Academic Program: PG

Academic Year 2025-26

Department of Computer Science & Engineering

Computer Science & Engineering

III & IV Semester M.Tech

Syllabus

SHRI DHARMASTHALA MANJUNATHESHWARA COLLEGE OF ENGINEERING & TECHNOLOGY,
DHARWAD – 580 002

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

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

S D M 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.

S D M 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 2025-26 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 – 2024-25
M.Tech, Computer Science and Engineering
III 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
24PCSC301	Cloud computing concepts and applications	4-0-0	4	50	100	3		
24PCSE3XX	Elective 4	4-0-0	4	50	100	3		
24PCSE3XX	Elective 5	4-0-0	4	50	100	3		
24PCSE3XX	Elective 6	4-0-0	4	50	100	3	-	-
OR								
24PCSL301	Internship in Industry or R&D organization	** Min 4 weeks during vacation after 2nd sem	4	50	-	-	100	3
24PCSL302	*** Project phase 1	0-0-6	6	50	-	-	50	3
Total		**16-0-6/12-4weeks-6**	**22**	**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.

Elective List:

Sl No	Course Code	Course title
1.	24PCSE325	Natural Language Processing and Text Mining
2.	24PCSE326	High performance Computing
3.	24PCSE327	Wireless networks and mobile computing
4.	24PCSE328	Virtual reality
5.	24PCSE329	Network Protocol Design
6.	24PCSE330	Cyber Forensic
7.	24PCSE331	Data stream mining

Scheme of Teaching and Examinations – 2024-25
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
24P--LXXX	** Project phase-II	0-0-22	18	100	--	--	100	3
24P--EOA1	***BOS recommended ONLINE course	-	Audit (PP)	-	-	-	-	-
24P--EOA2	***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

*** Classes and evaluation procedures are as per the policy prescribed for online courses by the institution. The students can take up online courses from I semester to III semester and produce the certificate of the same by the end of IV semester.

Total Credits offered for the first year: 40

Total Credits offered for the Second year: 40.

III – Semester

24PCSC301 Cloud Computing Concepts and Applications (4-0-0) 4

Contact Hours: 52

Course Learning Objectives (CLOs):

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

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)**
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	**PO-1**	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**
Mapping Level	**2.7**	**3.0**	**3.0**	**2.4**	**1.75**	**-**

Pre requisites:

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

Contents:

1 **Introduction, Cloud Infrastructure**:
Cloud computing introduction, 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, Service level agreements, exercises & problems **08 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 Map Reduce programming model, A case study: Grep 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. **12 Hrs**

3 **Cloud Resource Virtualization**: Virtualization, Layering and virtualization, Virtual machine monitors, Virtual Machines, Performance and Security Isolation, Full virtualization and para virtualization, Hardware support for virtualization, Case Study: Xen a VMM based para virtualization, Optimization of network virtualization, Performance comparison of virtual machines, Exercises and problems **12 Hrs**

4 **Cloud Resource Management and Scheduling**: Policies and mechanisms for resource management, Stability of a two-level resource allocation architecture, Coordination of specialized autonomic performance managers, A utility-based model for cloud-based Web services, Resourcing bundling: Scheduling algorithms for computing clouds, 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, A trusted virtual machine monitor, Amazon web services: EC2 instances, 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 **10 Hrs**

Reference Books:

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

24PCSE325 Natural Language Processing and Text Mining (4-0-0) 4

Contact Hours:52

Course Learning Objectives (CLOs):

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

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 4)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	Explain the Concepts of mathematics and linguistic foundations of natural language processing	-	3	-
CO-2	To apply the Naïve Bayes algorithm for text classification and its application in sentiment analysis.	3,4	1	-
CO-3	Understand the role of logistic regression in NLP classification tasks.	3,4	1	-
CO-4	Implement sequence-based NLP tasks such as text generation and sentiment analysis using RNNs/LSTMs.	3,4	1	-
CO-5	Understand fine-tuning and prompt engineering for LLMs.	3,4	1	-
CO-6	Implement key NLP applications such as Machine Translation, Question Answering, and Information Retrieval, focusing on deep learning models, transformer-based approaches, and real-world challenges.	3,4	1	-
CO-7	Understand techniques for labeling linguistic features, including syntax, semantics, and discourse, to	3,4	1	-

	enhance NLP model training and performance.			

