

## SCHEME OF SEVENTH SEMESTER

Academic Batch: 2018-22

S. No	Course Code	Course	BOS	Credit Distribution			Overall Credits	Contact hours	Marks		
				L	T	P			CIE	SEE	Total
1	21CSE71	Software Testing	CSE	3	0	0	3	3	50	50	100
2	21CSE72	Mobile Application Development	CSE	3	0	0	3	3	50	50	100
3	21CSE73X	Professional Elective-4	CSE	3	0	0	3	3	50	50	100
4	21CSE74X	Professional Elective-5	CSE	3	0	0	3	3	50	50	100
5	21NHOPXX	Open Elective -II	-	3	0	0	3	3	50	50	100
6	21CSL75	Software Testing Lab	CSE	0	0	2	2	4	25	25	50
7	21CSL76	Mobile Application Development Lab	CSE	0	0	2	2	4	25	25	50
8	21CSE77	Mini Project in Mobile Application Development	CSE	-	-	-	2	-	25	25	50
9	21CSE78	Project Phase-1	CSE	-	-	-	2	-	25	25	50
<b>TOTAL</b>							<b>23</b>	<b>23</b>	<b>350</b>	<b>350</b>	<b>700</b>

S. No.	COURSE CODE	PROFESSIONAL ELECTIVE-4
1	21CSE731	Fundamentals of Data Science
2	21CSE732	Artificial Intelligence
3	21CSE733	Cyber Security, Forensics and Law

4	21CSE734	Internet of Things
5	21CSE735	Embedded Systems

S. No.	COURSE CODE	PROFESSIONAL ELECTIVE-5
1	21CSE741	Natural Language Processing
2	21CSE742	Deep Learning
3	21CSE743	Robotics
4	21CSE744	Computer Vision
5	21CSE745	Service Oriented Architecture

Open Elective - II		
Course Code	Course	BOS
21NHOP01	Big Data Analytics using HP Vertica-1	CSE
21NHOP02	VM Ware Virtualization Essentials-1	ISE
21NHOP03	Adobe Experience manager-1	ISE
21NHOP04	Big Data Analytics using HP Vertica-2	CSE
21NHOP05	VM Ware Virtualization Essentials-2	ISE
21NHOP06	Adobe Experience manager-2	ISE
21NHOP07	SAP	MEE
21NHOP08	Schneider-Industry Automation	EEE
21NHOP09	Cisco-Routing and Switching-1	ECE
21NHOP10	Data Analytics	CSE
21NHOP11	Machine learning	MEE
21NHOP12	CISCO-Routing and switching - 2	ECE
21NHOP13	IIOT Embedded Systems	MEE
21NHOP14	Block chain	CSE

## SOFTWARE TESTING

Course Code : 21CSE71  
L:T: P : 3:0:0  
Exam Hours : 3

Credits : 3  
CIE Marks : 50  
SEE Marks : 50

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

CO #	COURSE OUTCOME
21CSE71.1	Understand the fundamental concepts in software testing
21CSE71.2	Design and evaluate test cases for various black box and white box testing techniques
21CSE71.3	Recognize the significance of integration testing
21CSE71.4	Understand the importance of acceptance testing
21CSE71.5	Analyze regression testing process and minimization
21CSE71.6	Apply the software automation process using selenium tool.

### Mapping of Course Outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
21CSE71.1	3	-	-	-	-	-	-	-	-	-	-	1	-	1
21CSE71.2	3	3	3	-	-	-	-	-	-	-	-	-	3	-
21CSE71.3	3	3	3	-	-	-	-	-	-	-	-	-	3	-
21CSE71.4	3	3	3	-	-	-	-	-	-	-	-	-	3	-
21CSE71.5	3	3	3	-	-	-	-	-	-	-	-	-	3	-
21CSE71.6	3	3	3	1	1	-	-	1	-	-	-	-	3	-

Correlation levels: 1-Slight (Low) 2-Moderate (Medium) 3-Substantial (High)

Module No	Module Contents	Hours	Cos
1	<b>Introduction</b> Faults, Errors, and Failures, Basics of software testing, Testing objectives, Principles of testing, Requirements, behavior and correctness, Testing and debugging, Test metrics and	9	CO1

	measurements, Verification, Validation and Testing, Types of testing, Software Quality and Reliability, Software defect tracking.		
<b>2</b>	<b>White Box and Black Box Testing</b> White box testing, static testing, static analysis tools, Structural testing: Module/Code functional testing, Code coverage testing, Code complexity testing, Black Box testing, Requirements based testing, Boundary value analysis, Equivalence partitioning, state/graph based testing, Model based testing and model checking, Differences between white box and Black box testing.	9	CO2
<b>3</b>	<b>Integration, System and Acceptance Testing</b> Top down and Bottom up integration, Bi-directional integration, System integration, Scenario Testing, Defect Bash, Functional versus Non-functional testing, Design/Architecture verification, Deployment testing, Beta testing, Scalability testing, Reliability testing, Stress testing, Acceptance testing: Acceptance criteria, test cases selection and execution	9	CO3 CO4
<b>4</b>	<b>Test Selection &amp; Minimization for Regression Testing</b> Regression testing, Regression test process, Initial Smoke or Sanity test, Selection of regression tests, Execution Trace, Dynamic Slicing, Test Minimization, Tools for regression testing, Ad hoc Testing: Pair testing, Exploratory testing, Iterative testing, Defect seeding.	9	CO5
<b>5</b>	<b>Introduction to Selenium:</b> Selenium IDE installation – Recording and running test cases using Selenium IDE – Selenium Commands. <b>Software Test Automation:</b> Fundamentals of Test Automation – Design and Architecture for Automation – Challenges in Automation <b>Selenium Web Driver:</b> Introduction to Web Driver – Architecture – Installation of Selenium Web Driver	9	CO6

#### Text Books:

1. Desikan and G. Ramesh, "Software Testing: Principles and Practices", Pearson Education.

#### Reference Books:

1. Aditya P. Mathur, "Fundamentals of Software Testing", Pearson Education.
2. Naik and Tripathy, "Software Testing and Quality Assurance", Wiley
3. K. K. Aggarwal and Yogesh Singh, "Software Engineering", New Age International Publication.

