Department of Computer Science and Engineering

Academic Year 2019-20

M. Tech in Computer Science and Engineering

Scheme and Syllabus

Third and Fourth Semesters

Batch : 2018 - 2020

New Horizon College of Engineering
Department of Computer Science and Engineering
Third Semester M.Tech. Program– Scheme

S. No	Course code	course	BOS	L	P	T	S	Overall credits	Contact Hours	CIE	SEE	TOTAL
THIRD SEMESTER-COMPUTER SCIENCE AND ENGINEERING												
				Credit distribution				Overall credits	Contact Hours	Marks		
1	19SCS31x	SPECIALIZATION ELECTIVE	CSE	3	0	0	1	4	4	50	50	100
2	19SCS32	INTERNSHIP	CSE	0	2	0	0	2	-	50	50	100
3	19SCS33	SEMINAR	CSE	0	0	0	2	2	-	50	50	100
4	19SCS34	PROJECT PHASE-1	CSE	0	14	0	0	14	-	50	50	100
Total								22	4	200	200	400

Specialization Elective	
Course code	course
19SCS311	INTERNET OF THINGS
19SCS312	MOBILE APPLICATION DEVELOPMENT
19SCS313	COMPUTER SYSTEMS-PERFORMANCE ANALYSIS
19SCS314	NATURAL LANGUAGE PROCESSING

New Horizon College of Engineering
Department of Computer Science and Engineering
Fourth Semester M.Tech. Program– Scheme

S. No	Course code	course	BOS	Credit distribution				Overall credits	Contact Hours	Marks		
				L	P	T	S			CIE	SEE	TOTAL
1	19SCS41x	SPECIALIZATION ELECTIVE	CSE	3	0	0	1	4	4	50	50	100
2	19SCS42	RESEARCH METHODOLOGY & IPR	CSE	2	0	0	0	2	2	25	25	50
3	19SCS43	INTERNSHIP	CSE	0	2	0	0	2	-	50	50	100
4	19SCS44	SEMINAR	CSE	0	0	0	2	2	-	50	50	100
5	19SCS45	PROJECT PHASE-2	CSE	0	12	0	0	12	-	50	50	100
Total								22	6	225	225	450

Specialization Elective	
Course code	course
19SCS411	AGILE TECHNOLOGIES
19SCS412	WEB INTELLIGENCE
19SCS413	ADVANCES IN COMPUTATIONAL SECURITY
19SCS414	HIGH PERFORMANCE COMPUTING

INTERNET OF THINGS

Course Code :19SCS311	**Credits : 04**
L:P:T:S : 3:0:0:1	**CIE Marks: 50**
Exam Hours : 3 hrs	**SEE Marks: 50**

Course Outcomes: At the end of the Course, the Student will be able to:

1) To understand the basics of Internet of Things
2) Analyze and Development of Prototyping in IoT
3) Formulate Various IOT protocols and its application
4) Design of IOT Protocols
5) Developing Web of Things and its Architecture
6) Apply various techniques of IOT to Real World Application.

Module 1

INTRODUCTION : The Internet of Things: TheFlavour of IoT,The "Internet" of "Things", The Technology of IOT, Enhanced Objects, Who is making IOT?, Design Principles for connected devices:Calm ad Ambient Technology, Magic as Metaphor, Privacy, Web Thinking for connected devices, Affordances   **9 Hrs**

Module 2

PROTOTYPING :Thinking about Prototyping:Sketching,Familiarity, Costs v/s Ease of Prototyping, Prototypes and Production ,open source and closed source, Electronics, Embedded Computing Basics, Arduino, RespBerry Pi, Beaglebone Black,Electric Imp, Other Platforms, Preparation, Sketch Iterate & Explore, Non Digital Methods   **8 Hrs**

Module 3

IOT PROTOCOLS: Protocol Standardization for IOT ,Efforts , M2M and WSN Protocols, SCADA and RFID Protocols, Issues with IOT Standardization ,Unified Data Standards, Protocols , IEEE 802.15.4 , BACNet Protocol ,Modbus ,KNX , Zigbee Architecture, Network layer – APS layer – Security   **9 Hrs**

Module 4

WEB OF THINGS : Web of Things versus Internet of Things – Two Pillars of the Web ,Architecture Standardization for WoT,Platform Middleware for WoT ,Unified Multitier WoT Architecture ,WoT Portals and Business Intelligence. Cloud of Things: Grid/SOA and Cloud Computing ,Cloud Middleware ,Cloud Standards ,Cloud Providers and Systems ,Mobile Cloud Computing ,The Cloud of Things Architecture   **9 Hrs**

Module 5

APPLICATIONS :The Role of the Internet of Things for Increased Autonomy and Agility in Collaborative Production Environments - Resource Management in the Internet of Things: Clustering, Synchronization and Software Agents. Applications , Smart Grid ,Electrical Vehicle Charging

9 Hrs

TEXT BOOKS:
1. "Designing the Internet of Things", Adrian McEwen,Hakim Cassimally,John Wiley &Sons ,1st Edition 2014
2. "Architecting the Internet of Things",Dieter Uckelmann; Mark Harrison; Florian Michahelles-(Eds.) – Springer – 2011
3. "The Internet of Things – Key applications and Protocols",Olivier Hersent, David Boswarthick, Omar Elloumi, , Wiley, 2012

