
22PCSC300	Cloud computing concepts & Application Development	4-0-0	4	50	100	3		
22PCSE3XX	Elective 5	3-0-0	3	50	100	3		
22PCSE3XX	Elective 6	3-0-0	3	50	100	3		
22PCSE3XX	Elective 7	3-0-2	4	50	100	3	-	-
OR								
22PCSL302	Internship in Industry or R&D organization	** Min 4 weeks during vacation after 2nd sem	4	50	-	-	100	3
22PCSL303	*** Project phase 1	0-0-6	6	50	-	-	50	3
Total		**13-0-8/10-4weeks-6)**	**20**	**250**	**400/300**		**50/150**	

CIE: Continuous Internal Evaluation **SEE**: Semester End Examination

L: Lecture **T**: Tutorials **P**: Practical

***** SEE for theory courses is conducted for 100 marks and reduced to 50 marks.

** The students are expected to undergo training in industry for a period of ***four weeks*** during the vacation immediately after completion of II Semester examination. A faculty is to be allotted to guide the student. A committee consisting of three faculty members shall evaluate the work carried out and the knowledge the students have acquired. **OR The students can take one elective course if they do not undergo internship.**

*** Project phase-I: The students are expected to formulate the problem and carry out the intensive literature survey along with preliminary investigations supporting the project phase-II in IV semester.

List of Electives:

Sub Code	Subject Title	L-T-P
22PCSE325	Data Stream Mining	3-0-2
22PCSE326	Software Defined Network	3-0-0
22PCSE327	Software Project Management	3-0-0
22PCSE328	Human Computer Interface	3-0-0
22PCSE329	Natural Language Processing and Text Mining	3-0-2
22PCSE330	Metaverse Fundamentals.	3-0-0
22PCSE331	Sematic Web	3-0-0

Scheme of Teaching and Examinations – 2022
M.Tech., Computer Science and Engineering
IV Semester M. Tech.

Course Code	Course Title	Teaching		Examination				
		L-T-P (Hrs/Week)	Credits	CIE	Theory (SEE)		Practical (SEE)	
				Max. Marks	*Max. Marks	Duration in hours	Max. Marks	Duration in hours
22PCSL400	Project phase-II	0-0-22	18	100	--	--	100	3
22PCSEOA1	**BOS recommended ONLINE course (NPTEL,MOOC)	-	Audit (PP)	-	-	-	-	-
22PCSEOA2	**BOS recommended ONLINE course	-	Audit (PP)	-	-	-	-	-
Total		**0-0-22**	**18**	**100**	**--**	**--**	**100**	

CIE: Continuous Internal Evaluation **SEE**: Semester End Examination

L: Lecture **T**: Tutorials **P**: Practical

***SEE** for theory courses is conducted for 100 marks and reduced to 50 marks.

****** Project phase-II: The students are expected to work on a project for the full semester in an industry or an institution

Total Credits offered for the first year: 42

Total Credits offered for the Second year: 38

III – Semester

22PCSC300 Cloud Computing Concepts & Application Development (4-0-0) 4

Contact Hours: 52

Course Learning Objectives (CLOs):

This course focuses on to understand the cloud computing paradigm, recognize its various forms and able to implement some cloud computing features.

Course Outcomes (COs):

CO	Description of the Course Outcome: At the end of the course the student will be able to:	Mapping to POs (1 to 6)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	**Compare** the strengths and limitations of cloud computing	1	4	5
CO-2	**Identify** the architecture, infrastructure and delivery models of cloud computing.	2,5	4	-
CO-3	**Apply** suitable virtualization concept	4	-	-
CO-4	**Explain and Choose** the appropriate cloud resource management principles and their vulnerability.	2,4	1	5
CO-5	**Develop and deploy** core issues of cloud computing such as security, privacy and interoperability	1, 2, 3	4, 5	-

Mapping Level:

POs/PSOs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
Mapping Level	2.7	3.0	3.0	2.4	1.75	-

Prerequisites:

- Operating Systems, Computer Architecture, Computer Networks & Web Technologies.
- Knowledge of Programming languages-Java, Web programming

Contents:

1 **Introduction, Cloud Infrastructure**: Cloud computing, Cloud computing delivery models and services, Ethical issues, Cloud vulnerabilities, Cloud computing at Amazon, Cloud computing the Google perspective, Microsoft Windows Azure and online services, Open-source software platforms for private clouds, Cloud storage diversity and vendor lock-in, Energy use and ecological impact, Service level agreements, User experience and software licensing. Exercises and problems. **10 Hrs**