Mapping Level:

POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
Mapping Level	**2**	**-**	**2.8**	**3**	**-**	

Pre requisites:

1. Basic knowledge on Mathematical foundation, Linguistic essentials
2. Knowledge of Finite Automata, Regular Expression and Grammar. and Machine Learning

Contents:

1. **Introduction**: Mathematical Foundations, Linguistic Essentials, Corpus Based Work. **Words:** Collocations, Empirical Laws, Basics of Text processing, Morphology and Finite State Transducers **08 Hrs**
2. **Foundations of NLP :** Basics of Natural Language Processing Regular Expressions, Tokenization; Minimum Edit Distance; Probabilistic Models of Pronunciation and Spelling, N-gram Language Models.
   Fundamental Algorithms of NLP : Naive Bayes & Text Classification; Sentiment Analysis. **12 Hrs**
3. **Neural Structures for NLP :** Logistic Regression; Vector Semantics and Embeddings; **Recurrent Neural Network(RNN) and Long short-term memory networks (LSTM) for NLP :** Recurrent Neural Networks , RNNs as Language Models, RNNs for other NLP tasks , Stacked and Bidirectional RNN architectures The LSTM, Common RNN NLP Architectures , The Encoder-Decoder Model with RNNs **12 Hrs**
4. **NLP Applications:** Machine Translation, Question Answering and Information Retrieval, Chatbots and Dialogue Systems, Automatic Speech Recognition and Text-to-Speech **10 Hrs**
5. **Annotating Linguistic Structure:** Sequence Labelling for Parts-of-Speech (POS) Tagging and Named Entity Recognition (NER); Context-Free Grammars and Constituency Parsing; Dependency Parsing; Information Extraction: Relations, Events, and Time; Semantic Role Labeling and Argument Structure; Coreference Resolution and Entity Linking; Discourse Coherence **10 Hrs**

CTA-Assignment:

1. Literature survey on applications of natural language processing
2. Implementation on any one of the application of natural language processing using industry relevant techniques and tools
3. Presentation of the survey and implementation done

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, 2023
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 James Allen, Natural Language Understanding. Pearson Education, 1995

24PCSE326 High performance Computing (4-0-0) 4

Contact Hours: 52

Course Learning Objectives (CLOs):

This 52-hour course intends to provide introductory knowledge of parallel architecture, design and analysis of parallel algorithms and parallel programming.

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)**
CO-1	**Explain** the need for parallelism with scientific and business applications and scope for parallel computing.	1,3	2	5
CO-2	**Estimate** the performance of computing systems using Amdahl's law and SPEC rating.	1	2	-
CO-3	**Explain** the parallel computing architectures and models and their communication models, **Design** parallel algorithm for a given scenario.	1	-	6
CO-4	**Understand** the design principles of parallel algorithms.	3	2	-
CO-5	**Write** and **execute** the MPI and OpenMP programs.	2	-	-

Mapping Level:

POs	**PO-1**	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**
Mapping Level	**3.0**	**2.4**	**2.0**	**-**	**1.0**	**1.0**

Pre requisites:

1. Computer Organization
2. High level Programming course
3. Assembly Language Programming

Contents:

6. **Introduction to parallel computing:** Motivating Parallelism, Scope for Parallel Computing; Flynn's classification of architectures. Need for parallel computers Models of computation Analyzing parallel algorithms Expressing parallel algorithms.
   Self-Study : High end processors, GPUs etc. **10 Hrs**
7. **Performance Measurement Techniques:** Benchmark programs, SPEC ratings, Amdahl's law, Gustaffsons law. **10 Hrs**
8. **Parallel Programming Platform:** Implicit parallelism, Limitations of Memory System Performance, Dichotomy of Parallel Computing, Physical organization of Parallel Platforms, Communication Costs in Parallel Machines, Inter Connection Networking and Routing. **08 Hrs**
9. **Principles of Parallel Algorithm Design:** Preliminaries, Decomposition Techniques, Characteristics of Tasks and Interactions, Mapping techniques for load balancing, Methods for Containing Interaction Overhead, Parallel Algorithm Models. **08 Hrs**
10. **Message Passing Programming:** Message passing Model, Message Passing Interface, Circuit Satisfiability, (MPI_Init, MPI_Comm_rank, MPI_Comm_size, MIP_Finalize, Compiling and Running MPI Programs), Introducing Collective Communication. **08 Hrs**
11. **Shared Memory Programming:** Parallel for loop, declaring private variables, critical sections, Reductions, performance improvements, General data parallelisms **08 Hrs**