REFERENCE BOOKS:
1. "The Internet of Things in the Cloud: A Middleware Perspective",Honbo Zhou – CRC Press – 2012
2. "Networks, Crowds, and Markets: Reasoning About a Highly Connected World", David Easley and Jon Kleinberg, Cambridge University Press - 2010
3. "The Internet of Things: Applications to the Smart Grid and Building Automation", Olivier Hersent, Omar Elloumi and David Boswarthick - Wiley -2012

MOBILE APPLICATION DEVELOPMENT

Course Code : 19SCS312   **Credits** : 04

L:P:T:S : 3:0:0:1   **CIE Marks** : 50

Exam Hours : 03   **SEE Marks** : 50

Course Objectives:

- understand the fundamentals of Android operating systems
- demonstrate their skills of using Android software development tools
- develop software with reasonable complexity on mobile platform
- build application using advanced android features
- debug and deploy programs on mobile devices

Module-1

Introduction: Introduction to mobile application development, introduction to various platforms, introductions to smart phones, introduction to development environment/IDE, Android OS design and Features – Android development framework, SDK features, Installing and running applications on Eclipse platform, Creating AVDs, Types of Android applications, Best practices in Android programming, Android tools. Android application components – Android Manifest file, Externalizing resources like values, themes, layouts, Menus etc, Resources for different devices and languages, Runtime Configuration Changes, Android Application Lifecycle – Activities, Activity lifecycle, activity states, monitoring state changes

9 Hrs

Module-2

Android User Interface: Measurements – Device and pixel density independent measuring units, Layouts – Linear, Relative, Grid and Table Layouts, User Interface (UI) Components – Editable and non editable Text Views, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Action Bar, Menu Bar, Recycler View, Dialog and pickers, Event Handling – Handling clicks or changes of various UI components, Fragments – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding, removing and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities

9Hrs

Module-3

Intents, Broadcasts and Services:

Intent –Explicitly starting new Activity, Implicit Intents, Passing data to Intents, Getting results from Activities, Native Actions, Broadcast Receivers – Using Intent filters to service implicit Intents, Resolving Intent filters, finding and using Intents received within an Activity, Notifications – Creating and Displaying notifications, Displaying Toasts, Overview of services in Android, Implementing a Service, Service lifecycle, Multi-Threading- Handlers and AsyncTask

9 Hrs

Module-4

Persistent Storage: Files – Using application specific folders and files, creating files, reading data from files, listing contents of a directory, Shared Preferences – Creating shared preferences, saving and retrieving data using Shared Preference, Database – Introduction to SQLite database, creating and opening a database, creating tables, inserting retrieving and deleting data, Content Providers -Registering Content Providers, Using content Providers (insert, delete, retrieve and update),   **9 Hrs**

Module-5

Advanced Applications Building apps with Multimedia, Building apps with Graphics & Animations, Building apps with Location Based Services and Google maps, Building apps with Connectivity & Cloud, Sensors, Bluetooth, Camera, Telephony Services. Android application development guidelines, Publishing android applications   **8 Hrs**

Text Books:
- Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox) , 2012
- Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013

Reference Books:
- Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013
- http://developer.android.com

Expected Course Outcome: At the end of the course graduate will be able to:

- Create Android applications in Android Studio, applying features such as, intent, service, Content Provider, Broadcast Receiver, SQLite, Google Maps, Animation and publish the android application.

COMPUTER SYSTEMS PERFORMANCE ANALYSIS

Course Code	:19SCS313	**Credits**	: 04
L:P:T:S	: 3:0:0:1	**CIE Marks**	: 50
Exam Hours	: 03	**SEE Marks**	: 50

Course Objectives:

- Specifying performance requirements & Evaluating design alternatives
- Comparing two or more systems
- Determining the optimal value of a parameter (system tuning)
- Finding the performance bottleneck (bottleneck identification)
- Characterizing the load on the system (workload characterization) & Predicting the performance at future loads (forecasting).

Module-1

Overview of Performance Evaluation

The Art Of Performance Evaluation; Common Mistakes In Performance Evaluation, A Systematic Approach To Performance Evaluation, Selection Of Evaluation Techniques And Performance Metrics.

8 Hrs

Module-2

Probability Theory and Statistics
Summarizing Measured Data, Comparing Systems Using Sample Data, Simple Linear Regression Models, and Other Regression Models

9 Hrs

Module-3

Experimental Design and Analysis

Introduction To Experimental Design, 2k Factorial Designs, 2kr Factorial Designs With Replications, 2k–P Fractional Factorial Designs, One-Factor Experiments, Two-Factor Full Factorial Design Without Replications, Two-Factor Full Factorial Design With Replications.

9 Hrs

Module-4

Random variables and common distributions

Random-Number Generation, Desired Properties Of A Good Generator, Linear-Congenital Generators, Testing Random-Number Generators, Random-Variate Generation, Commonly Used Distributions.   **9 Hrs**

Module-5

Queuing Models

Introduction To Queueing Theory, Introduction To Queueing Theory, Analysis Of A Single Queue, Queueing Networks, Operational Laws, Mean-Value Analysis And Related Techniques, Hierarchical Decomposition Of LargeQueueing Networks.

