Semester V

Sl. No.	Category	Code No.	Course Title	Hours per week			Total Contact Hrs/Week	Credit
				L	T	P		
1	Programme core course-16	CSPC501	Introduction to e-Governance	3	0	0	3	3
2	Programme core course-17	CSPC502	Internet of Things (IoT)	2	0	0	2	2
3	Programme core course-18	CSPC503	Web Technologies	2	0	0	2	2
4	Programme core course-19	CSPC504	Networking Lab	0	0	2	2	1
5	Programme core course-20	CSPC505	Web Technology Lab	0	0	2	2	1
6	Programme elective course-2	CSPE506	Distributed Systems / Cloud Computing / Data Science	3	0	0	3	3
7	Programme elective course-3	CSPE507	Mobile Computing / Software Testing / FOSS	3	0	0	3	3
8	Open elective course-1	**OE508	To be offered by other departments	3	0	0	3	3
9	Summer Internship-II (6 weeks) after IV Semester	CSSI509	Summer Internship-II	0	0	0	0	3
10	Major Project	CSPR510	Project part-I	0	0	2	2	1
			Total				**22**	**22**

Introduction to e-Governance

Course Code	:	CSPC 501
Course Title	:	Introduction to e-Governance
Number of Credits	:	3 (L: 3, T: 0, P: 0)
Prerequisites	:	-----
Course Category	:	Programme core course

Course outcomes:

1. Exposure to introductory ideas and practices of e-Governance initiatives in India
2. Understand and escalate the essence of e-Governance.
3. Articulate the policy and social issues facing agencies in implementing e-government initiatives.
4. Apply business-case and government IT-management concepts to e-government strategies.
5. Develop skills to evaluate government websites and e-services for best practice, principles and standards.

Detailed Course Contents

Module- 1:
Number of Class hours: 6

Learning Outcomes of the module:

1. Understand the basic concepts of ICT for development activities (K3)
2. Design and implement various e-governance projects using technologies and business models(K4)
3. Expose to the e-governance lifecycle(K3)

Detailed content of the module:

3.1 Exposure to emerging trends in ICT for development
3.2 Understanding of design and implementation of e-governance projects
3.3 E-governance lifecycle.

Module- 2:
Number of Class hours: 6

Learning Outcomes of the module:

1. Recognize the elements of government process for transparency (K3)
2. Analyse the e-governance plans of India(K5)
3. Implement the SMART government initiatives (K4)
4. Investigate the main components to develop effective and efficient e-government projects.(K3)

Detailed content of the module:

2.1 Need for Government Process Re-engineering (GPR);

2.2 National e-Governance Plan (NeGP) for India;
2.3 SMART Governments & Thumb Rules

Module 3:

No. of Class hours: 6

Learning Outcomes of the module:

1. Analyze and compare between development models of e-government services. (K3)
2. Distinguish the benefits of implementing e-government services. (K4)
3. Evaluate and compare between the technologies and mechanisms to develop e-government services. (K5)
4. Recognize the challenges that may hinder the development of e-government services. (K3)

Detailed content of the module:

3.1 Architecture and models of e-Governance, including Public Private Partnership (PPP);
3.2 Need for Innovation and Change Management in e-Governance;
3.3 Critical Success Factors; Major issue including corruption, resistance for change
3.4 E-Security and Cyber laws

Module 4

No. of Class hours: 6

Learning Outcomes of the module:

1. Categorize the initiatives of the government to implement e-government services. (K4)
2. Frame solutions to various challenges of e-government projects. (K5)
3. Find out the best practices of e-governance projects(K5)

Detailed content of the module:

4.1 Focusing on Indian initiatives and their impact on citizens;
4.2 Sharing of case studies to highlight best practices in managing e-Governance projects in Indian context.

Module 5

No. of Class hours: 6

Learning Outcomes of the module:

1. Identify and analyse the current practices of the project of e-government services through a case study of India (K5)
2. Recognise the main challenges of e-government and the possible mechanisms and technologies to make more developments. (K3)
3. Develop mini projects on e-governance projects. (K5)

Detailed content of the module:

5.1 Analyse e-governance sites (CSC, eSeva, etc) as part of Tutorials.

5.3. Analyse e-governance sites (Post Office, Passport Seva Kendra, etc) as part of Tutorials.
5.2 Mini Projects by students in groups-primarily evaluation of various e-governance projects.

Reference Books:

1. Managing Transformation –Objectives to Outcomes. J Satyanarayana, Prentice Hall India
2. The State, IT and Development. Kenneth Kenniston, RK Bagga and Rohit Raj Mathur, Sage Publications India Pvt Ltd.
3. e-Government -The Science of the Possible. J Satyanarayana, Prentice Hall, India
4.http://www.csi-sigegov.org/publications.php
5. https://negd.gov.in
6. https://www.nisg.org/case-studies-on-e-governance-in-india

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Internet of Things (IoT)

Course Code	:	CSPC 502
Course Title	:	Internet of Things
Number of Credits	:	2 (L: 2, T: 0, P: 0)
Prerequisites	:	-----
Course Category	:	PC

Course Outcome:
1. Understand the concepts of Internet of Things (K3)
2. Analyze basic protocols in wireless sensor network (K4)
3. Design IoT applications in different domain and be able to analyse their performance(K5)
4. Implement basic IoT applications on embedded platform(K5)

Module 1:
No of class hours: 04
Learning Outcomes of the module:
1. Illustrate what IoT is and how it works today (K3)
2. Recognise the factors that contributed to the emergence of IoT (K4)
3. Design and program IoT devices (K4)

Detailed content of the module:

1.1 Introduction to IoT;
1.2 Sensing;
1.3 Actuation

Module 2:
No of class hours: 07

Learning Outcomes of the module:
1. Analyse the basics of IoT networking (K4)
2. Distinguish and implement various communication protocols(K4)
3. Understand the various types of sensor network (K3)

Detailed content of the module:

2.1 Basics of IoT Networking,
2.2 Communication Protocols,
2.3 Sensor networks

Module 3
No of class hours: 7

Learning Outcomes of the module:
1. Implement various programming on the Arduino (K4)
2. Differentiate between the levels of the IoT stack (K3)
3. Familiarise with the key technologies and protocols employed at each layer of the stack(K3)

Detailed content of the module:

3.1 Introduction to Arduino programming
3.2 Integration of Sensors/Actuators to Arduino

Module 4
No of class hours: 7

Learning Outcomes of the module:
1. Design and implement the concepts of IoT with Raspberry Pi (K5)
2. Perform data analytics and draw conclusions. (K4)
3. Perform case study of the various uses of IoT in various sectors of the society(K4)

Detailed content of the module:

4.1 Implementation of IoT with Raspberry Pi;
4.2 Data Handling Analytics
4.3 Case Studies: Agriculture, Healthcare, Activity Monitoring

Module 5
No of class hours: 6

Learning Outcomes of the module:
1. Understand the ethical issues in IoT (K3)
2. Analyze the implementational environment and identify probable ethical solution to address any issue. (K4)

Detailed content of the module:

Ethics in IoT:

5.1 Characterizing the IoT, Privacy, Control – Disrupting Control, Crowd sourcing;
5.2 Environment – Physical thing, Electronics, Internet service;
5.3 Solutions – The IoT as a part of the solution, cautious optimism, the open IoT definition.

Reference Books:

1. https://nptel.ac.in/noc/individual_course.php?id=noc17-cs22
2. "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj
   and Anupama C. Raman (CRC Press)
3. Internet of Things by Dr. Jeeva Jose, Khanna Publishing House (Edition 2017)
4. "Internet of Things: A Hands-on Approach", by ArshdeepBahga and Vijay Madisetti (Universities Press)
5. Internet of Things: Architecture and Design Principles, Raj Kamal, McGraw Hill
6. Designing the Internet of Things – Adrian McEwen & Hakim Cassimality Wiley India, ISBN: 9788126556861

Web Technologies

Course Code	:	CSPC 503
Course Title	:	Web Technologies
Number of Credits	:	2 (L: 2, T: 0, P: 0)
Prerequisites	:	-----
Course Category	:	Programme core course

Course Outcome:
1. Realize the important concepts of website development tools and languages (K4)
2. Design and plan website developments. (K5)
3. Analyse the performances of website design. (K4)
4. Comprehend the database activities of dynamic websites. (k3)

Module 1:
No of Class Hours: 5
To provide basic skills on tools, languages and technologies related to website development. Learnings from this course may be used in the Mini Project and summer internship. Student will be able to develop/build a functional website with full features.

Learning Outcomes of the Module:
1. Realize the basic concepts of tools, languages and technologies related to website development. (K3)
2. Implement webservers for various operations. (K4)
3. Planning and designing of websites and for efficient navigations. (K4)

Detailed content of the module:

1.1 Introduction to WWW Protocols and programs, secure connections, application and development tools, the web browser
1.2 What is server, setting up UNIX and LINUX web servers
1.3 Logging users
1.4 Dynamic IP Web Design: Web site design principles, planning the site and navigation

Module 2:
No of Class Hours: 5

Learning Outcomes of the Module:
1. Analyse web system architectures and their performances. (K5)
2. Demonstrate the utilities of web proxies and load balancers (K4)
3. Comprehend web application architectures. (K3)

Detailed content of the module:

2.1 Web Systems Architecture of Web based systems- client/server (2-tier) architecture,
2.2 3-Tier architecture

2.3 Building blocks of fast and scalable data access Concepts - Caches-Proxies- Indexes-Load Balancers- Queues
2.4 Web Application architecture (WAA)

Module 3:
No of Class Hours: 5
Learning Outcomes of the Module:
1. Develop client-side scripting for multiple functionalities (K5)
2. Implement advanced and web browsers environment. (K4)
3. Create project plans for developing web-based applications (K5)

Detailed content of the module:

3.1Javascript Client-side scripting, what is Javascript, simple Javascript, variables
3.2 Functions, conditions, loops and repetition
3.3 Advance scripting Javascript and objects
3.4 Javascript own objects, DOM and web browser environments
3.5 Forms and validations DHTML: Combining HTML
3.6 CSS and Javascript, events and buttons, controlling your browser

Module 4:
No of Class Hours: 5

Learning Outcomes of the Module:
1. Develop Ajax based web applications(K4)
2. Implement PHP database programs for web-based applications(K4)
3. Analyse various database operations in the advanced PHP databases (K5)

Detailed content of the module:

4.1 Ajax: Introduction advantages & disadvantages
4.2 Ajax based web application, alternatives of ajax XML, XSL and XSLT
4.3 Introduction to XML, uses of XML, simple XML, XML key components
4.4 DTD and Schemas, XML with application, XSL and XSLT. Introduction to Web Services

Module 5:
No of Class Hours: 5

Learning Outcomes of the Module:
1. Develop Ajax based web applications(K4)
2. Implement PHP database programs for web-based applications(K4)
3. Analyse various database operations in the advanced PHP databases (K5)

Detailed content of the module:

5.1 PHP server-side scripting, Arrays, function and forms

5.2 Advance PHP Databases: Basic command with PHP examples, Connection to server, creating database
5.3 Selecting a database, listing database, listing table names creating a table, inserting data
5.4 Altering tables, queries, deleting database, deleting data and tables, PHP myadmin and database bugs.