2 **Cloud Computing & Application Paradigms**.: Challenges of cloud computing, Architectural styles of cloud computing, Workflows: Coordination of multiple activities, Coordination based on a state machine model: The Zookeeper, The Map Reduce programming model, A case study: The Gre The Web application, Cloud for science and engineering like High-performance computing on a cloud, Cloud computing for Biology research, Social computing, digital content and cloud computing. **10 Hrs**

3 **Cloud Resource Virtualization**: Virtualization, Layering and virtualization, Virtual machine monitors, Virtual Machines, Performance and Security Isolation, Full virtualization and paravirtualization, Hardware support for virtualization, Case Study: Xen a VMM based paravirtualization, Optimization of network virtualization, vBlades, Performance comparison of virtual machines, The dark side of virtualization, Exercises and problems. **10 Hrs**

4 **Cloud Resource Management and Scheduling**: Policies and mechanisms for resource management, Application of control theory to task scheduling on a cloud, Stability of a two-level resource allocation architecture, Feedback control based on dynamic thresholds, Coordination of specialized autonomic performance managers, A utility-based model for cloud-based Web services, Resourcing bundling: Combinatorial auctions for cloud resources, Scheduling algorithms for computing clouds, Fair queuing, Start-time fair queuing, Borrowed virtual time, Cloud scheduling subject to deadlines, Scheduling MapReduce applications subject to deadlines, Resource management and dynamic scaling, Exercises and problems. **10 Hrs**

5 **Cloud Security, Cloud Application Development:** Cloud security risks, Security: The top concern for cloud users, Privacy and privacy impact assessment, Trust, Operating system security, Virtual machine Security, Security of virtualization, Security risks posed by shared images, Security risks posed by a management OS, A trusted virtual machine monitor, Amazon web services: EC2 instances, Connecting clients to cloud instances through firewalls, Security rules for application and transport layer protocols in EC2, How to launch an EC2 Linux instance and connect to it, How to use S3 in java. **12 Hrs**

Reference Books:

1. Rajkumar Buyya , James Broberg, Andrzej Goscinski Computing Principles and Paradigms Willey 2014 2
2. Cloud Computing Implementation, Management and Security John W Rittinghouse, James F Ransome CRC Press 2013
3. Cloud Computing Theory and Practice Dan C Marinescu Elsevier (MK) 2013.
4. A T Vete,cloud computing-A Practical Approach,Mc Graw Hills 2010.
5. Dan C Marinescu: Cloud Computing Theory and Practice. Elsevier (MK) 2013.

22PCSE325 Data Stream Mining (3-0-2) 4

Contact Hours: 52

Course Learning Objectives (CLOs):

This course is at Postgraduate level for 52 contact hours/4 credits with focus on to understand the concept of data stream models, apply the basic clustering techniques for data streams, to understand the difference between FPM in data streams and traditional DM techniques, identify the classification techniques for data streams

Course Outcomes (COs):

CO	Description of the Course Outcome: At the end of the course, the student will be able to:	Mapping to POs (1 to 6)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	**Know** the various Data stream mining methods and challenges.	4	3	6
CO-2	**Apply** different clustering algorithms for given data set.	4	3	6
CO-3	**Identify** the need of usage of different frequent pattern mining technics.	4	3	6
CO-4	**Identify and understand** the fast decision tree algorithm to stream data mining.	4	3	6
CO-5	**Recognize** various Time Series analysis and Distributed Data Stream Monitoring techniques.	4	3	6

Mapping Level:

POs/PSOs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
Mapping Level	-	-	2.0	3.0	-	1.0

Prerequisites: Database Systems, Statistics: Expectation, basic probability, distributions, hypothesis tests, Linear Algebra, Algorithms and Data Structures.

Contents:

1. Introduction to Data Streams: Data stream mining methods and challenges. Data stream models, basic streaming methods, data synopsis, sampling, histograms, Wavelets, Discrete Fourier Transform **7 L+4 P**
2. Clustering from Data Streams: Basic concepts, Leader Algorithm, partitioning clustering, hierarchical clustering, grid clustering. Meta-clustering Algorithm **8 L+4 P**
3. Frequent Pattern Mining from Data Streams: Search space, landmark windows, mining recent frequent item sets, sequence pattern mining, reservoir sampling for sequential pattern mining. **8 L+6 P**
4. Decision Trees from Data Streams: Introduction, The very fast decision tree Algorithm, Extensions to the Basic Algorithm. Novelty Detection in Data Streams: introduction, Learning and Novelty, Novelty detection as a one class classification problem. **8 L+6 P**
5. Time Series Data Streams: Introduction to Time Series analysis, Time Series prediction, Similarity between time series, Symbolic Approximation-SAX. Ubiquitous Data Mining: Introduction to Ubiquitous Data Mining, Distributed Data Stream Monitoring, Distributed Clustering. **8 L+6 P**