9 Hrs

Text Books:

- Raj Jain: The Art of Computer Systems Performance Analysis, John Wiley and Sons, 2013.

Reference Books:

- Trivedi K S: Probability and Statistics with Reliability, Queuing and Computer Science Applications, 2nd Edition, Wiley India, 2001.

Expected Course Outcome: At the end of the course graduate will be able to:

- Understand the role of performance in modern computer systems
- Select appropriate tools for various performance measurements
- Apply techniques to measure performance of CPU, disk, and memory subsystems
- Apply measurement tools and techniques to uni processor and multiprocessor systems
- Interpret and explain, including statistical analysis, results produced by performance measurement tools
- Predict and forecast workload and performance parameters of a given computer system

NATURAL LANGUAGE PROCESSING

Course Code : 19SCS314   **Credits** : 04
L:P:T:S   : 3:0:0:1   **CIE Marks**   : 50
Exam Hours   : 03   **SEE Marks**   : 50

Course Objectives:

- To learn the fundamentals of natural language processing.
- To understand morphology and parts of speech tagging.
- To understand the use of CFG and PCFG in NLP.
- To understand the role of semantics of sentences and pragmatics.
- To apply the NLP techniques to IR applications.

Module-1 INTRODUCTION   9 Hours

Overview: Origins and challenges of NLP -Language and Grammar-Processing Indian Languages - NLP Applications-Information Retrieval – Language Modelling: Grammar-based LM, Statistical LM

Module-2 MORPHOLOGY AND PART OF SPEECH TAGGING   9   Hours

Linguistic essentials - Lexical syntax- Morphology and Finite State Transducers - Part of speech Tagging - Rule-Based Part of Speech Tagging - Markov Models - Hidden Markov Models – Transformation based Models - Maximum Entropy Models. Conditional Random Fields

Module-3 SYNTACTIC ANALYSIS   9 Hours

Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow parsing – Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs – Feature structures, Unification of feature structures.

Module-4 SEMANTIC ANALYSIS   9   Hours

Representing Meaning – Semantic Analysis - Lexical semantics –Word-sense disambiguation - Supervised – Dictionary based and Unsupervised Approaches - Compositional semantics Semantic Role Labelling and Semantic Parsing.

Module-5 INFORMATION RETRIEVAL AND LEXICAL RESOURCES   9   Hours

Information Retrieval: Design features of Information Retrieval Systems-Classical, Non-classical, Alternative Models of Information Retrieval – Valuation Lexical Resources: World Net-Frame Net- Stemmers-POS Tagger- Research Corpora.

Text Books:

1. Tanveer Siddiqui, U.S. Tiwary, "Natural Language Processing and Information Retrieval", Oxford University Press, 2008.

2. Daniel Jurafsky and James H Martin, "Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition", 2 nd Edition, Prentice Hall, 2008.

Reference Books:

1. James Allen, "Natural Language Understanding", 2 nd edition, Benjamin Cummings publishing company, 1995
2. Steven Bird, Ewan Klein and Edward Loper, —Natural Language Processing with Python, First Edition, OReilly Media, 2009
3. Tanveer Siddiqui, U.S. Tiwary, —Natural Language Processing and Information Retrieval, Oxford University Press, 2008.
4. Foundations of Statistical Natural Language Processing by Christopher D. Manning and Hinrich Schuetze, MIT Press, 1999

Expected Course Outcome: At the end of the course graduate will be able to:

- To tag a given text with basic Language features
- To design an innovative application using NLP components
- To implement a rule based system to tackle morphology/syntax of a language
- To design a tag set to be used for statistical processing for real-time applications
- To compare and contrast the use of different statistical approaches for different types of NLP applications.

INTERNSHIP

Course Code	:19SCS32	**Credits**	: 02
L:P:T:S	:0:2:0:0	**CIE Marks**	: 50
Exam Hours	:3 hrs.	**SEE Marks**	: 50

Course Objectives:
1) To develop the skills to work in the industry.
2) To enhance practical knowledge about the subjects learned during their course of study.
3) To develop their skills to enhance their practical knowledge with current trends and technology.
4) To develop their skills in team work.
5) To develop their skills to match with industry needs.

Internship Guidelines:
1. All the student shall have to undergo the mandatory internship during their 3rd/4th semester .

2. The internship can be carried out in any industry related to their discipline through NHCE or on their own effort.

3. Each student will be allocated to a internal faculty guide and a reviewer.

4. Student shall report the progress of the internship to the guide in the regular interval to seek his/her advice.

5. The internship shall be completed within the specified time.

6. After the completion of internship, student should submit a report with attendance certificate to the HOD with the approval of both internal and external guide.

7. The student should present his/her work in the PPT format to his/her guide and reviwer which will be considered for CIE. There should be minimum 10 -15 slides and duration for presentation will be 15-20 minutes for each review.

8. There will be 3 reviews and CIE marks will be allocated based on the review.

9. Hard copy of the report should be submitted during the final presentation.

10. SEE will be conducted for internship.

Expected Course Outcome: At the end of the course graduate will be able to:
1. Develop or improve his/her skill to work in industry.

2.Develop the skills required for effective team work.

3.Identify the industry needs and apply their knowledge to solve problem using recent trends and technology.

4.Help them to do their final year project with the practical knowledge.