Reference Books:

1. "Web Technologies--A Computer Science Perspective", Jeffrey C. Jackson,
2. "Internet & World Wide Web How to Program", Deitel, Deitel, Goldberg, Pearson Education
3. "Web programming- Building Internet Application", Chris Bales
4. Web Applications: Concepts and Real-World Design, Knuckles.

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Networking Lab

Course Code	:	CSPC 504
Course Title	:	Networking Lab
Number of Credits	:	1 (L: 0, T: 0, P: 2)
Prerequisites	:	-----
Course Category	:	Programme core course

Course outcomes:

1. Understanding of computer networks, issues, limitations, options available. (k3)
2. Able to configure basic small LAN and connect computers to it. (K4)
3. Design various types of networks and compare their performances. (K5)
4. Analyse the performances of various network protocols.(K5)

Course Content:

S.No.	Topics for Practice
1.	Showing various types of networking cables and connectors, identifying them clearly.
2.	Looking at specifications of cables and connectors of various companies on Internet, find out differences.
3.	Making patch cords using different types of cables and connectors - crimping, splicing, etc
4.	Demonstration of different type of cable testers, using them for testing patch cords prepared by the students in Lab and standard cables prepared by professionals
5.	Configuring computing devices (PC, Laptop, Mobile, etc) for network, exploring different options and their impact – IP address, gateway, DNS, security options, etc
6.	Showing various networking devices – NICs, Hub, Switch, Router, WiFi access point, etc.
7.	Looking at specifications of various networking devices various companies on

	Internet, find out differences.
8.	Network simulation tool (e.g. Cisco Packet Tracer)
9.	Setting up a small wired LAN in the Lab
10.	Setting up a small wireless LAN in the Lab

Reference Books:
1. Cisco press books on CCNA
2. User manual of networking devices available in the lab
3. Wiki pages on networking devices

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Web Technology Lab

Course Code	:	CSPC 505
Course Title	:	Web Technology Lab
Number of Credits	:	1 (L: 0, T: 0, P: 2)
Prerequisites	:	-----
Course Category	:	Programme core course

Course outcomes: Student will be able to program web applications using and will be able to do the following:
1. Use LAMP Stack for web applications and Tomcat Server for Servlets and JSPs (K6)
3. Write simple applications with Technologies like HTML, Javascript, AJAX, PHP, Servlets and JSPs (k4)
4. Connect to Database and get results (k4)
5. Parse XML files using Java (DOM and SAX parsers) (k4)

Course Content:

S.No.	Topics for Practice
1.	Coding Server Client Programs
2.	Developing Web Application using HTML, JavaScript
3.	Developing Advanced Web Application Programs using CSS
4.	Practicing PHP : Basics
5.	Practicing PHP : Web Application Development
6.	Practicing PHP: MySql - tiered Applications
7.	Developing a fully functional Web Service Application using all the technologies learned in this course.
8.	Write applications using AJAX, JSP

9.	Develop applications using servlets
10.	Perform database accessibility with the websites

Reference Books:
1. “Web Technologies--A Computer Science Perspective”, Jeffrey C. Jackson.
2. “Internet & World Wide Web How to Program”, Deitel, Deitel, Goldberg, Pearson Education
3. “Web programming- Building Internet Application”, Chris Bales
4. Web Applications: Concepts and Real-World Design, Knuckles

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Distributed Systems

Course Code	:	CSPE 506-1
Course Title	:	Distributed Systems
Number of Credits	:	3 (L: 3, T: 0, P: 0)
Prerequisites	:	Concept of Operating Systems, Computer Network, JAVA
Course Category	:	Programme Elective Course

Course Outcomes:

- To learn the principles, architectures, algorithms and programming models used in distributed systems.
- To examine how existing systems have applied the concepts of distributed systems in designing large systems.
- To design sample distributed systems.

Detailed Course Contents:

Module-1:

Class Hours: 3

Characterization of Distributed Systems: Introduction, Examples of Distributed systems, Resource sharing and web, challenges.
System Models: Introduction, Architectural and Fundamental models.

Module-2:

Class Hours: 6

Time and Global States: Introduction, Clocks, Events and Process states, Synchronizing physical clocks, Logical time and Logical clocks, Global states, Distributed Debugging.

Coordination and Agreement: Introduction, Distributed mutual exclusion, Elections, Multicast Communication, Consensus and Related problems.

Module-3:

Class Hours: 7

Inter Process Communication: Introduction, The API for the internet protocols, External Data Representation and Marshalling, Client-Server Communication, Group Communication, Case Study: IPC in UNIX.

Distributed Objects and Remote Invocation: Introduction, Communication between Distributed Objects, Remote Procedure Call, Events and Notifications, Case study-Java RMI.

Module-4:

Class Hours: 7

Distributed File Systems: Introduction, File service Architecture, Case Study1: Sun Network File System, Case Study 2: The Andrew File System.

Name Services: Introduction, Name Services and the Domain Name System, Directory Services, Case study of the Global Name Service.

Distributed Shared Memory: Introduction Design and Implementation issues, Sequential consistency and Ivy case study, Release consistency and Munin case study, other consistency models.

Module-5:

Class Hours: 7

Transactions and Concurrency Control: Introduction, Transactions, Nested Transactions, Locks, Optimistic concurrency control, Timestamp ordering, Comparison of methods for concurrency control.

Distributed Transactions: Introduction, Flat and Nested Distributed Transactions, Atomic commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery.