Reference Books:

1. Knowledge Discovery from Data Streams by Joao Gama CRC publication, 1st Edition 2010
2. Data Streams: Models and Algorithms, Charu C Aggarwal, Springer,2007
3. Introduction to Data Mining, By Pang-Ning Tan, Michael Steinbach, Anuj Karpatne, Vipin Kumar · 2019, Pearson.2011

22PCSE326 Software Defined Networks (3-0-0) 3

Contact Hours: 39

Course Learning Objectives (CLOs):

This 3 credit elective course at PG level aims to learn about fundamentals of software defined networking, an emerging paradigm in computer networking that allows a logically centralized software program to control the behavior of an entire network. It also enables the students to explore network virtualization and data center network technologies.

Course Outcomes (COs):

CO	Description of the Course Outcome: At the end of the course the student will be able to:	Mapping to POs (1 to 6)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	**Explain** and **discuss** the basic concepts and architectural differences of conventional networking approaches and SDN.	-	3,6	-
CO-2	**Analyze** the implementation of SDN through Open Flow Switches	1,3	2,5,6	-
CO-3	**Describe** Network Functions Virtualization components and their roles in SDN	1,3	2,5,6	-
CO-4	**Describe** the role of SDN in data centers.	-	3,6	-
CO-5	**Describe** SDN advanced switch features and SDN Controllers.	1,3,6	2,5	-

Mapping level:

POs/PSOs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
Mapping Level	3.0	2.0	2.6	-	2.0	2.2

Prerequisites: Knowledge of Data Communication Networks, Network Management at introductory level.

Contents:

1. **Software Defined Networking:** Introduction, Modern Data Center, Traditional Switch Architecture, Layer 2 & 3 Control, Evolution of switches and control planes, Data Center Innovation & Needs, The Evolution of Networking Technology, Forerunners of SDN, Open Source Contributions and Network Virtualization. **7 Hrs**
2. **Working of SDN:** Fundamental Characteristics of SDN, SDN Operation SDN Devices, SDN Controller, SDN Applications.
   The Open Flow Specification: Open Flow Overview, Open Flow 1.0 and Open Flow Basics, Open Flow 1.1, 1.2, and 1.3 Additions and Open Flow Limitations. **8 Hrs**
3. **Network Functions Virtualization:** Background and Motivation for NFV- Virtual Machines- NFV Concepts: Simple Example of the Use of NFV, NFV Principles, High-Level NFV Framework, NFV Benefits and Requirements- NFV Reference Architecture: NFV Management and Orchestration. **8 Hrs**
4. **Data centres definition:** Data centres definition, Data centres demand, tunnelling technologies for Data centres Path technologies in data centres, Ethernet fabrics in Data centres, SDN use case in Data centres. **8 Hrs**
5. **SDN Applications & Open Source:** Reactive versus Proactive Applications, Analyzing Simple/reactive SDN java Applications, Controllers: Floodlight, Open Daylight, Cisco XNC, Hewlett Packard, Creating Network visualization Tunnels, Offloading flows in Data Center, Access Control for the campus, Traffic Engineering for service Providers, Switch implementations, Controller implementations, SDN Applications, Orchestration & Network Virtualization, Open Stack, Applying SDN Open source. **8 Hrs**

Reference Books:

1. William Stallings, “Foundations of Modern Networking”, Pearson Ltd., 2016.
2. Software Defined Networks: A Comprehensive Approach by Paul Goransson and Chuck Black,Morgan Kaufmann Publications, 2014
3. SDN - Software Defined Networks by Thomas D. Nadeau & Ken Gray, O'Reilly, 2013
4. Feamster, Nick, Jennifer Rexford, and Ellen Zegura. "The road to SDN: an intellectual history of programmable networks." ACM SIGCOMM Computer Communication Review 44.2 (2014): 87-98.
5. Kreutz, Diego, et al. "Software-defined networking: A comprehensive survey." Proceedings of the IEEE 103.1 (2015): 14-76.

22PCSE327	Software Project Management	(3-0-0) 3

Contact Hours: 39

Course Learning Objectives (CLOs):

This course is at post graduate level for 3 credits, 39 contact hours with emphasis on practice-based learning. Student gets mastery on the various standards, procedures and industry relevant tools for effective management of scope, time, costs, and quality, ensuring satisfying the needs for which the project was undertaken.