SEMINAR

Course Code	:19SCS33	**Credits**	: 02
L:P:T:S	:0:0:0:2	**CIE Marks**	: 50
Exam Hours	:3 hrs.	**SEE Marks**	: 50

Course Objectives:

1) To develop the skills required to identify the recent topic/technology.
2) To identify, gather, organize, analyze and interpret the data relating to a particular concept/technology.
3) To demonstrate the conceptual understanding of the topic chosen for presentation.
4) To develop the skills required for effective presentation.
5) To develop and apply the skills required for justifying the methodology of a chosen topic.

Seminar Guidelines:

1. The student should choose topic in recent trend /technology from IEEE or renowned journal.

2. Each student will be allocated to a internal faculty guide and reviewer.

3. Student should get approval from the guide for his/her chosen topic within the stipulated time.

4. The student should present his/her work in the PPT format to his/her guide and reviewer which will be considered for CIE. There should be minimum 10 -15 slides and duration for presentation will be 15-20 minutes .

5. Hard copy of the report should be submitted during the final presentation.

6. CIE marks will be considered on the basis of the topic chosen, knowledge about the topic, communication skills, and levels of confidence, time management, questions and answer session.

7. SEE will be conducted for technical seminar.

Expected Course Outcome: At the end of the course graduate will be able to:

1. Identify, gather, organize, analyze and interpret the data relating to a particular concept/technology

2. Develop or improve his/her skill for understanding the concept.

2. Develop the skills required for effective presentation

3. Develop and apply the skills required to justify the methodology of a chosen topic.

PROJECT PHASE-1

Course Code	: 19SCS34	**Credits**	: 14
L:P:T:S	:0:14:0:0	**CIE Marks**	: 50
Exam Hours	: 03	**SEE Marks**	: 50

Course Outcomes: At the end of the Course, the student will be able to

1) Solve/work on the real world/ Practical/Theoretical problems involving research issues in computer science and engineering.
2) Able to summarize the work by proper Software Engineering Documents after evaluating the testing plans.
3) Practice presentations, Communications skills.
4) Able to learn and develop new concepts in multidisciplinary area
5) Use appropriate programming languages/software tools/ Hardware technologies.
6) Apply algorithmic strategies while solving problems.

This course will be conducted as a single student member under the direct supervision of a member of academic staff. Each student will be required to:

1) Identify the Problem statement and choose the specific project research topic which will reflect the common interests and expertise of the student and supervisor.
2) Perform a literature review of all the previous works done from IEEE papers to review current knowledge and developments in the chosen technical area.
3) Conduct a Feasibility study of the research area.
4) Submit the Project Proposal.
5)Publish a review/survey paper in international conference/journal.
The guidelines for M. Tech Project are intended to give both students and faculty members at the Department of Computer Science and Engineering a set of procedures and expectations that will make the project evaluation process easier, more predictable, and more successful. The Project Committee assigned for various programmes offered under Department of Computer Science & Engineering may add requirements or guidelines as they see fit – as long as there are no less demanding than the guidelines set forth in this.

The Project work Phase I shall be pursued during the third semester.

The Project work Phase II shall be pursued during the final semester.

AGILE TECHNOLOGIES

Course Code	: 19SCS411	Credits	: 04
L:P:T:S	: 3:0:0:1	CIE Marks	: 50
Exam Hours	: 03	SEE Marks	: 50

Course Objectives:

- To understand how an iterative, incremental development process leads to faster delivery of more useful software
- To understand the essence of agile development methods
- To understand the principles and practices of extreme programming
- To understand the roles of prototyping in the software process
- To understand the concept of Mastering Agility

Module-1

Why Agile?: Understanding Success, Beyond Deadlines, The Importance of Organizational Success, Enter Agility, **How to Be Agile?:** Agile Methods, Don't Make Your Own Method, The Road to Mastery, Find a Mentor

8 Hours

Module-2

Understanding XP: The XP Lifecycle, The XP Team, XP Concepts, **Adopting XP:** Is XP Right for Us?, Go!, Assess Your Agility

7 Hours

Module-3

Practicing XP:
Thinking: Pair Programming, Energized Work, Informative Workspace, Root-Cause Analysis, Retrospectives, **Collaborating:** Trust, Sit Together, Real Customer Involvement, Ubiquitous Language, Stand-Up Meetings, Coding Standards, Iteration Demo, Reporting, **Releasing:** "Done Done", No Bugs, Version Control, Ten-Minute Build, Continuous Integration, Collective Code Ownership, Documentation. **Planning:** Vision, Release Planning, The Planning Game, Risk Management, Iteration Planning, Slack, Stories, Estimating. **Developing:** Incremental requirements, Customer Tests, Test-Driven Development, Refactoring, Simple Design ,Incremental Design and Architecture, Spike Solutions, Performance Optimization, Exploratory Testing

11 Hours

Module-4

Mastering Agility
Values and Principles: Commonalities, About Values, Principles, and Practices, Further Reading, **Improve the Process:** Understand Your Project, Tune and Adapt, Break the Rules,

Rely on People : Build Effective Relationships, Let the Right People Do the Right Things, Build the Process for the People, **Eliminate Waste :**Work in Small, Reversible Steps, Fail Fast, Maximize Work Not Done, Pursue Throughput

9 Hours

Module-5

Deliver Value: Exploit Your Agility, Only Releasable Code Has Value, Deliver Business Results, Deliver Frequently, **Seek Technical Excellence :**Software Doesn't Exist, Design Is for Understanding, Design Tradeoffs, Quality with a Name, Great Design, Universal Design Principles, Principles in Practice, Pursue Mastery

9 Hours

Text Books:

- The Art of Agile Development (Pragmatic guide to agile software development), James shore, Chromatic, O'Reilly Media, Shroff Publishers & Distributors, 2007

Reference Books:

- Agile Software Development, Principles, Patterns, and Practices, Robert C. Martin, Prentice Hall; 1st edition, 2002
- "Agile and Iterative Development A Manger's Guide", Craig Larman Pearson Education, First Edition, India, 2004.