REFERENCES:

1. Distributed Systems : Principles and paradigms by Andrew S. Tanenbaum, Maarten Van Steen, Second Edition, Published by PHI.
2. Distributed Systems : An Algorithm Approach, Sukumar Ghosh, Chapman & Hall/CRC, Published by Taylor &Fransis Group, 2007.
3. Distributed Systems : Concepts and Design by George Coulouris, Jean Dollimore, Tim Kindberg, Gordon Blair, Fifth Edition, Published by Pearson

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Cloud Computing

Course Code	CSPE 506-2
Course Title	Cloud Computing
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	--
Course Category	Programme Elective Course

Course Outcomes: - After the completion of the course, the students will be able to

1. Realize the need of cloud computing, cloud essentials, benefits, challenges, limitations, usage and applications. (K4)
2. Choose appropriate cloud models, cloud application architecture, cloud computing architecture and various infrastructure to model real world-problems (K5)
3. Compare the various cloud services and determine the security issues for the users to place the very sensitive data housed on-site (K3)
4. Illustrate the concepts of virtualization, virtual cluster and different approaches to cloud computing like Aneka, Autonomic computing engine (K3)

Module- 1: Introduction to Cloud computing
Number of Class hours:6

Learning Outcomes:

1. Demonstrate the conceptsof cloud and their evolutions. (K3)
2. Investigate various cloud models and architecture. (K4)
3. Analyse the various scaling of cloud infrastructure (K3)

Detailed content of the module:
1.1 Evolution of cloud, Essentials, Cloud Computing definition
1.2 Benefits and Challenges, Limitations, Usage and Applications
1.3 Business Models around Cloud Computing, Characteristics, Cloud Adoption.
1.4 Cloud models: Introduction, Collaboration to cloud, Cloud Models
1.5 Cloud Applications and Architecture, Cloud Computing Architecture
1.6 Cloud Infrastructure Models
1.7 Cloud Infrastructure Self Service, Scaling a cloud infrastructure.

Module- 2: Cloud Services
Number of class hours: 6

Learning Outcomes:

1. Exemplify the various services in respect to storage and database. (K3)
2. Examine the various management scheme and security of services of the cloud. (K4)
3. Implement the testing of cloud services and the infrastructure. (K5)

Detailed content of the module:

2.1 Introduction to Services, Storage as a Service, Database as a Service
2.2 Information as Service, Process as a Service, Application as a Service
2.3 Management/Governance as Service, Platform as a Service, Security as a Service
2.4 Testing as Service, Integration as Service, Infrastructure as Service

Module- 3: Software and Service
Number of class hours: 6

Learning Outcomes:
1. Identify the aspects of device integration and the providers (K3)
2. Exemplify the concepts of various cloud file structures. (K3)
3. Differentiate the various features of Hadoop framework (K4)

Detailed content of the module:
3.1 Introduction, Mobile Device Integration
3.2 Providers, Microsoft Online Intuit Quick base
3.3 Cast Iron Cloud, Bungee Connect
3.4 Introduction to Map Reduce, Google File System,
3.5 Hadoop framework, Hadoop Distributed File System

Module- 4: Visualization for Cloud
Number of class hours: 6

Learning Outcomes:
1. Identify the notions of virtualization architecture along with their pros and cons.(K3)
2. Differentiate the different types of virtualization in clouds. (K4)
3. Illustrate virtual desktop infrastructure (K3)

Detailed content of the module:
4.1 Introduction, Pros and Cons of Virtualization
4.2 Virtualization Architecture, Virtualization Machine
4.3 Virtualization in Clusters/Grid Context, Virtual Network
4.4 Types of Virtualization, Virtual Machine Monitor
4.5 Virtual Desktop Infrastructure.

Module- 5: Visualization for Cloud
Number of class hours: 6

Learning Outcomes:
1. Identify the types of clouds and their functionalities(K3)
2. Integrate private and public clouds (K4)
3. Analyse comet cloud architecture and their applications (K4)

Detailed content of the module:

5.1 Cloud Computing: Introduction, Types of clouds, Cloud Comparing Approaches
5.2 Aneka Integration of private and public cloud, Aneka Cloud Platform
5.3 Introduction, Resource Provisioning Service, Aneka Hybrid Cloud Implementation
5.4 Comet Cloud Architecture, Autonomic Behaviour, Comet Cloud
5.5 Overview of Comet Cloud Based Applications, Implementation.

Reference Books: -

1. Cloud Computing, M.N RAO, PHI Learning Private Limited, ISBN: 978-81-203-5073-1
2. Cloud Computing – A practical approach for learning and implementation Pearson A. Srinivasan, J. Suresh
3. Cloud Computing A hands-on-Approach, universities Press ArshdeepBahga and Vijay Madisetti
4. Cloud Computing – Concepts, Technology and Architecture Pearson Thomas Erl

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Data Science

Course Code	:	CSPE 506-3
Course Title	:	Data Science
Number of Credits	:	3 (L: 3, T: 0, P: 0)
Prerequisites	:	-----
Course Category	:	Programme Elective Course

Course Outcome:

1. Explore the data mining concepts to develop programming abilities (K4)
2. Demonstrate proficiency with statistical analysis of data. (K5)
3. Build and access data-based models (K6)
4. Execute statistical analyses with professional statistical software. (K4)

Module 1
No. class hours: 6
Learning Outcomes of the Module:

1. Recognize the data mining concepts and distinguish the various systems of data mining(K3)
2. Integrate data mining systems with data warehouse system(K5)
3. Execute innumerable pre-processing of data(K5)
4. Apply data cleaning and discretization for multiple processing(K4)

Detailed contents of the Module:

1.1 Introduction Motivation, Importance, Definitions
1.2 Kind of Data, Data Mining Functionalities, Kinds of Patterns, Classification of Data Mining Systems

1.3 Data Mining Task Primitives, Integration of a Data Mining System with A Database or Data Warehouse System
1.4 Major Issues in Data Mining, Types of Data Sets and Attribute Values
1.5 Basic Statistical Descriptions of Data, Data Visualization, Measuring Data Similarity.
1.5 PREPROCESSING: Data Quality, Major Tasks in Data Pre-processing, Data Reduction
1.6 Data Transformation and Data Discretization, Data Cleaning and Data Integration.