Reference Books:

1. Anant Grama, Anshul Gupta ,George Karpis,Vipin Kumar, Introduction to Parallel Computing : second edition, 2011,Pearson
2. Michel J Quinn Parallel Programming: 2009 Tata McGrawHill

24PCSE327 Wireless Networks and Mobile Computing (4-0-0)4

Contact Hours: 52

Course Learning Objectives (CLOs)

This course focuses on the concepts of wireless communication, propagation methods, Channel models, capacity calculations multiple antennas and multiple user techniques used in the mobile communication. It addresses CDMA, GSM, Mobile IP, WiMAX. It also deals with various tools/techniques available to develop different mobile Internet applications.

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)**
CO-1	**Explain** mobile computing architecture of GSM and GPRS.	-	3	-
CO-2	**Explain** issues related to mobility in computing environment.	-	4	-
CO-3	**Explain** Mobile operating systems and the operating environment for Palm OS, WinCE, Symbion, and Android	-	3, 4	-
CO-4	**Explain** the basic principles of mobile applications and develop simple mobile	3	2	-
CO-5	**Write** programs using MIDlet models.	3, 4	2	-

Mapping Level:

POs	**PO-1**	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**
Mapping Level	**-**	**2.0**	**2.5**	**2.33**	**-**	**-**

Prerequisites: Knowledge of Computer Networks

Contents:

1. **Mobile Computing Architecture:** Architecture for Mobile Computing, 3-tier Architecture, Design Considerations for Mobile Computing. Wireless Networks: Global Systems for Mobile Communication (GSM and Short Service Messages (SMS): GSM Architecture, Entities, Call routing in GSM, PLMN Interface, GSM Addresses and Identities, Network Aspects in GSM, Mobility Management, GSM Frequency allocation. Introduction to SMS,

SMS Architecture, SM MT, SM MO, SMS as Information bearer, applications, GPRS and Packet Data Network, GPRS Network Architecture, GPRS Network Operations, Data Services in GPRS, Applications for GPRS, Billing and Charging in GPRS, Spread Spectrum technology, IS-95, CDMA versus GSM, Wireless Data, Third Generation Networks, Applications on 3G,Introduction to WiMAX. **12 Hrs**

2. **Mobile Client:** Moving beyond desktop, Mobile handset overview, Mobile phones and their features, PDA, Design Constraints in applications for handheld devices. Mobile IP: Introduction, discovery, Registration, Tunneling, Cellular IP, Mobile IP with IPv6. **10 Hrs**
3. **Mobile OS and Computing Environment**: Smart Client Architecture, The Client: User Interface, Data Storage, Performance, Data Synchronization, Messaging. The Server: Data Synchronization, Enterprise Data Source, Messaging. Mobile Operating Systems overview, Android; Client Development: The development process, Need analysis phase, Design phase, Implementation and Testing phase, Deployment phase, Development Tools, Device Emulators **10 Hrs**
4. **Building Mobile Internet Applications:** Thin client: Architecture, the client, Middleware, messaging Servers, Processing a Wireless request, Wireless Applications Protocol (WAP) Overview, Wireless Languages: Markup Languages, HDML, WML, HTML, cHTML, XHTML, VoiceXM**.** **12 Hrs**

Introduction, CDC, CLDC, MIDP: Programming for CLDC, MIDlet model, Provisioning, MIDlet lifecycle, Creating new application, MIDlet event handling, GUI in MIDP, Low level GUI Components, Multimedia APIs; Communication in MIDP, Security Considerations in MIDP. **08 Hrs**