**Continuous Internal Evaluation: Theory (50 Marks)**

<b>Bloom's Taxonomy</b>	<b>Tests (25)</b>	<b>Assignments (15)</b>	<b>Quizzes (10)</b>
<b>Marks (Out of 50)</b>			
Remember	5		
Understand	5		
Apply	10		5
Analyze	5	7.5	5
Evaluate		7.5	
Create			

**SEE – Semester End Examination: Theory (50 Marks)**

<b>Bloom's Taxonomy</b>	<b>Tests</b>
<b>Marks (Out of 50)</b>	
Remember	5
Understand	5
Apply	15
Analyze	15
Evaluate	5
Create	5

## MOBILE APPLICATION DEVELOPMENT

**Course Code : 21CSE72**

**L:T:P : 3:0:0**

**Exam Hours : 3**

**Credits : 3**

**CIE Marks : 50**

**SEE Marks : 50**

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

CO #	COURSE OUTCOME
21CSE72.1	Comprehend the knowledge on essentials of android application development
21CSE72.2	Analyze the application structure and the features of android technology
21CSE72.3	Develop applications using Intents, service and Notification
21CSE72.4	Create applications using files and data base
21CSE72.5	Build mobile applications using Shared preferences and Preferences activity
21CSE72.6	Create and publish mobile applications in Google Play Platform

### Mapping of Course Outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
21CSE72.1	3	-	-	-	3	-	-	-	-	-	-	2	3	-
21CSE72.2	3	3	-	-	3	-	-	-	-	-	-	2	3	-
21CSE72.3	3	3	3	-	3	-	-	-	3	-	-	-	3	-
21CSE72.4	3	3	3	-	3	-	-	-	3	-	-	-	3	-
21CSE72.5	3	3	3	-	3	-	-	-	3	-	-	-	3	-
21CSE72.6	3	3	-	-	3	-	-	-	3	-	-	-	3	-

Correlation levels: 1-Slight (Low)      2-Moderate (Medium)      3-Substantial (High)

Module No	Module Contents	Hours	COs

<b>1</b>	<b>INTRODUCTION TO ANDROID</b> Overview of Android, Types of Android Applications, Hardware imposed design considerations, Native Android Applications, Android Development Tools-Android SDK, Android SDK Features, Downloading and installing the Android SDK, Emulators, Android AVD, Creating AVDs, Android Debug Bridge, What comes in the box, Android API levels (version and version names), .apk file extension, Android architecture, The Dalvik Virtual Machine, What you need to begin, Android studio-Project Structure, Android Manifest File, Gradle build system, debug and profile tools-LogCat, The Android studio debugger, What makes an Android application, Creating your first Android Application	<b>9</b>	<b>CO1</b>
<b>2</b>	<b>APPLICATION STRUCTURE AND BASIC UI DESIGN</b> The activity lifecycle, Activity stacks, Activity states, Fundamental Android UI Design, Layouts-Linear, Relative, Constraint, frame, table, Absolute, Grid, Managing orientation, User Interface Components- Text view, Edit text box, Button, radio button, toggle button, checkboxes, spinners, Menu, Recycler view, Dialog and pickers -Alert dialog, Date picker, Time picker, Toast, Fragments – Creating fragments, The Fragment life cycle, creating and destroying fragments, Fragment states, Adding Fragments to activities, adding, removing and replacing fragments, Adapters- Array Adapter, Simple Cursor Adapter	<b>10</b>	<b>CO2</b>
<b>3</b>	<b>INTENTS, SERVICES AND NOTIFICATION</b> Intents-Explicit and Implicit intents, Native Android actions, Intent filters-Using Intent filters to service implicit intents, Broadcast Receiver-creating and registering, Services- Creating and controlling, Starting and stopping, Implementing a Service, Service lifecycle, Using background threads-Async Task, Notification, Designing for every screen size and density-Resolution independence, supporting and optimizing for different screen sizes	<b>9</b>	<b>CO3</b>
<b>4</b>	<b>DATA STORAGE AND PREFERENCES</b> Saving simple application data, Shared Preferences, Preferences activity, File access, SQLite database, content values and cursors, SQLite Open Helper, Querying a Database, Extracting values from a cursor, Adding, updating and removing rows, Content Providers-creating, registering, creating the	<b>9</b>	

	Content Provider's database, Implementing Content Provider Queries, Introduction to Firebase		<b>CO4, CO5</b>
<b>5</b>	<b>ADVANCED ANDROID AND ANDROID APP DEPLOYMENT</b> Sending SMS using App, Building apps with Location Based Services and Google maps, Building app with Camera, Hardware sensors,  Preparing for publishing – Signing & Versioning of apps, Using Google Play to distribute & Monetize, Best practices for security and privacy	<b>8</b>	<b>CO6</b>

### Text Books:

1. Reto Meier; Professional Android 4 Application Development; Wiley India Pvt.ltd; 1st Edition; 2012; ISBN-13: 9788126525898.
2. Phillips, Stewart, Hardy and Marsicano; Android Programming, 2nd edition - Big Nerd Ranch Guide;2015; ISBN-13 978-0134171494.

### Reference Books:

1. Mark Murphy; Beginning Android 3; Apress Springer India Pvt Ltd. ;1st Edition; 2011;ISBN-13: 978-1-4302-3297-1
2. Eric Hellman; Android Programming – Pushing the limits by Hellman; Wiley; 2013; ISBN 13: 978-1118717370
3. [www.developer.android.com](http://www.developer.android.com)

### Continuous Internal Evaluation: Theory (50 Marks)

<b>Bloom's Taxonomy</b>	<b>Tests</b>	<b>Assignments</b>	<b>Quizzes</b>
<b>Marks (Out of 50)</b>	<b>25</b>	<b>15</b>	<b>10</b>
Remember	5	-	-
Understand	10	-	-
Apply	5	10	-
Analyze	5	5	-
Evaluate	-	-	10
Create	-	-	-

### SEE – Semester End Examination: Theory (50 Marks)

<b>Bloom's Taxonomy</b>	<b>Tests</b>
<b>Marks (Out of 50)</b>	
Remember	05



Understand	10
Apply	15
Analyze	10
Evaluate	10
Create	

## FUNDAMENTALS OF DATA SCIENCE

**Course Code** : 21CSE731  
**L: T: P** : 3:0:0  
**Exam Hours** : 3

**Credits** : 3  
**CIE Marks** : 50  
**SEE Marks** : 50

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

CO #	COURSE OUTCOME
21CSE731.1	Analyze fundamental concepts of data science.
21CSE731.2	Analyze real time data to draw insights for the societal improvement.
21CSE731.3	Apply Bayesian model for predicting futuristic data.
21CSE731.4	Analyze the data using inferential statistical models to draw insights for the society.
21CSE731.5	Evaluate different mathematical models and identify the suitable model for a given application.
21CSE731.6	Interpret data using visualization techniques.