Module 2
No. Class hours: 6
Learning Outcomes of the Module:
1. Realize on-line analytical processing of data warehouse concepts (K3)
2. Design various data warehouse for effective processing (K5)
3. Implement data computation(K5)

Detailed contents of the Module:
2.1 Data Warehousing and on-line Analytical Processing Data Warehouse basic concepts
2.2 Data Warehouse Modeling - Data Cube and OLAP
2.3 Data Warehouse Design and Usage
2.4 Data Warehouse Implementation
2.5 Data Generalization by Attribute-Oriented Induction, Data Cube Computation.

Module 3
No. Class hours:6
Learning Outcomes of the Module:
1. Apply patterns for mining of data (K5)
2. Implement various association and correlation on various itemset (K4)
3. Recognize association rules for frequent patterns (K3)

Detailed contents of the Module:
3.1 Patterns, Associations and Correlations Mining Frequent Patterns
3.2 Associations and Correlations: Basic Concepts, Efficient and Scalable Frequent Itemset
3.3 Mining Methods, Pattern Evaluation Methods, Applications of frequent pattern and associations.
3.4 Frequent Patterns and Association Mining: A Road Map, Mining Various Kinds of Association Rules
3.5 Constraint-Based Frequent Pattern Mining, Extended Applications of Frequent Patterns.

Module 4
No. Class hours: 6
Learning Outcomes of the Module:
1. Analyse methodologies to improve classification accuracy (K5)
2. Recognize web mining algorithms (k3)
3. Implement various clustering and partitioning techniques(K4)

Detailed contents of the Module:
4.1 Classification Basic Concepts, Decision Tree Induction, Bayesian Classification Methods

4.2 Rule-Based Classification, Model Evaluation and Selection
4.4 Techniques to Improve Classification Accuracy: Ensemble Methods, Handling Different Kinds of Cases in Classification
4.5 Classification by Neural Networks, Support Vector Machines, Pattern-Based Classification, Lazy Learners (or Learning from Your Neighbors).

Module 5
No. Class hours: 6
Learning Outcomes of the Module:
1. Analyse clustering structures and partitioning methods (K5)
2. Recognize outlier detection techniques(k3)
3. Implement web mining and HITS algorithms(K4)

Detailed contents of the Module:
5.1 Cluster Analysis Basic Concepts of Cluster Analysis, Clustering Structures, Major Clustering Approaches, Partitioning Methods
5.2 Hierarchical Methods, Density-Based Methods, Model-Based Clustering, Why outlier analysis,
5.3 Identifying and handling of outliers, Outlier Detection Techniques.
5.4 WEB MINING: Basic concepts of web mining, different types of web mining,
5.5 PAGE RANK Algorithm, HITS Algorithm

Reference Books:
1. Jiawei Han, Micheline Kamber, Jian Pei, Data Mining: Concepts and Techniques, Elsevier
2. Margaret H Dunham, Data Mining Introductory and Advanced Topics, Pearson Education
3. Amitesh Sinha, Data Warehousing, Thomson Learning, India.
4. Xingdong Wu, Vipin Kumar, the Top Ten Algorithms in Data Mining, CRC Press, UK.
Course outcomes:

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Mobile Computing

Course Code	:	CSPE 507-1
Course Title	:	Mobile Computing
Number of Credits	:	3 (L: 3, T: 0, P: 0)
Prerequisites	:	-----
Course Category	:	Programme Elective Course

Course Outcome:
1. Recognize the basic concepts of wireless communications. (K3)
2. Analyse security, energy efficiency, mobility, scalability in wireless communications. (K4)
3. Demonstrate basic skills for cellular network designs. (K3)
4. Develop and deploy basic mobile applications(K6)

Module 1:
No. Class hours: 6
Learning Outcomes of the Module:
1. Identify the elementary perceptions of mobile applications. (K3)
2. Apply Android development tools for application development (K4)
3. Create Android Virtual devices (K4)

Detailed contents of the Module:
1.1 A brief history of Mobile, Types of mobile phone generations
1.2 The Mobile Ecosystem, Types of Mobile Applications
1.3 Mobile Information Architecture Android Versions, Features of Android
1.4 Android Architecture, Installing Android SDK Tools, Configuring Android in Eclipse IDE
1.5 Android Development Tools (ADT), Creating Android Virtual Devices (AVD)

Module 2:
No. Class hours: 6
Learning Outcomes of the Module:
1. Create android application programs (K4)
2. Recognize numerous android application components (K3)
3. Explore intent types and linking activities(K4)

Detailed contents of the Module:
2.1 Creating first android application, Anatomy of android application
2.2 Deploying Android app on USB connected Android device
2.3 Android application components, Activity life cycle, understanding activities
2.4 Exploring Intent objects, Intent Types
2.5 Linking activities using intents

Module 3:
No. Class hours: 6
Learning Outcomes of the Module:
1. Establish interactions between fragments (K3)
2. Implement various types of view (K4)
3. Device multiple UI event handling mechanisms (K4)

Detailed contents of the Module:
3.1 Fragments life cycle, Interaction between fragments, Understanding the components of a screen (Layouts)
3.2 Adapting to display orientation, Action Bar
3.3 Views (UI Widgets)-Button, Toast, ToggleButton, CheckBox, RadioButton
3.4 Spinner, WebView, EditText, DatePicker, TimePicker, ListView, ProgressBar
3.5 Analog and Digital clock, Handling UI events,
3.6 List fragment, Dialog fragment