Expected Course Outcome: At the end of the course graduate will be able to:

- Understand the basics of Agile technology and its usage
- Understand The XP Lifecycle, XP Concepts, Adopting XP
- Work on Pair Programming, Root-Cause Analysis, Retrospectives
- Work on Planning, Incremental Requirements, Customer Tests
- Implement Concepts to Eliminate Waste
- Understand Universal Design Principles and Principles in Practice

WEB INTELLEGENCE

Course Code	: 19SCS412	**Credits**	: 04
L: P: T: S	: 3:0:0:1	**CIE Marks**	: 50
Exam Hours	: 3	**SEE Marks**	: 50

Course Outcomes: At the end of the Course, the Student will be able to

1) Understand different issues and approaches related to web Intelligence
2) Gain the knowledge of fundamental concepts on knowledge representation and Ontological
   Engineering.
3) Apply different data mining techniques on big data
4) Learn various web mining techniques with applications like Web usage Mining.
5) Understand different web content mining and web structure mining techniques
6) Understand the application of Web Intelligence on the Social Web

Module 1

Introduction to Web Intelligence: What is Web intelligence, Benefits of Intelligent Web, Ingredients of Web Intelligence, Topics of Web Intelligence, Related Technologies, Information Retrieval,Document representation, Retrieval Models, Evaluation of Retrieval Performance   **8 Hrs**

Module 2

Semantic Web: The Layered-Language Model, Metadata and Ontologies, Ontology Languages for the Web Data Mining Techniques: Classification and Association, Clustering
9 Hrs

Module 3

Web Usage Mining: Web-Log Processing, Analyzing Web Logs, Applications of Web Usage Mining- Clustering of Web Users, Classification Modeling of Web Users, Association Mining of Web Usages, Sequence-Pattern Analysis of Web Logs   **9 Hrs**

Module 4

Web Content Mining:Web Crawlers, Search engines, Personalization of Web Content, Multimedia Information Retrieval   **9 Hrs**

Module 5

Web Structure Mining: Modeling Web Topology- PageRank Algorithm, Hyperlink-Induced Topic Search (HITS), Random Walks on the Web, Social Networks
9 Hrs

Text Book(s):
1. Akerkar, R. & Lingras, P. (2008). Building an Intelligent Web: Theory and Practice. Jones and
   Bartlett Publishers, Sudbury, Massachusetts.
2. Data Mining Concepts &Techniques –by Jaiwei Han ,Micheline Kamber,Jian Pei 3rd Edition,MK
   publisher.

References:
1. Juan D.Vel´asquez and Lakhmi C. Jain (Eds.): Advanced Techniques in Web Intelligence – 1,
   Springer, Sep-2010.
2. Ning Zhong: Web Intelligence Research and Development, Springer,2001.
3. Richi Nayak, Nikhi Ichalkaranje, Lakhmi C. Jain: Evolution of the Web in Artificial Intelligence
   Environments,Springer,2008.

ADVANCES IN COMPUTATIONAL SECURITY

Course Code	:19SCS413	**Credits**	: 04
L:P:T:S	: 3:0:0:1	**CIE Marks**	: 50
Exam Hours	: 03	**SEE Marks**	: 50

Course Objectives:

- To understand the basics of cryptography and need for data security.
- Know the different kinds of security threats in databases.
- Understand the different kinds of security threats in operating system.
- Learn to find cloud security tools and techniques.
- Learn about the models and standards for security.

Module-1

Introduction to Cryptography and Data Security:

Data Security ,Cryptographic Systems- Public-Key Systems, Digital Signatures , Information Theory -Entropy and Equivocation , Perfect Secrecy ,Unicity Distance ,Complexity Theory - Algorithm Complexity Problem. Complexity and NP-Completeness ,Ciphers Based on Computationally Hard Problems, Number Theory - Congruence and Modular Arithmetic, Computing Inverses, Computing in Galois Fields   **9 Hrs**

Module-2

Security In Databases:

Security requirements of database systems – Reliability and Integrity in databases – Redundancy – Recovery – Concurrency/ Consistency – Monitors – Sensitive Data – Types of disclosures – Inference-finding and confirming sql injection

8 Hrs

Module-3

Security in Operating System:

Security in the Design of Operating System-- Simplicity of Design - Layered Design - Kernelized Design- Reference Monitor- Correctness and Completeness- Secure Design Principles-Trusted Systems - Trusted System Functions- The Results of Trusted Systems Research, Rootkit -Phone Rootkit - Rootkit Evades Detection - Rootkit Operates Unchecked - Sony XCP Rootkit - TDSS Rootkits - Other Rootkits