### Mapping of Course Outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
21CSE731.1	3	-	-	-	-	-	-	-	-	2	-	-	-	3
21CSE731.2	3	3	-	-	-	2	-	-	-	2	-	-	-	3
21CSE731.3	3	3	-	-	-	-	-	-	-	2	-	-	-	3
21CSE731.4	3	3	-	-	-	2	-	-	-	2	-	-	-	3
21CSE731.5	3	3	-	2	-	-	-	-	-	2	-	-	-	3
21CSE731.6	3	3		-	-	-	-	2	-	2	-	-	-	3

Module No	Module Contents	Hours	COs
1	<b>Introduction to Data Science:</b> What is Data Science? Basic Terminology, Why Data Science? The data science Venn diagram, Data Science terminology, Data science case studies	8	CO1
2	<b>Types of data:</b> Structured Vs unstructured data, Quantitative Vs Qualitative data, Four levels of data. <b>Steps of data science:</b> Explore the data with sample data sets.	9	CO2
3	<b>Advanced Probability:</b> Bayes theorem and its applications, random variables; <b>Inferential Statistics:</b> Point estimates, sampling distributions, confidence interval, hypothesis tests.	9	CO3 CO4
4	<b>Algorithms for Data Science:</b> Regression, Naive Bayes, k-nearest neighbours, decision trees, and support vector machines, k-means, random forests	9	CO5
5	<b>Visualization:</b> Communicating data, identifying effective and ineffective visualizations, when graphs and statistics lie, verbal communications, the why, how, what strategy of presenting.	9	CO6

#### Text Book(s):

1. "Principles of Data Science", Sinan Ozdemir, Packt Publishing.

#### Reference Book(s):

1. Doing Data Science: Straight Talk from the Front line", "Cathy O'Neil, Rachel Schutt," O'Reilly Media, 2013
2. "Data Science from Scratch First Principles with Python", "Joel Grus" O'Reilly Media, 2015

#### CIE – Continuous Internal Evaluation: Theory (50 Marks)

Blooms Taxonomy	Tests	NPTEL COURSE
<b>Marks (Out of 50)</b>	<b>25</b>	<b>25</b>
L1: Remember	-	3
L2: Understand	5	5
L3: Apply	10	5
L4: Analyze	5	5
L5: Evaluate	5	5
L6: Create	-	2

#### SEE – Semester End Examination: Theory (50 Marks)

Blooms Taxonomy	Marks (Out of 50)
-----------------	-------------------

L1: Remember	5
L2: Understand	5
L3: Apply	15
L4: Analyze	15
L5: Evaluate	5
L6: Create	5

## ARTIFICIAL INTELLIGENCE

**Course Code** : 21CSE732  
**L:T: P** : 3:0:0  
**Exam Hours** : 3

**Credits** : 3  
**CIE Marks** : 50  
**SEE Marks** : 50

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

CO #	COURSE OUTCOME
<b>21CSE732.1</b>	Apply the basic concepts of Artificial Intelligence and the searching techniques for searching and solving any AI problem.
<b>21CSE732.2</b>	Analyze different logics to represent knowledge, reasoning patterns in propositional logic and derive the proof from the facts using inference.
<b>21CSE732.3</b>	Analyze monotonic and non monotonic reasoning. Derive statistical reasoning for incomplete and uncertain Information using bayes theorem. Design a simple Bayesian network
<b>21CSE732.4</b>	Analyze the concept of weak and strong filler structures and different forms of learning and also Demonstrate the fundamentals of conceptual dependency and design scripts.
<b>21CSE732.5</b>	Analyze the fundamentals of different game playing techniques
<b>21CSE732.6</b>	Analyze different AI techniques used in planning

### Mapping of Course Outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
<b>21CSE732.1</b>	3	3	-	-	-	-	-	-	-	2	-	2	-	-
<b>21CSE732.2</b>	3	3	3	-	-	-	-	-	-	2	-	-	3	-
<b>21CSE732.3</b>	3	3	3	-	-	-	-	-	-	2	-	2	3	-
<b>21CSE732.4</b>	3	3	3	-	-	-	-	-	-	2	-	-	-	-

21CSE732.5	3	3	3	2	-	-	-	-	-	2	-	-	3	-
21CSE732.6	3	3	3	2	-	-	-	-	-	2	-	2	3	3

**Correlation levels: 1-Slight (Low) 2-Moderate (Medium)**

**3-Substantial (High)**

Module No	Module Contents	Hours	COs
<b>1</b>	<b>Introduction and Search techniques:</b> What is artificial intelligence? Foundations of AI, Problem solving, Problem Definition and characteristics, Spaces and search, Heuristic search technique –Generate and test, Hill climbing, Best first search, problem reduction.	<b>9</b>	<b>CO1</b>
<b>2</b>	<b>Knowledge Representation</b> Knowledge-based agents, the wumpus world as an example world, Logic, propositional logic, Reasoning patterns in propositional logic, Agents based on propositional logic Syntax and semantics of first-order logic, Using first-order logic, Knowledge engineering in first-order logic	<b>9</b>	<b>CO2</b>
<b>3</b>	<b>Reasoning with Uncertainty &amp; Probabilistic Reasoning</b> Symbolic Reasoning under Uncertainty-Nonmonotonic reasoning implementation of BFS and DFS, Statistical reasoning-Bayes theorem and Bayesian networks	<b>9</b>	<b>CO3</b>
<b>4</b>	<b>Weak Slot and Filter Structures</b> -semantic nets and frames <b>Strong slot-and-filler structures</b> -conceptual dependency, scripts, CYC. <b>Learning:</b> Forms of learning, Inductive learning, Learning decision trees, Ensemble learning	<b>9</b>	<b>CO4</b>
<b>5</b>	<b>Game playing:</b> The minimax search procedure, adding alpha –beta cut-offs, additional refinements, iterative deepening, reference on specific games <b>planning-</b> An example domain: blocks world, Components of a planning system, goal stack planning, nonlinear planning using constraint posting, hierarchical planning, reactive systems.	<b>9</b>	<b>CO5 CO6</b>

#### **Text Books:**

1. E. Rich, K. Knight & S. B. Nair - Artificial Intelligence, 3/e, McGraw Hill
2. Artificial Intelligence: A Modern Approach, Stuart Russell, Peter Norving, Pearson Education 2nd Edition.