Module 4:
No. Class hours: 6
Learning Outcomes of the Module:
1. Implement menu options for popups, images and media players(K4)
2. Device alarm managers, SMS, Email and media players(K4)
3. Create telephony manager and storing of data persistently (K5)

Detailed contents of the Module:
4.1 Menus-Option, Context, Popup, Images-ImageView, ImageSwitcher, AlertDialog
4.2 Alarm manager, SMS, E-mail, Media Player
4.3 Using camera, recording video
4.4 Handling Telephony Manager, Storing the data persistently-Data Storage Options: preferences

Module 5:
No. Class hours: 6
Learning Outcomes of the Module:
1. Demonstrate storage and content provider through various data structures(K4)
2. Device SQLite database operations (K4)
3. Create connectivity in SQLite and deploy APK files(K5)

Detailed contents of the Module:
5.1 Internal Storage, External Storage, Content Provider
5.2 The SQLite database, Connecting with SQLite database and operations-Insert, Delete, Update, Fetch,
5.3 Publishing android applications, Deploying APK files

Reference Books:
1. Wei-Meng Lee, Beginning Android 4 Application Development, Wiley Publishing, Inc.
2. Pradeep Kothari, "Android Application Development Black Book", DreamTech Press
3. James C. Sheusi, "Android Application Development for Java Programmers", Cengage Learning
4. Mark L Murphy, "Beginning Android", Wiley India Pvt Ltd
5. Sayed Y Hashimi and Satya Komatineni(2009), "Pro Android", Wiley India Pvt Ltd
6. Reto Meier, Professional Android 4 Application Development, Wiley India Pvt Ltd

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Software Testing

Course Code	:	CSPE 507-2
Course Title	:	Software Testing
Number of Credits	:	3 (L: 3, T: 0, P: 0)
Prerequisites	:	-----
Course Category	:	Programme Elective Course

Course Outcome:

1. Inculcate essential software testing knowledge and skills, required to reasonably test a system under development in a systematic manner. (K4)
2. Analyse software functional and non-functional testing (K3)
3. Devise methods to execute test cases of different types for a sample system(K4)

Module 1:

No. Class hours: 6

Learning Outcomes of the Module:

1. Demonstrate fundamental concepts for software testing (K3)
2. Analyse software testing life cycle (K4)
3. Illustrate various types of tests performed on software for quality measurement(K3)

Detailed contents of the Module:

1.1 Basics Introduction to Software Quality basics: Verification and validation
1.2 Quality perspectives, Testing terminology, Software Testing Life Cycle (STLC)
1.3 “V” model of Testing, QA process
1.4 Cost of testing, types of tests,

Module 2

No. Class hours: 6

Learning Outcomes of the Module:

1. Analyse test cases and draw conclusions to improve software quality(K4)
2. Determine test case scenarios for software requirements (K5)
3. Establish user acceptance tests for multiple requirements(K3)

Detailed contents of the Module:

2.1 Writing test cases, Functional Testing
2.2 Non-functional testing, (Performance testing)
2.3 UI testing. Preparing test data, Writing Unit test
2.4 Integration test and User Acceptance Tests
2.5 Preparing test scenarios from Software requirements

Module 3
No. Class hours: 6
Learning Outcomes of the Module:
1. Perform test executions of the software(K3)
2. Establish test planning and strategies for quality improvement(K5)
3. Determine various test coverage and reporting(K4)

Detailed contents of the Module:
3.1 Test Execution and Management test execution
3.2 Test Oracles, test planning
3.3 Test strategy including when to stop testing
3.4 Test-coverage - Traceability matrix, JIRA, Bugzilla and other bug tracking tools
3.5 Test data mining, test reporting.

Module 4
No. Class hours: 6
Learning Outcomes of the Module:
1. Perform performance test cases for different types of test (load, stress, benchmarking, etc.) (K5)
2. Analyse automated test for User interface (K4)
3. Demonstrate in writing-executing test scripts for a sample system (K4)

Detailed contents of the Module:
4.1 Test Automation, Why automation
4.2 When not to automate, Writing simple automated test cases
4.3 Learn and practice any one automated testing framework like Selenium
4.4 Other quality Assurance Quality and Defect management - Code reviews,
4.5 Quality tools, Change management, version control

Module 5
No. Class hours: 6
Learning Outcomes of the Module:
1. Illustrate the need for tools and the types. (K5)
2. Analyse testing process management tools. (K4)
3. Demonstrate the use of tools in testing process (K4)

Detailed contents of the Module:
5.1 Need for Tools, Classification of Tools, Functional / Regression Testing Tools
5.2 Performance / Load Testing Tools, Testing Process Management Tools, Benefits of Tools
5.3 Risks Associated with the Tools, does your Organization Need Tools, Selecting Tools,
5.4 Introducing the tools in the Testing Process

Reference Books/Resources:
1. Software Engineering – A Practitioner's Approach, 7th Edition, Roger Pressman.
2. Bugzilla (https://www.bugzilla.org/)
3. JIRA (https://www.atlassian.com/software/jira)

FOSS

Course Code	:	CSPE 507-3
Course Title	:	FOSS(Free and Open-Source Software)
Number of Credits	:	3 (L: 3, T: 0, P: 0)
Prerequisites	:	-----
Course Category	:	Programme Elective Course

Course Outcome:

1. Exposure to free and open-source software philosophy and tools. (K4)
2. Implement server administrations for secure environment. (k5)
3. Find and evaluate FOSS alternatives for any software requirement. (K4)
4. Analyse FOSS case studies for better understanding and implementation (K3)