Course Outcomes (COs):

CO	Description of the Course Outcome: At the end of the course the student will be able to:	Mapping to POs (1 to 6)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	**Use** appropriate metrics to manage the software development outcome.	3,4,6	1,2, 5	-
CO-2	**Identify** the various risk for the given project and propose mitigation plan	3,4,6	1,2, 5	-
CO-3	**Use** industry relevant project configuration management tool	3,4,6	1,2, 5	-
CO-4	**Estimate** the cost and resource required for the given project specification.	3,4,6	1,2, 5	-
CO-5	**Use** tools to monitor the project progress in terms of targets, slippage, resources & revision.	3,4,6	1,2, 5	-
CO-6	**Develop** comprehensive project plan.	3,4,6	1,2, 5	-

Mapping level:

POs/PSOs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
Mapping Level	2.0	2.0	3.0	3.0	2.0	3.0

Prerequisites: Software Engineering.

Contents:

1 **Metrics**: Introduction, The Metrics Roadmap, A Typical Metrics Strategy, What Should you Measure?, Set Targets and track Them, Understanding and Trying to minimize variability, Act on data, People and Organizational issues in Metrics Programs, Common Pitfalls to watch out for in Metrics Programs, Matrices implementation checklists and tools.

Software configuration management: Introduction, Some Basic Definitions and terminology, the processes and activities of software configuration management, configuration status accounting, configuration audit, software configuration management in geographically distributed teams, Metrics in software configuration management, software configuration management tools and automation. **8 Hrs**

2 **Risk Management**: Introduction, What is risk management and why is it important?, Risk management cycle, Risk identification: common tools and techniques, Risk Quantifications, Risk Monitoring, Risk Mitigation, Risks and Mitigation in the context of global project teams, some practical techniques risk management, Metrics in risk management.

Project Planning and Tracking: Components of Project Planning and Tracking, The "What " Part of a Project Plan, The "What Cost " Part of a Project Plan, The "When " Part of Project Planning, The "How " Part of a Project Planning: Tailoring of Organizational Processes For the Project, The " By Whom " Part of the Project Management Plan : Assigning Resources, Putting it all together : The Software Management Plan, Activities Specific to Project Tracking, Interfaces to the Process Database. Project Closure: When Does Project Closure Happen?. Why Should We Explicitly do a Closure?, An Effective Closure Process, Issues that Get Discussed During Closure, Metrics for Project Closure, Interfaces to the Process Database. **9 Hrs**

3 **Software Requirements gathering**: Inputs and start criteria for requirements gathering, Dimensions of requirements gathering, Steps to be followed during requirements gathering, outputs and quality records from the requirements phase, skill sets required during requirements phase, differences for a shrink-wrapped software, challenges during the requirements management phase, Metrics for requirements phase.

Estimation: What is Estimation? when and why is Estimation done?, the three phases of Estimation, Estimation methodology, formal models for size Estimation, Translating size Estimate into effort Estimate, Translating effort Estimates into schedule Estimate, common challenges during Estimation , Metrics for the Estimation processes. **9 Hrs**

4 **Design and Development Phases**: Some differences in our chosen approach, salient features of design, evolving an architecture/ blueprint, design for reusability, technology choices/ constraints, design to standards, design for portability, user interface issues, design for testability, design for diagnose ability, design for maintainability, design for install ability, inter-operability design, challenges during design and development phases, skill sets for design and development, metrics for design and development phases.

Project management in the testing phase: Introduction, What is testing?, what are the activities that makeup testing?, test scheduling and types of tests, people issues in testing, management structures for testing in global teams, metrics for testing phase. **8 Hrs**

5 **Project management in the Maintenance Phase**: Introduction, Activities during Maintenance Phase, management issues during Maintenance Phase, Configuration management during Maintenance Phase, skill sets for people in the maintenance phase, estimating size, effort, and people resources for the maintenance phase, advantages of using geographically distributed teams for the maintenance phase, metrics for the maintenance phase.

Impact of the internet on project management: Introduction, the effect of internet on project management, managing projects for the internet, Effect on the project management activities. People focused process models: Growing emphasis on people centric models, people capability maturity model (P-CMM), other people focused models in the literature, how does an organization choose the models to use? **5 Hrs**

Reference Books:

1. Watts Humphrey, “Managing the Software Process”, Pearson Education, 2000.
2. Pankaj Jalote, “Software Project Management in practice”, Pearson Education, 2002.
3. Ramesh Gopalaswamy, “Managing Global Projects”, Tata McGraw Hill, 2013.