9 Hrs

Module-4

Cloud Security:

Cloud Computing Concepts- Service Models - Deployment Models- Moving to the Cloud - Risk Analysis-Cloud Provider Assessment- Switching Cloud Providers- Cloud as a Security Control , Tools and Techniques Data Protection in the Cloud - Cloud Application Security - Logging and Incident Response- Cloud Identity Management -Security Assertion Markup Language- OAuth- OAuth for Authentication - Securing IaaS - Public IaaS Versus Private Network Security   **9 Hrs**

Module-5

Security Models And Standards:

Secure SDLC – Secure Application Testing – Security architecture models – Trusted Computing Base – Bell-LaPadula Confidentiality Model – Biba Integrity Model – Graham-Denning Access Control Model – Harrison-Ruzzo-Ulman Model – Secure Frameworks – COSO – CobiT – Compliances – PCI DSS – Security Standards - ISO 27000 family of standards – NIST.   **9 Hrs**

Text Books:
- Charles P. Pfleeger, Shari Lawrence Pfleeger, "Security in Computing", Fourth Edition, Pearson Education, 2007.
- Michael Whitman, Herbert J. Mattord, "Management of Information Security", Third Edition, Course Technology, 2010.
- Cryptography and data security, Dorothy Elizabeth Rob, ling Denning, Addison-Wesley.

Reference Books:
- William Stallings, "Cryptography and Network Security : Principles and Practices", Fifth Edition, Prentice Hall, 2010.
- Michael Howard, David LeBlanc, John Viega, "24 Deadly Sins of Software Security: Programming Flaws and How to Fix Them", First Edition, Mc GrawHill Osborne Media, 2009.
- Matt Bishop, "Computer Security: Art and Science", First Edition, Addison

Expected Course Outcome:
At the end of the course graduate will be able to:
- Understand the data threats and its countermeasures
- Understand data vulnerability and SQL injection
- Get the knowledge about the security services available for operating system
- Analyze the different tools and techniques for cloud security
- Gain the knowledge of security models and published standards

HIGH PERFORMANCE COMPUTING

Course Code	: 19SCS414	**Credits**	: 04
L:P:T:S	: 3:0:0:1	**CIE Marks**	: 50
Exam Hours	: 03	**SEE Marks**	: 50

Course Objectives:

- Understand the architecture of various high performance computers
- Understand the concepts of parallel processing and its contributions towards high-performance computing
- Understand the state of the art platforms used in cloud computing
- To design a powerful and cost-effective and efficient algorithms for a high performance computer system

Module-1

Cluster Computing

Introduction, Cluster Computer and its Architecture, Clusters Classifications, Components for Clusters, Cluster Middleware, Resource Management and Scheduling, Programming Environments and Tools, Cluster Applications, Setting up the Cluster, Security, Resource Sharing, Cluster Architectures, Detecting and Masking Faults, Recovering from Faults, Lightweight Messaging Systems, Lightweight Communication Mechanisms, Kernel-Level Lightweight Communications, User-Level Lightweight Communications ,Congestion Management.   **8 Hrs**

Module-2

Process Scheduling, Load Sharing and Balancing on Clusters

Components and Architecture of Job and Resource Management Systems, State-of-the-Art in RMS, Scheduling Parallel Jobs on Clusters, Rigid Jobs with Process Migration, Malleable Jobs with Dynamic Parallelism, Communication-Based Coscheduling, Batch Scheduling, Load Sharing in Cluster Computing, Integration of Load Sharing and Fault Tolerance, Scheduling Tasks to Machines Connected via Fast Networks, Scheduling Tasks to Arbitrary Processors Networks, Dynamic Load Balancing (DLB), Mapping and Scheduling, Static Scheduling and Dynamic Scheduling, Load Balancing Issues.   **9 Hrs**

Module-3

Grid Computing

Building blocks of the grid, Anatomy of the grid, Grid Architecture, Relationship with other technologies, Open grid service architecture, Legion grid Architecture, Condor and the grid, Autonomic computing and the grid, Virtualization Services for Data Grids, Peer to Peer Grids, Grid Programming Issues, Programming Support, Distributed Object Based Grid Computing Environments, Meta computing   **9 Hrs**

Module-4

Cloud Computing

Introduction, Building cloud computing environments, Parallel vs. distributed computing, Elements of parallel computing, Elements of distributed computing, Technologies for distributed computing, Virtualization, Characteristics of virtualized environments, Taxonomy of virtualization techniques, Virtualization and cloud computing, Pros and cons of virtualization, Cloud Computing Architecture, The cloud reference model, Types of clouds, Open challenges,

9 Hrs

Module-5

Cloud Computing

Concurrent Computing, Introducing parallelism for single-machine computation, Programming applications with threads, High-Throughput Computing, Task computing, Task-based application models, Data-Intensive Computing, Technologies for data-intensive computing, Cloud Platforms in Industry, Amazon web services, Google AppEngine, Microsoft Azure, CloudApplications, Energy efficiency in clouds, Management of clouds, Federated clouds/InterCloud, Third-party cloud services.   **9 Hrs**

Text Books:

- R. Buyya, High Performance Cluster Computing: Architectures and Systems, Volume 1, Pearson Education, 2008.
- Grid Computing: Making The Global Infrastructure a Reality: John Wiley & Sons
- R. Buyya, C. Vecchiola and S. T. Selvi, Mastering Cloud Computing Foundations and Applications Programming, Morgan Kaufmann, Elsevier, 2013.