#### **Reference Books:**

1. Dan W. Patterson, Introduction to Artificial Intelligence and Expert Systems –Prentice Hall of India.

2. G. Luger, "Artificial Intelligence: Structures and Strategies for complex problem Solving", Fourth Edition, Pearson Education, 2002.
3. Artificial Intelligence and Expert Systems Development by D W Rolston-McGraw hill

**Continuous Internal Evaluation: Theory (50 Marks)**

<b>Blooms Taxonomy</b>	<b>Tests</b>	<b>NPTEL COURSE</b>
<b>Marks (Out of 50)</b>	<b>25</b>	<b>25</b>
L1: Remember	-	5
L2: Understand	10	5
L3: Apply	5	5
L4: Analyze	5	5
L5: Evaluate	5	5
L6: Create	-	5

**SEE – Semester End Examination: Theory (50 Marks)**

<b>Bloom's Taxonomy</b>	<b>Tests</b>
<b>Marks (Out of 50)</b>	
Remember	5
Understand	5
Apply	15
Analyze	15
Evaluate	5
Create	5

## CYBER CRIME, FORENSICS AND LAW

**Course Code : 21CSE733**

**L:T:P : 3:0:0**

**Exam Hours : 3**

**Credits : 03**

**CIE Marks : 50**

**SEE Marks : 50**

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

<b>21CSE733.1</b>	Analyze the various types of cybercrimes and cybercriminals.
<b>21CSE733.2</b>	Interpret the importance of tools and methods used in cybersecurity.
<b>21CSE733.3</b>	Apply cyber laws to investigate cybercrimes.
<b>21CSE733.4</b>	Develop solutions to societal problems using forensics techniques.
<b>21CSE733.5</b>	Analyze various cyber forensic investigation tools and methods.
<b>21CSE733.6</b>	Evaluate the methods for data recovery and evidence collection.

### Mapping of Course Outcomes to Program Outcomes

	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>21CSE733.1</b>	3	3	-	-	-	-	-	-	-	-	-	2
<b>21CSE733.2</b>	3	3	-	-	-	-	-	-	-	-	-	-
<b>21CSE733.3</b>	3	3	-	-	-	-	-	-	-	-	-	2
<b>21CSE733.4</b>	3	-	1	2	-	2	-	-	-	-	-	-
<b>21CSE733.5</b>	3	3	-	-	-	-	-	-	-	-	-	-
<b>21CSE733.6</b>	3	3	-	2	-	2	-	-	-	-	-	-

**Correlation levels: 1-Slight (Low) 2-Moderate (Medium) 3-Substantial (High)**

<b>Module No</b>	<b>Module Contents</b>	<b>Hours</b>	<b>Cos</b>
<b>1</b>	<b>Introduction to Cybercrime-</b> Cybercrime: Definition and origins of the word, Cybercrime and Information Security, Who are Cybercriminals ?, Classification of Cybercrimes, Categories of	<b>9</b>	<b>21CSE733.1</b>

	Cybercrime, How criminals plan the Attacks, Social engineering, Cyberstalking, Cybercafe and Cybercrimes		
<b>2</b>	<b>Tools and Methods used in Cybercrime</b> -Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL injection, Buffer Overflow, Attacks on wireless Networks, Methods of phishing, Phishing techniques, Spear Phishing, Types of Phishing Scams, Phishing Toolkits and Spy Phishing, Phishing countermeasures	<b>9</b>	<b>21CSE733.2</b>
<b>3</b>	<b>Cybercrimes and Cybersecurity: The Legal Perspectives</b> – Cybercrime and the Legal Landscape around the world, Why do we need Cyberlaws: The Indian Context, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario in India, Consequences of not addressing the weakness in Information Technology Act, Digital Signatures and the Indian IT Act, Amendments to the Indian IT Act, Cybercrime and punishment, Cyberlaw, technology and students: Indian Scenario	<b>9</b>	<b>21CSE733.3</b>
<b>4</b>	<b>Understanding Computer Forensics</b> -Digital forensics science, The need for Computer Forensics, Cyberforensics and Digital Evidence, Forensics Analysis of E-mail, Digital Forensics Life cycle, Chain of custody concept, Network Forensics, Approaching a Computer Forensics Investigation, Computer Forensics and steganography, Relevance of the OSI 7 layer model to Computer Forensics, Forensics and social networking sites, Challenges in computer forensics, special tools and techniques, Antiforensics	<b>9</b>	<b>21CSE733.4</b>
<b>5</b>	<b>Forensics of Hand-held devices</b> -Understanding Cell phone working characteristics, Hand-held devices and digital forensics, Toolkits for Hand-Held device forensics, forensics of iPods and Digital Music devices, An illustration on real life use of forensics, Techno-Legal Challenges with Evidence from Hand-held devices, Organizational Guidelines on Cell phone forensics	<b>9</b>	<b>21CSE733.5, 21CSE733.6</b>

**Text Book(s):**

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, by Nina Godbole and Sunit Belapure, Wiley

**Reference Book(s):**

1. Guide to Computer Forensics and Investigations (4<sup>th</sup> edition). By B. Nelson, A. Phillips, F. Enfinger, C. Steuart. ISBN 0-619-21706-5, Thomson, 2009
2. Cyber Crime and Cyber Terrorism Investigator's Handbook By Babak Akhgar, Andrew Staniforth, Francesca Bosco. ISBN: 978-0-12-800743-3, Elsevier, 2014
3. Websites and indian cyber law by Saisushanth, Kindle edition, 2015