Module 1:

No. Class hours: 6

Learning Outcomes of the Module:

1. Establish the FOSS philosophy for community-based software development(K3)
2. Create guidelines to work with the FOSS community (K4)
3. Determine the requirements for free open-source software(k5)

Detailed contents of the Module:

1.1 FOSS PHILOSOPHY: Understanding the FOSS Community and FOSS Philosophy
1.2 Benefits of Community based Software Development
1.3 Guidelines for working with FOSS community
1.4 Requirements for being open, free software Open-source software,
1.5 FOSS Licensing Models, FOSS examples

Module 2:

No. Class hours: 6

Learning Outcomes of the Module:

1. Perform Linux installation and hardware configurations (K5)
2. Analyse kernel operations during boot time (K3)
3. Execute system administration functions for keeping the server secure(K5)

Detailed contents of the Module:

2.1 LINUX Installation and Hardware Configuration, Boot Process
2.2 Dual-Booting Linux and other Operating Systems
2.3 Kernel Options during Boot
3.4 X Windows System Configuration
3.5 System Administration (Server Administration, Backup and Restore Procedures, Strategies for keeping a Secure Server)

Module 3:
No. Class hours: 6
Learning Outcomes of the Module:
1. Acquire the concepts of programming tools and techniques (K5)
2. Write programs using Java/Python/Perl (K4)
3. Establish database connectivity with Mysql, PostgreSQL (k5)

Detailed contents of the Module:
3.1 Programming Tools and Techniques
3.2 Libreoffice Tools; Samba: Cross platform
3.3 Introduction about LAMP, Introduction to Programming using languages like Java /Python / Perl
3.4 Database Systems Mysql, PostgreSQL or equivalent

Module 4:
No. Class hours: 6
Learning Outcomes of the Module:
1. Implement mobile programming for various uses (K4)
2. Explore various FOSS tools and applications through various case studies (K5)
3. Implement various examples of the FOSS Case studies(K4)

Detailed contents of the Module:
4.1 Open-Source UML Tools; Introduction to Mobile Programming
4.2 Version Control Systems like SVN, Git or equivalent; Project Management Tools
4.3 Bug Tracking Systems; Package Management Systems
4.4 FOSS Case Studies
4.5 Some example case studies of FOSS implementation

Module 5
No. Class hours: 8
Learning Outcomes of the Module:
1. Recognize infrastructure need for open-source project and archiving facilities (K4)
2. Explore community building necessities to maintain bug database, newgroup, etc. (K5)
3. Apprehend the free software licensing and code contamination penalty. (K4)

Detailed contents of the Module:
5.1 Infrastructure for an Open-Source Project, Public code archive, Project documentation
5.2 Bug database, Open mailing lists and newsgroup, Project website, Building a Community
5.3 Joining an Existing Open-Source Project, become a community member, adopt development process of OSS
5.4 Get the contributions accepted, Ending an Open-Source Project
5.5 Legal Impacts of Open Software and Free Software, Statutory Development Related to Software Contracts, Self-Enforcing Nature of Open Source and Free Software Licenses
5.6 Negative Effects of Open Source and Free Software Licensing, Chain-of-title problem, Code contamination penalty, Intellectual property liability, Enforcement of license

Reference Books:

1. Linux in a Nutshell, by Ellen Siever
2.Philosophy of GNU URL: http://www.gnu.org/philosophy
3.Linux Administration URL: http://www.tldp.org/LDP/lame/LAME/linux-admin-madeeasy/.
4.Version control system URL: http://git-scm.com/.
4.Samba: URL : http://www.samba.org/.
5. Libre office: http://www.libreoffice.org/.

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Summer Internship-II

Course Code	CSSI509
Course Title	Summer Internship-II
Number of Credits	3 (L: 0, T: 0, P: 0)
Prerequisites	Fundamental and basic practical skills of relevant discipline/programme
Course Category	Internship

Internships may be full-time or part-time; they are full-time in the summer vacation and part-time during the academic session.

Sl. no.	Schedule	Duration	Activities	Credits	Hours of Work
1	Summer Vacation after 4th Semester	6 Weeks	Industrial/Govt./NGO/MSME/ Rural Internship/Innovation / Entrepreneurship ##	3	120 Hours

(##During the summer vacation after 4th Semester, students are ready for industrial experience. Therefore, they may choose to undergo Internship /Innovation /Entrepreneurship related activities. Students may choose either to work on innovation or entrepreneurial activities resulting in start-up or undergo internship with industry/ NGO's/ Government organizations/ Micro/ Small/ Medium enterprises to make themselves ready for the industry. In case a student want to pursue his/her family business and don't want to undergo internship, a declaration by a parent may be submitted directly to the TPO.)

Course Outcome: -

After completion of the course, students will be able to:

C.O.1: Describe a better understanding of the engineering / technological workplace(K2).

C.O.2: Develop and demonstrate workplace competencies necessary for professional and academic success (K2).

C.O.3: Classify career preferences and professional goals (K3).

C.O.4: Develop preliminary portfolio including work samples from the internship (K2).

C.O.5: Increase competitiveness for full-time engineering employment / start-up (K3).