22PCSE328	Human Computer Interface	(3-0-0) 3

Contact Hours: 39

Course Learning Objectives (CLOs):

This course enables the students to represent the real-time problems as games using pure and mixed strategies. It also focuses on the different types of games such as extensive, Bayesian and repeated.

Course Outcomes (COs):

CO	Description of the Course Outcome: At the end of the course the student will be able to:	Mapping to POs (1 to 6)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	**Design** and **Develop** processes and life cycle of Human Computer Interaction.	-	1,4,5	2
CO-2	**Analyze** product usability evaluations and testing methods.	-	1	3
CO-3	**Apply** the interface design standards / guidelines for cross cultural and disabled users.	-	1,2,3,4	-
CO-4	**Categorize, Design** and **Develop** Human Computer Interaction in proper architectural structures.	-	1,2,3	4,5

Mapping level:

POs/PSOs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
Mapping Level	2.0	1.67	1.67	1.67	1.5	-

Prerequisites: Knowledge of user interface design

Contents:

1 **HCI - Foundations:** Introduction, Input–output channels, Human memory, Thinking: reasoning and problem solving, Emotion, Individual differences, Psychology and the design of interactive systems, Text entry devices, Positioning, pointing and drawing, Display devices, Devices for virtual reality and 3D interaction, Physical controls, sensors and special devices, Paper: printing and scanning. **7 Hrs**

2 **Designing - Programming Interactive systems:** Models of interaction, Frameworks and HCI, Ergonomics, Interaction styles, Elements of the WIMP interface, The context of the interaction, Experience, engagement and fun, Paradigms for interaction. **7 Hrs**

3 **Cantered design and testing:** Interaction design basics-The process of design, User focus, Scenarios, Navigation design, Screen design and layout, Iteration and prototyping, Design for non-Mouse interfaces, HCI in the software process, Iterative design and prototyping, Design rules, Principles to support usability, Standards and Guidelines, Golden rules and heuristics, HCI patterns. **8 Hrs**

4 **Implementation support:** Elements of windowing systems, Programming the application, Using toolkits, User interface management systems, Evaluation techniques, Evaluation through expert analysis, Evaluation through user participation, Universal design, User support **9 Hrs**

5 **Models and Theories:** Cognitive models, Goal and task hierarchies, Linguistic models, The challenge of display-based systems, Physical and device models, Cognitive architectures

Collaboration and communication: Face-to-face communication, Conversation, Text-based communication, Group working, Dialog design notations, Diagrammatic notations, Textual dialog notations, Dialog semantics, Dialog analysis and design. **8 Hrs**

Reference Books:

1. A Dix, Janet Finlay, G D Abowd, R Beale, Human-Computer Interaction, 3rd Edition, Pearson Publishers, 2008.
2. Shneiderman, Plaisant, Cohen and Jacobs, Designing the User Interface: Strategies for Effective Human Computer Interaction, 5th Edition, Pearson Publishers, 2010.
3. Jonathan Lazar et al "Research Methods in Human Computer Interaction", 2nd Edition, Morgan Kaufmann Publication 2017

22PCSE329 Natural Language Processing & Text Mining (3-0-2) 4

Contact Hours: 52

Course Learning Objectives (CLOs):

This course focuses on the concepts, techniques and applications of natural language processing and text mining.

Course Outcomes (COs):

CO	Description of the Course Outcome: At the end of the course, the student will be able to:	Mapping to POs (1 to 6)		
		Substantial level (3)	Moderate level (2)	Slight level (1)
CO-1	**Explain** the Concepts of mathematics and linguistic foundations of natural language processing	-	3	6
CO-2	**Perform** the various processing on the words.	-	1	6
CO-3	**Apply** the formal relationships between words.	-	1	6
CO-4	**Represent** the meaning of the sentence and perform various semantic analysis.	-	1	5,6
CO-5	**Explain** the architecture and Operations of text mining.	-	1	6
CO-6	**Explain** and **apply** the text categorization and clustering techniques	-	1	5,6

Mapping Level:

POs/PSOs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
Mapping Level	2.0	-	2.0	-	1.0	1.0

Prerequisites:

- Basic knowledge on Mathematical foundation, Linguistic essentials
- Knowledge of Finite Automata, Regular Expression and Grammars
- Knowledge on Machine Learning will help.