**CIE – Continuous Internal Evaluation: Theory (50 Marks)**

<b>Blooms Taxonomy</b>	<b>Tests</b>	<b>NPTEL COURSE</b>
<b>Marks (Out of 50)</b>	<b>25</b>	<b>25</b>
L1: Remember		
L2: Understand		
L3: Apply	10	10
L4: Analyze	5	15
L5: Evaluate	10	
L6: Create		

**SEE – Semester End Examination: Theory (50 Marks)**

<b>Blooms Taxonomy</b>	<b>Marks (Out of 50)</b>
L1: Remember	
L2: Understand	10
L3: Apply	15
L4: Analyze	15
L5: Evaluate	10
L6: Create	



## INTERNET OF THINGS

**Course Code** : 21CSE734  
**L: T: P** : 3:0:0  
**Exam Hours** : 03 Hours

**Credits** : 03  
**CIE Marks** : 50  
**SEE Marks** : 50

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

<b>21CSE734.1</b>	Interpret the impact and challenges posed by IoT networks leading to new architectural models.
<b>21CSE734.2</b>	Compare and contrast the deployment of smart objects and the technologies to connect them to network.
<b>21CSE734.3</b>	Appraise the role of IoT protocols for efficient network communication.
<b>21CSE734.4</b>	Elaborate the need for Data Analytics in IoT.
<b>21CSE734.5</b>	Analyse the importance of IOT Security
<b>21CSE734.6</b>	Illustrate the different sensing technologies in real world environment and identify the applications of IoT using Arduino and Raspberry Pi

### Mapping of Course Outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
<b>21CSE734.1</b>	2	2	1	-	-	1	-	1	-	1	-	1	-	-
<b>21CSE734.2</b>	1	1	1	-	-	1	-	1	-	-	-	1	-	-
<b>21CSE734.3</b>	1	1	2	1		1	-	-	-	-	--	1	--	--
<b>21CSE734.4</b>	2	1	2	2		1	-	-	-	--		1	-	-
<b>21CSE734.5</b>	1	1	2	-	2	2	2	-	1	1	2	1	-	-
<b>21CSE734.6</b>	1	1	2	-	2	2	2	-	1	1	2	1	-	-

**Correlation levels: 1-Slight (Low) 2-Moderate (Medium) 3-Substantial (High)**

Module No	Module Contents	Hours	COs
<b>1</b>	<b>Introduction:</b> What is IoT, Genesis of IoT, IoT and Digitization, IoT Impact, Convergence of IT and IoT, IoT Challenges, IoT Network Architecture and Design, Drivers Behind New Network Architectures, Comparing IoT Architectures, A Simplified IoT Architecture, The Core IoT Functional Stack, IoT Data Management and Compute Stack	<b>8</b>	<b>CO1</b>
<b>2</b>	<b>Smart Objects:</b> The “Things” in IoT, Sensors, Actuators, and Smart Objects, Sensor Networks, Connecting Smart Objects, Communications Criteria, IoT Access Technologies. <b>IoT Platform-</b> Components of IoT Platform, AWS IoT Platform, ThinkSpeak	<b>9</b>	<b>CO2</b>

<b>3</b>	<b>IoT Protocol:</b> IP as the IoT Network Layer, The Business Case for IP, the need for Optimization, Optimizing IP for IoT, Profiles and Compliances, Application Protocols for IoT, The Transport Layer, IoT Application Transport Methods. MQTT, COAP	<b>9</b>	<b>CO3</b>
<b>4</b>	<b>Data and Analytics for IoT,</b> An Introduction to Data Analytics for IoT, Machine Learning, Big Data Analytics Tools and Technology, Edge Streaming Analytics, Network Analytics, <b>IoT Security:</b> Securing IoT, A Brief History of OT Security, Common Challenges in OT Security, How IT and OT Security Practices and Systems Vary, Formal Risk Analysis Structures: OCTAVE and FAIR, The Phased Application of Security in an Operational Environment	<b>10</b>	<b>CO4 CO5</b>
<b>5</b>	<b>IoT Physical Devices and Endpoints - Arduino UNO:</b> Introduction to Arduino, Arduino UNO, Installing the Software, Fundamentals of Arduino Programming. <b>RaspberryPi:</b> Introduction to RaspberryPi, About the RaspberryPi Board: Hardware Layout, Operating Systems on RaspberryPi, Configuring RaspberryPi, Programming RaspberryPi with Python, Wireless Temperature Monitoring System Using Pi, DS18B20 Temperature Sensor, Connecting Raspberry Pi via SSH, Accessing Temperature from DS18B20 sensors, Remote access to RaspberryPi, <b>Use cases:</b> Smart and Connected Cities, An IoT Strategy for Smarter Cities, Smart City IoT Architecture, Smart City Security Architecture	<b>9</b>	<b>CO6</b>

#### Text Book(s):

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry,"IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", 1<sup>st</sup> Edition, Pearson Education (Cisco Press Indian Reprint). (ISBN: 978- 9386873743)
2. Srinivasa K G, "Internet of Things", CENGAGE Learning India, 2017

#### Reference Book(s):

1. Vijay Madiseti and ArshdeepBahga, "Internet of Things (A Hands-on-Approach)", 1<sup>st</sup> Edition, VPT, 2014. (ISBN: 978-8173719547)
2. Raj Kamal, "Internet of Things: Architecture and Design Principles", 1st Edition, McGraw Hill Education, 2017. (ISBN: 978-9352605224)

#### CIE – Continuous Internal Evaluation: Theory (50 Marks)

<b>Blooms Taxonomy</b>	<b>Tests</b>	<b>NPTEL COURSE</b>
<b>Marks (Out of 50)</b>	<b>25</b>	<b>25</b>
L1: Remember	-	5
L2: Understand	-	5
L3: Apply	10	5
L4: Analyze	5	5
L5: Evaluate	5	5
L6: Create	5	-

**SEE – Semester End Examination: Theory (50 Marks)**

<b>Blooms Taxonomy</b>	<b>Marks (Out of 50)</b>
L1: Remember	5
L2: Understand	5
L3: Apply	15
L4: Analyze	15
L5: Evaluate	5
L6: Create	5