Reference Books:

1. Mobile Computing: Technology, Applications and Service Creation, Ashok Talukder, RoopaYavagal, Hasan Ahmed, 2nd Edition, Tata McGraw Hill, 2017
2. Martyn Mallik: Mobile and Wireless Design Essentials, Wiley India, 2003
3. Raj Kamal: Mobile Computing, Oxford University Press, 2007
4. ItiSahaMisra: Wireless Communications and Networks, 3G and Beyond, Tata McGraw Hill, 2009

24PCSE328 Virtual Reality (4-0-0) 4

Contact Hours: 52

Course Learning Objectives (CLOs):

This course is designed to give historical and modern overviews and perspectives on virtual reality. It describes the fundamentals of sensation, perception, technical and engineering aspects of virtual reality systems

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)**
CO-1	**Explain** how VR systems work and list the applications of VR.	1	2, 3	-
CO-2	**Explain** the design and implementation of the hardware that enables VR systems to be built	1	3	4
CO-3	**Explain** and model the geometric of virtual world.	1	3	4
CO-4	**Understand** the system of human vision and its implication on perception and rendering.	1	3	4
CO-5	**Explain** the concepts of motion and tracking in VR systems.	1	3	4

Mapping level:

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

Contents:

1. Introduction to Virtual Reality: Defining Virtual Reality, History of VR, Human Physiology and Perception, Key Elements of Virtual Reality Experience, Virtual Reality System, Interface to the Virtual World-Input & output- Visual, Aural & Haptic Displays, Applications of Virtual Reality **09Hrs**
2. Representing the Virtual World: Representation of the Virtual world, Visual Representation in VR, Aural Representation in VR and Haptic Representation in VR **10Hrs**

3. The Geometry of Virtual Worlds &The Physiology of Human Vision: Geometric Models, Changing Position and Orientation, Axis-Angle Representations of Rotation, Viewing Transformations, Chaining the Transformations, Human Eye, eye movements & implications for VR **12Hrs**
4. Visual Perception and Rendering: Visual Perception - Perception of Depth, Perception of Motion, Perception of Color, Combining Sources of Information Visual Rendering -Ray Tracing and Shading Models, Rasterization, Correcting Optical Distortions, Improving Latency and Frame Rates **12Hrs**
5. Motion and Tracking: Motion in Real and Virtual Worlds- Velocities and Accelerations, The Vestibular System, Physics in the Virtual World, Mismatched Motion and Vacation Tracking- Tracking 2D & 3D Orientation, Tracking Position and Orientation, Tracking Attached Bodies **09Hrs**

Reference Books:

1. Virtual Reality, Steven M. LaValle, Cambridge University Press, 2016.
2. Understanding Virtual Reality: Interface, Application and Design, William R Sherman and Alan B Craig, (The Morgan Kaufmann Series in Computer Graphics)". Morgan Kaufmann Publishers, San Francisco, CA, 2002.
3. Developing Virtual Reality Applications: Foundations of Effective Design, Alan B Craig, William R Sherman and Jeffrey D Will, Morgan Kaufmann, 2009.

24PCSE329	Network Protocol Design	(4-0-0) 4

Contact Hours: 52

Course Learning Objectives (CLOs):

This course will enable the students to understand, analyze, design and implement network protocols that meet the evolving needs of modern communication systems

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)**
CO-1	**Explain** networking protocols in Abstract Protocol notation	-	3,4	-
CO-2	**Explain** routing, security and compression protocols	-	3,4	-
CO-3	**Design** various error, congestion and multiplexing protocols	3	2,4	-

Mapping Level:

POs	**PO-1**	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**
Mapping Level	**-**	**2.0**	**2.34**	**2.0**	**-**	**-**

Pre requisites: Knowledge of Data Communication.