Reference Books:

- A. Chakrabarti, Grid Computing Security, Springer, 2007.
- B. Sosinsky, Cloud Computing Bible, Wiley, 2011
- Ronald Krutz, Cloud Security, Wiley India.

Expected Course Outcome: At the end of the course graduate will be able to:

- Showcase a basic understanding of cluster computing
- be competent in process scheduling, load sharing and load balancing of clusters
- design and set up an HPC cluster
- demonstrate a basic knowledge of grid computing
- capable of writing algorithms that yield good performance on high-performance architectures
- reason about the computing power of a high performance computing system design

RESEARCH METHODOLOGY AND IPR

Course Code	: 19SCS42	Credits	: 02
L:T:P	: 2:0:0	CIE Marks	: 25
Exam Hours	: 03	SEE Marks	: 25

Course objectives:
- To give an overview of the research methodology and explain the technique of defining a research problem
- To explain functions of the literature review in research.
- To explain carrying out a literature search, its review, developing theoretical and conceptual frameworks and writing a review.
- To explain various research designs and their characteristics.
- To explain the details of sampling designs, and different methods of data collections.
- To explain the art of interpretation and the art of writing research reports.
- To explain various forms of the intellectual property, its relevance and business impact in the changing global business environment.
- To discuss leading International Instruments concerning Intellectual Property Rights.

Module-1	**Teaching Hours**
Research Methodology: Introduction, Meaning of Research, Objectives of Research, Motivation in Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Importance of Knowing How Research is Done, Research Process, Criteria of Good Research, and Problems Encountered by Researchers in India.	**05**

Bloom's Taxonomy Level	L_1 – Remembering, L_2 – Understanding.

Module-2	
Defining the Research Problem: Research Problem, Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem, An Illustration, **Reviewing the literature:** Place of the literature review in research, Bringing clarity and focus to your research problem, Improving research methodology, Broadening knowledge base in research area, Enabling contextual findings, How to review the literature, searching the existing literature, reviewing the selected literature, Developing a theoretical framework, Developing a conceptual framework, Writing about the literature reviewed.	**05**

Bloom's Taxonomy Level	L_1 – Remembering, L_2 – Understanding.

Module-3

Research Design: Meaning of Research Design, Need for Research Design, Features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs, Basic Principles of Experimental Designs, Important Experimental Designs.   **05**

Design of Sample Surveys: Introduction, Sample Design, Sampling and Non-sampling Errors, Sample Survey versus Census Survey, Types of Sampling Designs,

Bloom's Taxonomy Level	L_1 – Remembering, L_2 – Understanding.

Module-4

Data Collection: Experimental and Surveys, Collection of Primary Data, Collection of Secondary Data, Selection of Appropriate Method for Data Collection, Case Study Method,   **05**

Interpretation and Report Writing: Meaning of Interpretation, Technique of Interpretation, Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout

Interpretation and Report Writing (continued): of the Research Report, Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Reports.

Bloom's Taxonomy Level	L_1 – Remembering, L_2 – Understanding, L_3 – Applying, L_4 – Analysing.

Module-5

Intellectual Property: The Concept, Intellectual Property System in India, Development of TRIPS Complied Regime in India, Patents Act, 1970, Trade Mark Act, 1999,The Designs Act, 2000, The Geographical Indications of Goods (Registration and Protection) Act1999, Copyright Act,1957,The Protection of Plant Varieties and Farmers' Rights Act, 2001,The Semi-Conductor Integrated Circuits Layout Design Act, 2000, Trade Secrets, Utility Models, IPR and Biodiversity, The Convention on Biological Diversity (CBD) 1992, Competing Rationales for Protection of IPRs, Leading International Instruments Concerning IPR, World Intellectual Property Organization (WIPO),WIPO and WTO, Paris Convention for the Protection of Industrial Property, National Treatment, Right of Priority, Common Rules, Patents, Marks, Industrial Designs, Trade Names, Indications of Source, Unfair Competition, Patent Cooperation Treaty (PCT), Advantages of PCT Filing, Berne Convention for the Protection of Literary and Artistic Works, Basic Principles, Duration of Protection, Trade Related Aspects of Intellectual Property Rights(TRIPS) Agreement, Covered under TRIPS Agreement, Features of the Agreement, Protection of Intellectual Property under TRIPS, Copyright and Related Rights, Trademarks, Geographical indications, Industrial Designs, Patents, Patentable Subject Matter, Rights Conferred, Exceptions, Term of protection, Conditions on Patent Applicants, Process Patents, Other Use without Authorization of the Right Holder, Layout-Designs of Integrated Circuits, Protection of Undisclosed Information, Enforcement of Intellectual Property Rights, UNSECO   **05**

Bloom's Taxonomy Level	L_1 – Remembering, L_2 – Understanding, L_3 – Applying, L_4 – Analyzing.