## EMBEDDED SYSTEMS

Course Code : 21CSE735  
L:T: P : 3:0:0  
Exam Hours : 3

Credits : 3  
CIE Marks : 50  
SEE Marks : 50

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

CO #	COURSE OUTCOME
21CSE735.1	Apply the features of processors, Memory, I/O and communication interfaces in developing embedded system
21CSE735.2	Analyzing the characters and applications of embedded systems
21CSE735.3	Appraise the programmers model of 8051 micro controller to give frugal solutions for real world problems
21CSE735.4	Design computational models for hardware and software design
21CSE735.5	Apply the concept of RTOS in embedded system applications
21CSE735.6	Engage in self learning in analyzing and carry out embedded projects

### Mapping of Course Outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
21CSE735.1	3	-	-	-	-	-	-	-	-	-	-	3	-	-
21CSE735.2	3	3	3	-	3	-	-	-	-	-	-	-	-	-
21CSE735.3	3	3	3	1	3	2	2	-	2	-	-	3	3	-
21CSE735.4	3	3	3	-	3	-	-	-	-	-	-	3	-	-
21CSE735.5	3	-	-	-	-	-	-	-	-	-	-	3	-	-
21CSE735.6	-	-	-	-	3	2	2	-	2	1	-	3	-	-

Correlation levels: 1-Slight (Low) 2-Moderate (Medium) 3-Substantial (High)

Module No	Module Contents	Hours	COs
1	<b>Introduction to Embedded Systems:</b> What is an Embedded System, Embedded Systems Vs General Computing Systems, Classification of Embedded System, Major Application areas of Embedded System, Purpose of Embedded System, The Innovative Bonding of lifestyle with Embedded Technologies <b>Typical Embedded System :</b> Core of the Embedded System, Sensors and Actuators, Memory, Communication Interface, Embedded Firmware	9	CO1

<b>2</b>	<b>Characteristic and application of Embedded system :</b> Characteristic and Quality Attributes of embedded system embedded system application and Domain specific	<b>9</b>	<b>CO2</b>
<b>3</b>	<b>Programing the 8051 micro controller :</b> instruction set of 8051 and Different Addressing mode supported by 8051 micro controller	<b>9</b>	<b>CO3</b>
<b>4</b>	<b>Hardware Software Co-Design and Program Modeling:</b> Fundamental Issues in Hardware Software Co-Design, Computational Models in Embedded Design, Introduction to Unified Modeling Language, Hardware Software Trade-offs	<b>9</b>	<b>CO4 CO6</b>
<b>5</b>	<b>Real Time Operating System(RTOS) based Embedded System Design</b> Operating system basics, Types of operating systems, Tasks, Process and threads, Multiprocessing and Multitasking, Task Scheduling The embedded product development lifecycle	<b>9</b>	<b>CO5 CO6</b>

#### TEXT BOOKS:

1. Introduction to Embedded Systems, Shibu K V, 2<sup>nd</sup> Edition 2017, McGRAW HILL

#### REFERENCE BOOKS:

1. Embedded Systems – A contemporary Design Tool, James K Peckol, 2014, John Wiley.
2. “Computers as Components- Principles of Embedded Computing System Design”, by Marilyn Wolf , 4th edition, Morgan Kaufman Publications, ISBN: 978-0-12-805387-4, 2017.

#### CIE – Continuous Internal Evaluation: Theory (50 Marks)

Blooms Taxonomy	Tests	NPTEL COURSE
<b>Marks (Out of 50)</b>	<b>25</b>	<b>25</b>
L1: Remember		
L2: Understand	5	10
L3: Apply	10	10
L4: Analyze	5	5
L5: Evaluate	5	
L6: Create		

**SEE – Semester End Examination: Theory (50 Marks)**

<b>Blooms Taxonomy</b>	<b>Marks(Out of 50)</b>
L1: Remember	5
L2: Understand	5
L3: Apply	15
L4: Analyze	15
L5: Evaluate	5
L6: Create	5

## NATURAL LANGUAGE PROCESSING

Course Code : 21CSE741  
L:T: P : 3:0:0  
Exam Hours : 3

Credits : 3  
CIE Marks : 50  
SEE Marks : 50

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

CO #	COURSE OUTCOME
21CSE741.1	Understand the basic concepts of NLP.
21CSE741.2	Analyze Regular expression , word level and syntactic analysis
21CSE741.3	Generate the natural language by extracting relations from text
21CSE741.4	Evaluating word matching, latent semantic analysis, and topic models
21CSE741.5	Examine Probabilistic Classification and Finite-State Sequence Modeling
21CSE741.6	Apply information retrieval techniques for NLP

### Mapping of Course Outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
21CSE741.1	3	3	-	-	-	-	-	-	-	-	-	-	-	3
21CSE741.2	3	3	3	3	-	-	-	-	-	-	-	3	3	3
21CSE741.3	3	3	3	3	-	-	-	-	-	-	-	3	3	3
21CSE741.4	3	3	3	3	-	-	-	-	-	-	-	3	3	3
21CSE741.5	3	3	3	3	-	-	-	-	-	-	-	3	3	3
21CSE741.6	3	3	3	3	-	-	-	-	-	-	-	3	3	3

Correlation levels: 1-Slight (Low)      2-Moderate (Medium)      3-Substantial (High)

Module No	Module Contents	Hours	COs
1	<b>OVERVIEW AND LANGUAGE MODELING:</b> Overview: Origins and challenges of NLP- Language and Grammar-Processing Indian Languages- NLP Applications-Information Retrieval. Language Modeling: Various Grammar- based Language Models-Statistical Language Model.	8	CO1