Contents:

1. How to specify network protocols? Semantics of traditional protocol specifications, syntax of traditional protocol. Network processes constants, inputs, and variables. Specifications in new protocol, A vending machine protocol, a request/reply protocol, a Manchester encoding protocol. Current internet. **10 Hrs**
2. Protocol execution processes in the internet. Nondeterministic assignment process arrays, protocol process communication in the internet, Types of transmission errors. Error occurrence. Normal timeout actions implementing transmission errors in the internet connections: using timeouts connections, using identifiers full-duplex and half-duplex connections. Connections in the internet. **10 Hrs**

3. Detection of message corruption. Detection of message loss, detection of message reorder, error detection in the internet. Error recovery-forward & backward error recovery. Cumulative acknowledgment, individual acknowledgment, blocks acknowledgment error recovery in the internet flow control. Window size control, rate control, circular buffer control, flow control in the internet **12 Hrs**
4. Local and global topology information, maintaining local topology information, hierarchical topology information topology information in the internet, Abstraction of perfect channel in the internet, Hierarchical routing, random routing.. **10 Hrs**
5. Asymmetric and symmetric keys authentication. Privacy and integrity non-repudiation authorization. Message digest security in the internet data compression. Huffman coding, static Huffman compression, dynamic Huffman compression. Context sensitive compression, lossy compression, data compression in the internet. **10 Hrs**

Reference Books:

1. Mohamed G. Gouda, “Elements of Network Protocol Design”, John Wiley & Sons 2004.

2.Douglas E Comer, “Computer Networks and Internet with Internet Applications”, FourthEdition, Pearson 2004.

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24PCSE330 Cyber Forensics (4-0-0)4

Contact Hours: 52

Course Learning Objectives (CLOs):

This Course focuses on computer forensics and computer investigation It illustrates the process of data acquisition and email investigation is carried out. Further, the students shall know the fundamental aspects of Social Engineering and Cyber Laws.l

Course Outcomes (COs):

Description of the Course Outcome: 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 how to prepare a digital forensics investigation by considering a systematic approach	-	3	1
CO-2	Demonstrate the process of data Acquisition	-	3,4	-
CO-3	Apply different computer forensic tools to a given cybercrime scene	-	3,4	-
CO-4	Implement real-world hacking techniques to test system security	-	3,4	6
CO-5	Understand the fundamental concepts of Cyber Law and Cyberspace.	-	3,4	

Mapping Level:

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

Contents:

1. **Computer Forensics** and Investigation as a Profession, Understanding Computer Investigation, preparing for digital investigations, Maintaining Professional Conduct, preparing a Digital Forensics Investigation, Procedures for Private-Sector High-Tech Investigations, Understanding Data Recovery Workstations and Software, Conducting an Investigation. **10 Hrs**
2. **Data Acquisition:** understanding storage formats for digital evidence, Acquisition methods ,acquisition tools, validating data acquisitions, Processing Crime and incident Scenes: Identifying digital evidence, collecting evidence in private-sector incident scenes, processing law enforcement crime scenes, preparing for a search, securing a computer incident or crime scene, seizing digital evidence at the scene, storing digital evidence, obtaining a digital hash, reviewing a case. **10 Hrs**
3. **Virtual machines** Forensics, Network Forensics and Live Acquisition
   Email Investigation-Exploring the role of email in investigations, exploring the role of client and server in email, investigating email crimes and violations, understanding email servers, using specialized email forensic tools. **10 Hrs**
4. **Introduction to Ethical Hacking Ethics, and Legality** – Understanding Ethical Hacking, Different Phases Involved in Ethical Hacking, Describing the Ways to Conduct Ethical Hacking, Understanding the Legal Implications of Hacking
   Footprinting and Social Engineering- Define the Term Footprinting, Information Gathering Methodology, How E-Mail Tracking Works, How Web Spiders Work, Social Engineering
   System Hacking-Understanding Password-Cracking Techniques, Keyloggers,Spyware Technologies, Rootkits, Sniffers,Denial of Service-Session Hijacking **12 Hrs**
5. **Concept of Cyber law and Cyber Space:** Introduction - Meaning and Features of Cyber law - Significance and Advantages of Cyber Law - Meaning of Cyber Space - Inclusive of Cyber Space - Facilitating Functions of Cyber Space - Major Issues in Cyber Space. Need for an Indian Cyber law: Plans of National Information Technology Policy (NITP) - Need for Protection of data - Transactions in Security - Electronic Banking.. 1**0 Hrs**