Course outcomes:

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

- Discuss research methodology and the technique of defining a research problem
- Explain the functions of the literature review in research, carrying out a literature search, developing theoretical and conceptual frameworks and writing a review.
- Explain various research designs and their characteristics.
- Explain the art of interpretation and the art of writing research reports

Textbooks

1	Research Methodology: Methods and Techniques	C.R. Kothari, Gaurav Garg	New Age International	4th Edition, 2018
2	ResearchMethodologyastep-by-stepguideforbeginners. (For the topic Reviewing the literature under module 2)	Ranjit Kumar	SAGE PublicationsLtd	3rd Edition, 2011
3	Study Material (For the topic Intellectual Property under module 5)		Professional Programme Intellectual Property Rights, Law and Practice, The Institute of Company Secretaries of India, Statutory Body Under an Act of Parliament, September 2013	

Reference Books

1	Research Methods: the concise knowledge base	Trochim	Atomic Dog Publishing	2005
2	Conducting Research Literature Reviews: From the Internet to Paper	Fink A	Sage Publications	2009

INTERNSHIP

Course Code :19SCS43   **Credits**   : 02
L:P:T:S   :0:2:0:0   **CIE Marks** : 50
Exam Hours :3 hrs.   **SEE Marks** : 50

Course Objectives:

- To develop the skills to work in the industry.
- To enhance practical knowledge about the subjects learned during their course of study.
- To develop their skills to enhance their practical knowledge with current trends and technology.
- To develop their skills in team work.
- To develop their skills to match with industry needs.

Internship Guidelines:

1.All the student shall have to undergo the mandatory internship during their 3rd/4th semester .

2.The internship can be carried out in any industry related to their discipline through NHCE or on their own effort.

3.Each student will be allocated to a internal faculty guide and a reviewer.

4.Student shall report the progress of the internship to the guide in the regular interval to seek his/her advice.

5.The internship shall be completed within the specified time.

6.After the completion of internship, student should submit a report with attendance certificate to the HOD with the approval of both internal and external guide.

7.The student should present his/her work in the PPT format to his/her guide and reviwer which will be considered for CIE. There should be minimum 10 -15 slides and duration for presentation will be 15-20 minutes for each review.

8.There will be 3 reviews and CIE marks will be allocated based on the review.

9.Hard copy of the report should be submitted during the final presentation.

10.SEE will be conducted for internship.

Expected Course Outcome: At the end of the course graduate will be able to:

1.Develop or improve his/her skill to work in industry.

2.Develop the skills required for effective team work.

3.Identify the industry needs and apply their knowledge to solve problem using recent trends and technology.

4.Help them to do their final year project with the practical knowledge.

SEMINAR

Course Code	:19SCS44	**Credits**	: 02
L:P:T:S	:0:0:0:2	**CIE Marks**	: 50
Exam Hours	:3 hrs.	**SEE Marks**	: 50

Course Objectives:

6) To develop the skills required to identify the recent topic/technology.
7) To identify, gather, organize, analyze and interpret the data relating to a particular concept/technology.
8) To demonstrate the conceptual understanding of the topic chosen for presentation.
9) To develop the skills required for effective presentation.
10) To develop and apply the skills required for justifying the methodology of a chosen topic.

Seminar Guidelines:

1. The student should choose topic in recent trend /technology from IEEE or renowned journal.

2. Each student will be allocated to a internal faculty guide and reviewer.

3. Student should get approval from the guide for his/her chosen topic within the stipulated time.

4. The student should present his/her work in the PPT format to his/her guide and reviewer which will be considered for CIE. There should be minimum 10 -15 slides and duration for presentation will be 15-20 minutes .

5. Hard copy of the report should be submitted during the final presentation.

6. CIE marks will be considered on the basis of the topic chosen, knowledge about the topic, communication skills, and levels of confidence, time management, questions and answer session.

7. SEE will be conducted for technical seminar.

Expected Course Outcome: At the end of the course graduate will be able to:

1. Identify, gather, organize, analyze and interpret the data relating to a particular concept/technology

2. Develop or improve his/her skill for understanding the concept.

2. Develop the skills required for effective presentation

3. Develop and apply the skills required to justify the methodology of a chosen topic.

PROJECT PHASE-2

Course Code : 19SCS45   **Credits**   : 12
L:P:T:S   :0:12:0:0   **CIE Marks** : 50
Exam Hours : 03   **SEE Marks** : 50

Course Outcomes: At the end of the course the student will be able to

- Solve/work on the real world/ Practical/Theoretical problems involving research issues in computer science and engineering.
- Able to summarize the work by proper Software Engineering Documents after evaluating the testing plans.
- Practice presentations, Communications skills.
- Able to learn and develop new concepts in multidisciplinary area
- Use appropriate programming languages/software tools/ Hardware technologies.
- Apply algorithmic strategies while solving problems.

This course will be conducted as a single student under the direct supervision of a faculty member of academic staff. The specific project topic undertaken will reflect the common interests and expertise of the student and supervisor. Each student will be required to:

1) Undertake the detailed technical work in the chosen research area.
2) Design the Architecture of the System
3) Produce progress reports or maintain a professional journal to establish work completed, and
   to schedule additional work within the time frame specified for the project.
4) Prepare an interim report describing the work undertaken and results obtained so far
5) Demonstrate the Complete working of the Project with results of all modules.
6) Publish a research paper in international conference/journal.