Course Content:-

Internships are educational and career development opportunities, providing practical experience in a field or discipline. The Summer Internship-II is a student centric activity that would expose Technical students to the industrial environment, which cannot be simulated in the classroom and hence creating competent professionals for the industry. They are structured, short-term, supervised placements often focused around particular tasks or projects with defined timescales. An internship may be compensated, non-compensated or some time may be paid. The internship has to be meaningful and mutually beneficial to the intern and the organization. It is important that the objectives and the activities of the internship program are clearly defined and understood. Following are the intended objectives of internship training:

1. Will expose Technical students to the industrial environment, which cannot be simulated in the classroom and hence creating competent professionals for the industry.
2. Provide possible opportunities to learn, understand and sharpen the real time technical / managerial skills required at the job.
3. Exposure to the current technological developments relevant to the subject area of training.
4. Experience gained from the 'Industrial Internship' in classroom will be used in classroom discussions.
5. Create conditions conducive to quest for knowledge and its applicability on the job.
6. Learn to apply the Technical knowledge in real industrial situations.
7. Gain experience in writing Technical reports/projects.
8. Expose students to the engineer's responsibilities and ethics.
9. Familiarize with various materials, processes, products and their applications along with relevant aspects of quality control.
10. Promote academic, professional and/or personal development.
11. Expose the students to future employers.
12. Understand the social, economic and administrative considerations that influence the working environment of industrial organizations
13. Understand the psychology of the workers and their habits, attitudes and approach to problem solving.

Overall compilation of Internship Activities / Credit Framework:

Major Head of Activity	Credit	Schedule	Total Duration	Sub Activity Head	Proposed Document as Evidence	Evaluated by	Performance appraisal/ Maximum points/ activity
Innovation / IPR / Entrepreneurship	3	Summer Vacation after 4th Semester	6 Weeks	Participation in innovation related completions for eg. Hackathons etc.	Certificate	Faculty Mentor	Satisfactory/ Good/ Excellent
				Development of new product/ Business Plan/ registration of start-up	Certificate	Programme Head	Satisfactory/ Good/ Excellent
				Participation in all the activities of Institute's Innovation Council for eg: IPR workshop/ Leadership Talks/ Idea/ Design/ Innovation/ Business Completion/ Technical Expos etc.	Certificate	President/ Convener of ICC	Satisfactory/ Good/ Excellent
				Work experience at family business	Declaration by Parent	TPO	Satisfactory/ Good/ Excellent
Internship	3	Summer Vacation after 4th Semester	6 Weeks	(Internship with Industry/ Govt. / NGO/ PSU/ Any Micro/ Small/ Medium enterprise/ Online Internship	Evaluating Report	Faculty Mentor/ TPO/ Industry supervisor	Satisfactory/ Good/ Excellent
Rural Internship	3	Summer Vacation after 4th Semester	6 Weeks	Long Term goals under rural Internship	Evaluating Report	Faculty Mentor/ TPO/ NSS/ NCC head	Satisfactory/ Good/ Excellent

STUDENT'S DIARY/ DAILY LOG

The main purpose of writing daily diary is to cultivate the habit of documenting and to encourage the students to search for details. It develops the students' thought process and reasoning abilities. The students should record in the daily training diary the day-to-day account of the observations, impressions, information gathered and suggestions given, if any. It should contain the sketches & drawings related to the observations made by the students.

The daily training diary should be signed at the end of each day by the supervisor/ in charge of the section where the student has been working. The diary should also be shown to the Faculty Mentor visiting the industry from time to time and get ratified on the day of his visit.

Student's Diary and Internship Report should be submitted by the students along with attendance record and an evaluation sheet duly signed and stamped by the industry to the Institute immediately after the completion of the training. It will be evaluated on the basis of the following criteria:

a) Regularity in maintenance of the diary.
b) Adequacy & quality of information recorded.
c) Drawings, sketches and data recorded.
d) Thought process and recording techniques used.
e) Organization of the information.

INTERNSHIP REPORT

After completion of Internship, the student should prepare a comprehensive report to indicate what he has observed and learnt in the training period. The student may contact Industrial Supervisor/ Faculty Mentor/TPO for assigning special topics and problems and should prepare the final report on the assigned topics. Daily diary will also help to a great extent in writing the industrial report since much of the information has already been incorporated by the student into the daily diary. The training report should be signed by the Internship Supervisor, TPO and Faculty Mentor. The Internship report will be evaluated on the basis of following criteria:

a) Originality.
b) Adequacy and purposeful write-up.
c) Organization, format, drawings, sketches, style, language etc.
d) Variety and relevance of learning experience.
e) Practical applications, relationships with basic theory and concepts taught in the course.

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Major Project (Part- I)

Course Code	CSPR510
Course Title	Major Project (Part-I)
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	Nil
Course Category	Project Work (PR)

Course Outcome:-

After completion of the course, students will be able to:

C.O. 1: Demonstrate a sound technical knowledge of their selected project topic and the knowledge, skills and attitudes of a professional engineer (K2).

C.O. 2: Develop the skill of working in a Team (K3).

C.O. 3: Design engineering solutions to complex problems utilising a systems approach (K6).

C.O. 4: Design the solution of an engineering project involving latest tools and techniques (K6).

C.O. 5: Develop the skill of effective communication with engineers and the community at large in written an oral forms. (K3)

Course Content:-

The major project topic should be selected / chosen to ensure the satisfaction of the urgent need to establish a direct link between education, national development and productivity and thus reduce the gap between the world of work and the world of study. The course should have the following-

1) Develop sound knowledge about the domain of the project work.
2) Perform detailed study about various components of a project.
3) Learn to be an important member of a team for successful execution of a project work.
4) Study about methodologies and professional way of documentation and communication related to project work.
5) Develop idea about problem formulation, finding the solution of a complex engineering problem.
6) Develop project report as per the suggested format to communicate the findings of the project work.
7) Acquire the skill of effective oral communication to the fellow engineers and people in the society at large.
8) Knowledge of how to organize, scope, plan, do and act within a project thesis.
9) Familiarity with specific tools (i.e. hardware equipment and software) relevant to the project selected.
10) Demonstrate the implementation of a major project work.

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