Reference Books:

1. Bill Nelson, Amelia Phillips, Frank Enfinger, Christopher Steuart, —Computer Forensics and Investigations‖, Cengage Learning, India Edition, 2016
2. CEH official Certfied Ethical Hacking Review Guide, Wiley India Edition, 2015
3. John R.Vacca, —Computer Forensics‖, Cengage Learning, 2005
4. MarjieT.Britz, —Computer Forensics and Cyber Crime‖: An Introduction‖, 3rd Edition, Prentice Hall, 2013.
5. Jonathan Rosenoer , Cyber law: The Law of Internet, Springer Verlog, Paperback, 17 September 2011

24PCSE331	Data Stream Mining	(4-0-0)4

Contact Hours: 52

Course Learning Objectives (CLOs):

This course 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):

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	

Mapping Level:

POs	**PO-1**	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**
Mapping Level	**-**	**-**	**2**	**3**	**-**	**2**

Pre requisites:

Database Systems, Statistics, Expectation, basic probability, distributions, and 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 **11Hrs.**

2 **Clustering from Data Streams**: Basic concepts, Leader Algorithm, partitioning clustering, hierarchical clustering, grid clustering. Meta-clustering Algorithm **11Hrs.**

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. **10Hrs.**

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. **10Hrs.**

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 **10Hrs.**

Reference Books:

1. Joao Gama “Knowledge Discovery from Data Streams” CRC publication, 1st Edition 2010.
2. Charu C Aggarwal “Data Streams: Models and Algorithms”, Springer, 2007.
3. Pang-Ning Tan, Michael Steinbach “Introduction to Data Mining” , Pearson.2011.

24PCSL301	Internship in Industry or R&D organization	6

Contact Hours: entire 3rd sem

Course Learning Objectives (CLOs):

Internship provide students the opportunity of hands-on experience that include personal training, time and stress management, interactive skills, presentations, budgeting, marketing, liability and risk management, paperwork, equipment ordering, maintenance, responding to emergencies etc. The objective is to put theory into practice, expand thinking and broaden the knowledge and skills acquired through course work in the field, understand, gain insight to professional communication including meetings, memos, reading, writing, public speaking, research, client interaction, input of ideas, and confidentiality. and adhere to professional standards in the field.

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)**
CO-1	**Gain** practical experience within the industry in which the internship is done.	-	1	4
CO-2	**Apply** the knowledge and skills in the professional career.	-	3	-
CO-3	**Develop** and refine oral and written communication skills. And prepare a technical report.	-	2	4,6
CO-4	**Demonstrate** the knowledge gained through presentation.	-	2,3	4,6

Mapping Level:

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

Contents:

Students under the guidance of internal guide/s and external guide shall take part in all the activities regularly to acquire as much knowledge as possible without causing any inconvenience at the place of internship.

Seminar: Each student, is required to

- Present the seminar on the internship orally and/or through power point slides.
- Answer the queries and involve in debate/discussion.
- Submit the report duly certified by the external guide.
- The participants shall take part in discussion to foster friendly and stimulating environment in which the students are motivated to reach high standards and become self-confident.

Continuous Internal Evaluation CIE marks for the Internship report (30 marks), seminar (10 marks) and question and answer session (10 marks) shall be awarded (based on the quality of report and presentation skill, participation in the question and answer session by the student) by the committee constituted for the purpose by the Head of the Department. The committee shall consist of three faculty from the department with the senior most acting as the Chairperson.

Semester End Examination SEE marks for the internship report (20 marks), seminar (20 marks) and question and answer session (10 marks) shall be awarded (based on the quality of report and presentation skill, participation in the question-and-answer session) by the examiners appointed by the College

24PCSL302	Project Work-I	(0-0-6)6

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):

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** 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 **demonstrate** compliance with the design and stated requirements.	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	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
Mapping Level	3.0	2.5	3.0	3.0	1.0	1.0

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

24PCSL401	Project Work-II	(0-0-22)18

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):

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** 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	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
Mapping Level	3.0	2.5	3.0	3.0	1.0	1.0

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