Academic Program: PG

Academic Year 2022-23

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 2020-21 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 Examination
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
20PCSEC300	High Performance Computing	4-0-0	4	50	100	3		
20PCSEE3XX	Elective 5	3-0-0	3	50	100	3		
20PCSEE3XX	Elective 6	3-0-0	3	50	100	3		
20PCSEE3XX	Elective 7	3-0-0	3	50	100	3	--	--
OR								
20PCSEL302	Internship in Industry or R&D organization	** Min 4 weeks during vacation after 2nd sem	3	50	--	--	100	3
20PCSEL303	*** Project phase 1	0-0-15	9	50			50	3
Total		**13-0-15/ 10-4weeks-15)**	**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.

List of Electives:

Sl. No	Course code	Course Title
1.	20PCSEE325	Cloud Computing
2.	20PCSEE326	Software Defined Network
3.	20PCSEE327	Software Project Management
4.	20PCSEE328	Game Theory
5.	20PCSEE329	Human Computer Interface
6.	20PCSEE330	Applied Cryptography

Scheme of Teaching and Examination

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
20PCSEL400	Project Phase-II	0-0-20	22	100	--	--	100	3
Total		**0-0-20**	**22**	**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: 44

Total Credits offered for the Second year: 44

III – Semester

20PCSEC300	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	2.4	2	-	1	1

Prerequisites:

- Knowledge of
- Computer Organization
- High level Programming course
- Assembly Language Programming

Contents:

1	**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.,	**6 Hrs**
2	**Performance Measurement Techniques:** Benchmark programs, SPEC ratings, Amdahl's law, Gustaffsons law.	**6 Hrs**
3	**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.	**10 Hrs**
4	**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.	**10 Hrs**
5	**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.	**10 Hrs**
6	**Shared Memory Programming:** Parallel for loop, declaring private variables, critical sections, Reductions, performance improvements, General data parallelisms.	**10 Hrs**

Reference Books:

1. Introduction to Parallel Computing : Anant Grama, Anshul Gupta ,George Karpis,Vipin Kumar, second edition, 2011,Pearson
2. Parallel Programming: Michel J Quinn 2009 Tata McGrawHill
3. Jonathan Lazer et al "Research Methods in Human Computer Interaction", 2nd Edition, Morgan Kaufmann Publication 2017.

20PCSEE325	Cloud Computing	(3-0-0) 3

Contact Hours: 39

Course Learning Objectives (CLOs):

This course is designed for post graduate level as an elective course, focuses on the concepts, architecture, infrastructure, design principles and services in cloud environment.

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 principles, key concepts, architecture and services in cloud computing.	-	2	-
CO-2	**Demonstrate** workflow, programming model for given application.	4	3	-
CO-3	**Administrate** the cloud resources.	3	-	-
CO-4	**Explore** various issues, challenges, storage systems in cloud computing.	-	5	-
CO-5	**Develop** an application for identified requirement and deploy it on cloud.	2	6	-

Mapping level:

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

Prerequisites:

-NIL-

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.	**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 Zookeeper, The MapReduce programming model, A case study: The Gre The Web application.	**08 Hrs**
3	**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 .	**08 Hrs**
4	**Storage Systems :** The Evolution of Storage Technology, Storage Models, File Systems, and Databases, Distributed File Systems: The Precursors, General Parallel File System, Google File System, Apache Hadoop, Locks and Chubby: A Locking Service, Transaction Processing and NoSQL Databases, BigTable	**08 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. 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.	**07 Hrs**

Reference Books:

1. Dan C Marinescu, “Cloud Computing Theory and Practice”, 2013, Elsevier (MK)
2. RajkumarBuyya, James Broberg, AndrzejGoscinski, “Cloud Computing Principles and Paradigms”, 2014, Willey
3. John W Rittinghouse, James F Ransome, “Cloud Computing Implementation, Management and Security”, 2013, CRC Press

20PCSEE326	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):

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	**PO-1**	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**
Mapping Level	3	2	2.6	-	2	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.

20PCSEE3257	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):

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

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. **08 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. **09 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. **09 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. **08 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? **05 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.

20PCSEE328	Game Theory	(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):

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** strategic situations and **represent** them as games	-	3	-
CO-2	**Solve** simple games using techniques	3	4	1
CO-3	**Identify** and **use** relevant strategies to solve the game theory problems**.**	3	4	1
CO-4	**Apply** game-theoretic analysis both formally and intuitively in negotiation and bargaining situations.	3	4,6	1

Mapping level:

POs	**PO-1**	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**
Mapping Level	1.0	-	2.8	2.0	-	2.0

Prerequisites:

- Knowledge of Probability and Statistics

Contents:

1	**Introduction:** Overview, Applications, Normal Form, Payoffs, Strategies, Pure Strategy Nash Equilibrium, Dominant Strategies, Mixed Strategy Nash Equilibrium, Dominated actions, Equilibrium in a single population.	**9 Hrs**
2	**Extensive Games:** Extensive Games with perfect information, Strategies and Outcomes, Nash Equilibrium, Subgame Perfect Equilibrium	**7 Hrs**
3	**Extensive Games – Extensions:** Allowing for simultaneous moves, Illustration – Entry into a monopolized industry, Subgame Perfect Equilibrium and Backward Induction.	**7 Hrs**
4	**Bayesian Games:** Motivational examples, General definitions, Illustration – Auctions, Auctions with an arbitrary distribution of valuations, Extensive games with imperfect information, Strategies, Nash Equilibrium, Beliefs and Sequential Equilibrium, Signaling Games.	**9 Hrs**
5	**Repeated Games:** Definition, Types – Finitely and Infinitely Repeated games, Nash equilibrium of infinitely repeated games, The Prisoner's dilemma. **Bargaining:** Definition, Bargaining as an extensive game, Trade in market as an illustration, Nash's axiomatic model, Relation between strategic and axiomatic models.	**7 Hrs**

Reference Books:

1. Kevin Leyton-Brown and Yoav Shoham "Essentials of Game Theory", Morgan and Claypool Publishers, 2008.
2. Matthew O. Jackson "A Brief Introduction to the Basics of Game Theory", Stanford University, 2011.
3. Osborne, M.J "An Introduction to Game Theory", Oxford University Press, 2004.
4. Gibbons, R.A "Primer in Game Theory", Pearson Education, 1992.

20PCSEE329	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):

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	**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

20PCSEE330	Applied Cryptography	(3-0-0) 3

Contact Hours: 39

Course Learning Objectives (CLOs):

This is a 3-credit course at postgraduate level that focuses on both theoretical concepts and practical applications of cryptography and network security techniques.

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 fundamentals of cryptography and **revise** the basic mathematics required for cryptography.	-	1,3	-
CO-2	**Explain** the principles of symmetric encryption techniques and **apply** them in solving security related problems.	1,3,6	2	-
CO-3	**Explain** the principles of asymmetric encryption techniques and **apply** them in solving security related problems.	1,3,6	2	-
CO-4	**Apply** cryptographic techniques to solve data integrity and authentication problems.	1,3,6	2	-
CO-5	**Explain** the basic principles of web and email security.	-	2,5,6	-

Mapping level:

POs	**PO-1**	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**
Mapping Level	2.75	2	2.75	-	1	2.75

Prerequisites:

- Basic Knowledge of Computer Networks.

Contents:

1	**Computer Network Security Concepts and Number Theory:** Computer Security Concepts, The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, Fundamental Security Design Principles. Divisibility and the Division Algorithm, The Euclidean Algorithm, Modular Arithmetic , Prime Numbers, Fermat's and Euler's Theorems, Testing for Primality, The Chinese Remainder Theorem, Discrete Logarithms.	**5 Hrs**
2	**Symmetric Ciphers**: Classical Encryption Techniques: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques. Block Ciphers and the Data Encryption Standard: Traditional Block Cipher Structure, The Data Encryption Standard, A DES Example, The Strength of DES. Advanced Encryption Standard: Finite Field Arithmetic, AES Structure, AES Transformation Functions, AES Key Expansion, An AES Example, AES Implementation.	**10 Hrs**
3	**Asymmetric Ciphers**: Public-Key Cryptography and RSA: Principles of Public- Key Cryptosystems, The RSA Algorithm.Other Public-Key Cryptosystems: Diffie-Hellman Key Exchange, Elgamal Cryptographic System, Elliptic Curve Arithmetic, Elliptic Curve Cryptography.	**8 Hrs**
4	**Cryptographic Data Integrity Algorithms and Mutual Trust** Cryptographic Hash Functions: Applications of Cryptographic Hash Functions, Two Simple Hash Functions, Requirements and Security, Hash Functions Based on Cipher Block Chaining, Secure Hash Algorithm (SHA). Message Authentication Codes: Message Authentication Requirements, Message Authentication Functions, Requirements for Message Authentication Codes, Security of MACs, MACs Based on Hash Functions: HMAC, Digital Signatures: Digital Signatures, Elgamal Digital Signature Scheme. Key Management and Distribution: Symmetric Key Distribution Using Symmetric Encryption, Symmetric Key Distribution Using Asymmetric Encryption, Distribution of Public Keys, X.509 Certificates, Public-Key Infrastructure. User Authentication: Remote User-Authentication	**10 Hrs**
5	**Transport layer and E-mail security**: Web Security Considerations, Transport Layer Security, HTTPS, Secure Shell (SSH).Internet Mail Architecture, Email Formats, Email Threats and Comprehensive Email Security, S/MIME, Pretty Good Privacy.	**6 Hrs**

Reference Books:

1. W. Stallings. Cryptography and Network Security: Principles and Practices (7th edition). Prentice Hall, 2016, ISBN-13: 978-0134444284.
2. Bruce Schneier, Applied Cryptography, John Wiley & Sons, Second Edition, 2007, ISBN 978-1-119-09672-6.
3. William Stalling & Lawrie Brown, Computer Security: Principles and Practice, Pearson 2008, Indian Edition 2010.

20PCSEL302 Internship in Industry/R&D organization (4 weeks) 3

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):

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	**PO-1**	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**
Mapping Level	**2.3**	**3**	**2.3**	**2**	**3**	**3**

Prerequisites:

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

20PCSEL303	Project Phase 1	(0-0-15) 9

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):

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

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

20PCSEL400	Project Phase 2	(0-0-20) 22

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):

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	**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