<b>2</b>	<b>WORD LEVEL AND SYNTACTIC ANALYSIS:</b> Word Level Analysis: Regular Expressions- Finite-State Automata-Morphological Parsing-Spelling Error Detection and correction-Words and Word classes-Part-of Speech Tagging. Syntactic Analysis: Context-free Grammar-Constituency- Parsing-Probabilistic Parsing	9	CO2
<b>3</b>	<b>EXTRACTING RELATIONS FROM TEXT:</b> From Word Sequences to Dependency Paths: Introduction, Subsequence Kernels for Relation Extraction, A Dependency-Path Kernel for Relation Extraction and Experimental Evaluation. Mining Diagnostic Text Reports by Learning to Annotate Knowledge Roles: Introduction, Domain Knowledge and Knowledge Roles, Frame Semantics and Semantic Role Labeling, Learning to Annotate Cases with Knowledge Roles and Evaluations. A Case Study in Natural Language Based Web Search: InFact System Overview, The GlobalSecurity.org Experience.	10	CO3
<b>4</b>	<b>EVALUATING SELF-EXPLANATIONS IN iSTART:</b> Word Matching, Latent Semantic Analysis, and Topic Models: Introduction, iSTART: Feedback Systems, iSTART: Evaluation of Feedback Systems, Textual Signatures: Identifying Text-Types Using Latent Semantic Analysis to Measure the Cohesion of Text Structures: Introduction, Cohesion, Coh-Metrix, Approaches to Analyzing Texts, Latent Semantic Analysis, Predictions, Results of Experiments. Automatic Document Separation: A Combination of Probabilistic Classification and Finite-State Sequence Modeling: Introduction, Related Work, Data Preparation, Document Separation as a Sequence Mapping Problem, Results. Evolving Explanatory Novel Patterns for Semantically-Based Text Mining: Related Work, A Semantically Guided Model for Effective Text Mining.	10	CO4, CO5
<b>5</b>	<b>INFORMATION RETRIEVAL AND LEXICAL RESOURCES:</b> Information Retrieval: Design features of Information Retrieval Systems-Classical, Non classical, and Alternative Models of Information Retrieval – valuation Lexical Resources: World Net-Frame Net- Stemmers-POS Tagger- Research Corpora.	8	CO6

#### **Text Books:**

1. Natural Language Processing and Information Retrieval, Tanveer Siddiqui, U.S. Tiwary, Oxford University Press, 2008
2. Natural Language Processing and Text Mining, Anne Kao and Stephen R. Potee, Springer- Verlag London Limited, 2007

#### **Reference Books:**

1. Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition, Daniel Jurafsky and James H Martin, Prentice Hall, 2008 2nd Edition
2. Natural Language Understanding, D James Allen, Benjamin/Cummings publishing company, 2nd edition, 1995



**Continuous Internal Evaluation: Theory (50 Marks)**

<b>Bloom's Taxonomy</b>	<b>Tests</b>	<b>Assignments</b>	<b>Quizzes</b>	<b>Cocurricular</b>
<b>Marks (Out of 50)</b>	<b>25</b>	<b>10</b>	<b>5</b>	<b>10</b>
Remember				
Understand	10	5	2.5	
Apply	5	5	2.5	
Analyze	5			5
Evaluate	5			5
Create				

**SEE – Semester End Examination: Theory (50 Marks)**

<b>Bloom's Taxonomy</b>	<b>Tests</b>
<b>Marks (Out of 50)</b>	
Remember	
Understand	20
Apply	10
Analyze	10
Evaluate	10
Create	

## DEEP LEARNING

Course Code : 21CSE742  
L:T: P : 3:0:0  
Exam Hours : 3

Credits : 3  
CIE Marks : 50  
SEE Marks : 50

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

CO #	COURSE OUTCOME
21CSE742.1	Identify appropriate Activation functions and loss functions for training different neural networks
21CSE742.2	Distinguish Neural Networks and Deep Neural Networks with respect to architectural principles
21CSE742.3	Illustrate the architecture of different neural networks
21CSE742.4	Select the appropriate Deep Neural Architecture based on application requirements
21CSE742.5	Analyze the performance of Deep Neural Networks
21CSE742.6	Apply Deep Learning for solving Real World Problems

### Mapping of Course Outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
21CSE742.1	3	3	-	-	-	-	-	-	-	-	3	-	-	3
21CSE742.2	3	3	3	3	-	-	-	3	-	-	3	3	3	3
21CSE742.3	3	3	3	3	-	-	-	3	-	-	3	3	3	3
21CSE742.4	3	3	3	3	-	-	-	3	-	-	3	3	3	3
21CSE742.5	3	3	3	3	-	-	-	3	-	-	3	3	3	3
21CSE742.6	3	3	3	3	-	-	-	3	-	-	3	3	3	3

Correlation levels: 1-Slight (Low)      2-Moderate (Medium)      3-Substantial (High)

Module No	Module Contents	Hours	COs
1	Introduction of Neural Networks: Perceptron, Multilayer Feed forward Networks, Feed Forward Neural network Architecture Training Neural Networks, Activation Functions, Loss Functions, Loss Function classification, Hyperparameters	8	CO1
2	Fundamentals of Deep Networks: Defining Deep Learning, Common Architectural Principles of Deep Networks, Building Blocks of Deep Networks, Auto encoders: Types, Applications	9	CO2

<b>3</b>	Major Architectures of Deep Networks: Unsupervised Pretrained Networks, Convolution Neural Networks (CNNs), Recurrent Neural Networks, Stochastic Gradient descent NN, Recursive Neural Networks	10	CO3,C O4
<b>4</b>	Tuning Deep Networks: Basic Concepts in Tuning Deep Networks, Matching Input Data and Network Architectures, Relating Model Goal and Output Layers, Working with Layer Count, Parameter Count, and Memory, Weight Initialization Strategies, Using Activation Functions	10	CO5
<b>5</b>	Applications: Large Scale Deep Learning, Computer Vision, Speech Recognition, Natural Language Processing, Recommender Systems in social networks, case study-applications of deep learning in Health care for diagnosis of diseases	8	CO6

#### **Text Books:**

1. "Deep Learning a Practitioner's Approach" Adam Gibson, Josh Patterson ,O'Reilly Media, 2017
2. "Deep Learning", Ian Good fellow and Yoshua Bengio and Aaron Courville, MIT Press, 2016

#### **Reference Books:**

1. Deep Learning Neural Networks: Design And Case Studies, Daniel Graupe, world scientific publishing, 2016
2. Deep Learning: Methods and Applications, Li Deng , Dong Yu ,Now Publisher Inc, 2014
3. Introduction to Artificial Neural networks, Zurada J.M, Jaico Publishing house, 2012.