Contents:

1. **Introduction**: Basics of Natural Language Processing, Mathematical Foundations, Linguistic Essentials, Corpus Based Work. **4L+2P**
2. **Words:** Collocations, Empirical Laws, Basics of Text processing, Morphology and Finite State Transducers, Probabilistic Models of Pronunciation and Spelling, N –grams**,** Maximum Entropy models, Random Fields. **8L+6P**
3. **Syntax:** Word Classes and Part-of-Speech Tagging, Context Free Grammar for Languages, Parsing with Context Free Grammar, Markov Models, , Lexicalized and Probabilistic Parsing **9L+6P**
4. **Semantics:** Distributional Semantics, Lexical Semantics, Topic Models, Word Sense Disambiguation, Methodological Preliminaries, Supervised & Unsupervised Disambiguation, Dictionary-Based Disambiguation, Latent Dirichlet Allocation for text classification, Latent Semantic Indexing, Probabilistic Latent Semantic Indexing. **9L+6P**
5. **Introduction to Text Mining:** Overview of text mining, General Architecture, Core Operations, Preprocessing techniques, Document classification, Information extraction, Evaluation of performance, sentiment analysis

   Text Categorization: Machine Learning Approach to Text Categorization. Classification of Linked and Web Data, Text Clustering: Supervised and Unsupervised Clustering. Text Summarization Techniques. **9L+6P**

Reference Books:

1. Dan Jurafsky, James H Martin, Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition, Pearson Education India,2nd edition (2013).
2. Christopher Manning “Foundations of Statistical Natural Language Processing,” MIT Press, July 1999.
3. Kao, Anne, and Steve R. Poteet, eds. Natural language processing and text mining. Springer Science & Business Media, 2007.
4. Ronen Feldman, James Sanger “The Text Mining Handbook: Advanced Approaches in Analyzing Unstructured Data,” Cambridge University Press, 2007.
5. Sholom Weiss, Nitin Indurkhya, Tong Zhang, Fred Damerau “Text Mining Predictive Methods for Analyzing Unstructured Information,” Springer, paperback 2010.

22PCSE330	Metaverse Fundamentals	(3-0-0) 3

Contact Hours: 39

Course Learning Objectives (CLOs):

The students are expected to learn about the emerging technological developments in global communication system and upgrade to 3D Internet and Extended Realities (XR) creating virtual worlds and experience. They also need to understand the role and contribution of blockchain, cryptocurrency in emerging industry and social domains and all the legal issues it entails

Course Outcomes (COs):

CO	Description of the Course Outcome: At the end of the course the student will be able to:	Mapping to POs(1 to 6)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Appreciate the current limitations of the internet and discovers ways to overcome them	-	1	-
CO-2	Map different technologies that play key role in the design and development of the metaverse and their contribution in functioning of the metaverse.	5	-	4
CO-3	Blockchain concepts- block, decentralization, P2P networks and other constructs used in the Metaverse	-	4	6
CO-4	Metaverse building technologies like 3D engines, smart contracts, DAOs	4	6	-
CO-5	Real world applications and use cases- in education, business, governance, games	6	4	-

Mapping level:

POs/PSOs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
Mapping Level	2.0	-	-	2.0	3.0	2.0

Prerequisites: Internet concepts

Contents:

1. **Introduction:** Introduction to Metaverse - History of Web and evolution of Web 3.0- History of Metaverse- what is metaverse? **4 Hrs**
2. **Metaverse Technologies:** Technologies involved in Metaverse - Metaverse as a product of Extended Reality XRMixed Reality (MR)- Augmented Reality (AR) - Virtual Reality (VR) - Artificial Intelligence in Metaverse- Finance and Economics of Metaverse- Benefits of Metaverse **8 Hrs**
3. **Blockchain adoption in Metaverse** Blockchain overview- History of Blockchain- Need of decentralization in Metaverses Mart contract capabilities in Blockchain-NFT Token standards- Cryptocurrencies in Metaverse **9 Hrs**
4. **Metaverse Development Tools:** Tools required to Metaverse development- Starting with Metaverse- developer- content creator- content consumer- tools- Unity 3D-Unreal Engine Amazon Sumerian-Spark AR cybernetics **9 Hrs**
5. **Metaverse- use-cases** Gaming in Metaverse- meetings in Metaverse-Virtual Learning in Metaverse-Social Interactions in Metaverse-Virtual Real-estate in Metaverse, e-commerce in metaverse, Travel in Metaverse- personalized Avatars- Digital Identity in Metaverse **9 Hrs**

Reference Books:

1. The Metaverse: Complete Reference https://bit.ly/MetaverseChapaters
2. Metaverse Glossary: Ravindra Dastikop
3. Publisher Amazon https://www.amazon.in/METAVERSE-GLOSSARY-YOUR-GATEWAY-FUTURE-ebook/dp/B0B622B2W4 Metaverse References https://bit.ly/MetaverseMatter

22PCSE331	Semantic Web	(3-0-0) 3

Contact Hours: 39

Course Learning Objectives (CLOs):

This course focuses on the following learning perspectives on theoretical and practical aspects of Web Ontology Language and knows various patterns for developing and reusing ontologies.

Course Outcomes (COs):

CO	Description of the Course Outcome: At the end of the course the student will be able to:	Mapping to POs (1 to 6)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	**Explain** the architecture of semantic web and the importance of markup languages.	4	3	6
CO-2	**Design** ontologies using web ontology language.	4	3	6
CO-3	**Apply** the logic with web ontology language.	4	3	6
CO-4	**Analyze** scalable architectures and semantic web services.	4	3	6
CO-5	**Explain** the evolution of ontologies with semantic interpretation of information.	4	3	6

Mapping level:

POs/PSOs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
Mapping Level	-	-	2.0	3.0	-	1.0

Prerequisites: Knowledge of hypertext markup language and web services is required.

Contents:

1. **The semantic web vision:** Today's web, Semantic web Technologies, A layered approach, Structured web documents in XML, Introduction to RDF, RDF syntax, RDF schema, Axiomatic statements for RDF and RDF schema, Direct inference system on RDF and RDFS. **8Hrs**
2. **Ontology and Web ontology Language:** Introducing OWL, Discovering the Various Species of OWL, Exploring the Foundations of OWL Understanding OWL Essentials, Making Simple Assertions, Inconsistency, Examining Property Characteristics, Complex Classes, Understanding Why OWL Is Different, Developing OWL Ontologies. **8Hrs**
3. **Ontology building and inference by logic:** Monotonic rules - syntax and semantics, Nonmonotonic rules - syntax, Rule markup in XML, Constructing and reusing ontologies, Semantic web knowledge management architecture, Querying using SPARQL, Jena ontology API, Reasoners. **8Hrs**
4. **Ontology scalable architectures and Discovering the semantic web services:** Discovering the Roles, Creating Semantics for Enterprise Systems, Scaling Semantic Web Tools, Patterns of Architectural Usage and Applicationdevelopment using OWL API. **8Hrs**
5. **Ontology evolution and Semantic knowledge:** Ontology population and enrichment, Semantic representation of multimedia content, Ontology based semantics extraction from text and Images. **7Hrs**

Reference Books:

1. Grigoris Antoniou and Frank van Harmelen: A Semantic Web Primer, Second Edition. MIT Press, Cambridge, MA 2008.
2. Jeffrey T.Pollock: Semantic Web For Dummies, Wiley Publishing, Inc 2009.
3. Semantic Web Programming by John Hebeler, Matthew Fisher, Ryan Blace Andrew Perez-Lopez,Wiley Publishing, Inc.
4. Georgios Paliouras, Constantine Spyropoulos, George Tsatsaronis (Eds.) Knowledge-Driven Multimedia Information Extraction and Ontology Evolution, Springer, 2011.

22PCSL302 Internship in Industry/R&D organization (4 weeks) 4

Course Learning Objectives (CLOs):

Internship provides an opportunity for the students to get industry exposure to real time scenarios that include professional skill development programs and adhere to the professional standards.

Course Outcomes (COs):

CO	Description of the Course Outcome: At the end of the course the student will be able to:	Mapping to POs (1 to 6)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	**Explore** the domain knowledge	-	3,1	-
CO-2	**Apply** the knowledge and skills in the professional career.	3	4,1	-
CO-3	**Prepare** a technical report	2,3,5	-	-
CO-4	**Demonstrate** the knowledge gained through presentation	1,6	3	-

Mapping level:

POs/PSOs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
Mapping Level	2.3	3.0	2.3	2.0	3.0	3.0

Prerequisites:

- Knowledge of both theory and practical courses learnt in all the previous Semesters and relevant value-added information.

22PCSL303	Project Phase 1	(0-0-6) 6

Contact Hours: 100

Course Learning Objectives (CLOs):

This course focuses on the objective to understand the domain through proper modeling and analysis using the state-of-art technology. Then apply relevant software engineering principles to develop modular applications, build test cases, verification and validation techniques to make the project reliable.

Course Outcomes (COs):

CO	Description of the Course Outcome: At the end of the course the student will be able to:	Mapping to POs (1 to 6)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	**Identify** the problem and **formulate** the problem statement.	1,3,4	5,6	-
CO-2	**Analyze** the problem scenario and **Design** the solutions to complex engineering problems using software engineering principles or appropriate research methodology.	1,3,4	5,6	-
CO-3	**Identify** and **Implement** a feasible solution using appropriate technology, tools, procedures and techniques.	1,3,4	5,6	-
CO-4	**Verify** and **Validate** the proposed system for correctness and to **demonstrate** compliance with the design and hence the stated requirements / research gap.	1,3,4	2,5,6	-
CO-5	**Prepare** the report and communicate effectively through presentation.	1,2,3,4	5,6	-

Mapping level:

POs/PSOs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
Mapping Level	3.0	2.5	3.0	3.0	2.0	2.0

The project will be evaluated/carried in two phases.

PHASE-1 details are as below:

1. Problem specification and the mile stones to be achieved in solving the problem has to be clearly specified. Mode of demonstration and necessary details of demonstrations has to be made clear.
2. Should submit a report outlining the following;
   - Problem statement and its detailed specification
   - Literature Survey
   - Requirements
   - Design and System architecture
   - References

The DPGC/Project Coordinating Team will be formed to review the project synopsis with respect to feasibility and relevance. CIE Marks for the project is to be awarded by project guide/supervisor. The SEE marks are to be awarded by examiners (appointed by DPGC) based on the guidelines and project rubrics.

Reference Books:

1. Sommerville, Ian. "Software engineering 9th Edition." ISBN-10 137035152 (2011): 18.
2. Jalote, Pankaj. An integrated approach to software engineering. Springer Science & Business Media, 2012.
3. Rajib Mall, Fundamentals of Software Engineering

22PCSL400	Project Phase 2	(0-0-22) 18

Contact Hours: 200

Course Learning Objectives (CLOs):

This course focuses on the objective to understand the domain through proper modeling and analysis using the state-of-art technology. Then apply relevant software engineering principles to develop modular applications, build test cases, verification and validation techniques to make the project reliable.

Course Outcomes (COs):

CO	Description of the Course Outcome: At the end of the course the student will be able to:	Mapping to POs (1 to 6)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	**Identify** the problem and **formulate** the problem statement.	1,3,4	5,6	-
CO-2	**Analyze** the problem scenario and **Design** the solutions to complex engineering problems using software engineering principles or appropriate research methodology.	1,3,4	5,6	-
CO-3	**Identify** and **Implement** a feasible solution using appropriate technology, tools, procedures and techniques.	1,3,4	5,6	-
CO-4	**Verify** and **Validate** the proposed system for correctness and to **demonstrate** compliance with the design and hence the stated requirements / research gap.	1,3,4	2,5,6	-
CO-5	**Prepare** the report and communicate effectively through presentation.	1,2,3,4	5,6	-

Mapping level:

POs/PSOs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
Mapping Level	3	2.5	3	3	2	2

PHASE-2 details are as below:

The students are expected to work on the project for the full semester in an industry or in the institution. It is expected that students complete the implementation work of PHASE-1 of the project along with possible publication and knowledge transfer through conduction of training program on various technology used. Semester End Examination is fully based on Phase-1 to Phase-2 with respect the following points:

- Problem statement and its detailed specification.
- Literature Survey
- Feasibility and Risk analysis
- Requirements and cost involved in carrying out the project
- System architecture
- Methodology
- Project outcomes
- Details of mode of demonstration.
- References

Reference Books:

1. Sommerville, Ian. "Software engineering 9th Edition." ISBN-10 137035152 (2011): 18.
2. Jalote, Pankaj. An integrated approach to software engineering. Springer Science & Business Media, 2012.
3. Rajib Mall, Fundamentals of Software Engineering

22PCSEOA1	BOS recommended ONLINE Course	Audit

Contact Hours: As Specified by the Organization

Course Learning Objectives (CLOs):

The students are expected to identify their field of interest and undergo learning by taking ONLINE courses and attending classes. Classes and evaluation procedures are as per the policy prescribed for online courses by the respective organizations and PP is a must for the award of the Degree**.**

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs (1 to 6)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO1	Identify his/her field of interest.	1	-	3
CO2	Demonstrate the knowledge acquired in the selected course/field.	1	-	3

Mapping Level:

POs/PSOs	**PO-1**	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**
Mapping Level	3.0	-	1.0	-	-	-

22PCSEOA2	BOS recommended ONLINE Course	Audit

Contact Hours: As Specified by the Organization

Course Learning Objectives (CLOs):

The students are expected to identify their field of interest and undergo learning by taking ONLINE courses and attending classes. Classes and evaluation procedures are as per the policy prescribed for online courses by the respective organizations and PP is a must for the award of the Degree**.**

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs (1 to 6)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO1	Identify his/her field of interest.	1	-	3
CO2	Demonstrate the knowledge acquired in the selected course/field.	1	-	3

Mapping Level:

POs/PSOs	**PO-1**	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**
Mapping Level	3.0	-	1.0	-	-	-