#### **Continuous Internal Evaluation: Theory (50 Marks)**

<b>Bloom's Taxonomy</b>	<b>Tests</b>	<b>Assignments</b>	<b>Quizzes</b>	<b>Cocurricular</b>
<b>Marks (Out of 50)</b>	<b>25</b>	<b>10</b>	<b>5</b>	<b>10</b>
Remember				
Understand	10	5	2.5	
Apply	5	5	2.5	
Analyze	5			5
Evaluate	5			5
Create				

#### **SEE – Semester End Examination: Theory (50 Marks)**

<b>Bloom's Taxonomy</b>	<b>Tests</b>
<b>Marks (Out of 50)</b>	
Remember	
Understand	20
Apply	10
Analyze	10
Evaluate	10
Create	

## ROBOTICS

Course Code : 21CSE743  
L:T: P : 3:0:0  
Exam Hours : 3

Credits : 3  
CIE Marks : 50  
SEE Marks : 50

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

CO #	COURSE OUTCOME
21CSE743.1	Apply the concept of robot technology and mathematically represent different types of robot.
21CSE743.2	Get exposed to the case studies and design of robot machine interface.
21CSE743.3	Gain ability to use manipulator and gripper operation
21CSE743.4	Develop kinematic and path planning equations for standard configurations
21CSE743.5	Familiarize various control schemes of Robotics control
21CSE743.6	Illustrate the fundamental concept of various robot programming languages

### Mapping of Course Outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
21CSE743.1	3	3	-	-	3	-	-	-	-	-	-	-	3	3
21CSE743.2	3	3	-	-	-	-	-	-	-	-	-	-	3	3
21CSE743.3	3	3	-	-	-	-	-	-	-	-	-	-	3	3
21CSE743.4	3	3	1	-	3	-	-	-	-	-	-	-	3	3
21CSE743.5	3	3	-	-	3	-	-	-	-	-	-	-	3	3
21CSE743.6	3	3	-	-	3	-	-	-	-	-	-	-	3	3

Correlation levels: 1-Slight (Low)      2-Moderate (Medium)      3-Substantial (High)

Module No	Module Contents	Hours	COs
1	<b>BASIC CONCEPTS</b> Definition and origin of robotics – different types of robotics – various generations of robots – degrees of freedom – Robot classifications and specifications- Asimov's laws of robotics.	9	CO1
2	<b>POWER SOURCES, SENSORS AND ACTUATORS</b> Hydraulic, pneumatic and electric drives: Design and control issues – determination of HP of motor and gearing ratio – variable speed arrangements – path determination – micro machines in robotics.	9	CO2

3	<b>MANIPULATORS AND GRIPPERS DIFFERENTIAL MOTION</b> Construction of manipulators – manipulator dynamics and force control – electronic and pneumatic manipulator control circuits – end effectors – U various types of grippers – design considerations.	9	CO3
4	<b>KINEMATICS AND PATH PLANNING</b> Linear and angular velocities-Manipulator Jacobian-Prismatic and rotary joints-Inverse -Wrist and arm singularity - Static analysis - Force and moment Balance Solution kinematics problem.	9	CO4
5	<b>DYNAMICS AND CONTROL AND APPLICATIONS</b> Lagrangian mechanics-2DOF Manipulator-Lagrange Euler formulation-Dynamic model –Manipulator control problem-Linear control schemes-PID control scheme-Multiple robots– robots in manufacturing and non-manufacturing applications <b>INTRODUCTION TO ROBOT LANGUAGES</b> VAL-RAPID-language-basic commands-motion instructions	9	CO5, CO6

#### Text Books:

1. Mikell P. Weiss G.M., Nagel R.N., Odraj N.G., Industrial Robotics, McGraw-Hill Singapore, 2015.
2. Saeed B Niku, Introduction to Robotics, Analysis, Systems, Applications

#### Reference Books:

1. Deb.S.R., Robotics technology and flexible Automation, John Wiley, USA 1992.
2. Asfahl C.R., Robots and manufacturing Automation, John Wiley, USA 1992.

#### Continuous Internal Evaluation: Theory (50 Marks)

Bloom's Taxonomy	Tests	Assignments	Quizzes	Cocurricular
<b>Marks (Out of 50)</b>	<b>25</b>	<b>10</b>	<b>5</b>	<b>10</b>
Remember	5			
Understand	5			
Apply	5	5	2.5	
Analyze	5		2.5	5
Evaluate	5	5		5
Create				

#### SEE – Semester End Examination: Theory (50 Marks)

Bloom's Taxonomy	Tests
<b>Marks (Out of 50)</b>	
Remember	10
Understand	10
Apply	10
Analyze	10
Evaluate	10
Create	

## COMPUTER VISION

**Course Code: 21CSE744**

**L:T:P : 3:0:0**

**Exam Hours: 3**

**Credits: 03**

**CIE Marks: 50**

**SEE Marks: 50**

**COURSE OUTCOMES:** At the end of the Course, the Student will be able to:

<b>21CSE744.1</b>	Analyze fundamental image processing techniques required for computer vision.
<b>21CSE744.2</b>	Apply boundary tracking techniques, chain codes and other region descriptors.
<b>21CSE744.3</b>	Outline shape and region analysis methods.
<b>21CSE744.4</b>	Apply Hough Transform for line, circle, and ellipse detections.
<b>21CSE744.5</b>	Apply 3D vision and motion related techniques.
<b>21CSE744.6</b>	Summarize the applications of computer vision.

### Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
<b>21CSE744.1</b>	2	3	-	-	-	-	-	-	-	-	-	2	1	2
<b>21CSE744.2</b>	2	3	1	-	-	-	-	-	-	-	-	2	1	2
<b>21CSE744.3</b>	2	3	1	-	-	-	-	-	-	-	-	2	1	2
<b>21CSE744.4</b>	2	3	1	-	-	-	-	-	-	-	-	2	1	2
<b>21CSE744.5</b>	2	3	1	-	-	-	-	-	-	-	-	2	1	2
<b>21CSE744.6</b>	2	3	1	-	-	-	-	-	-	-	-	-	1	2

Module No.	Module Contents	Hours	COs
1	<b>IMAGE PROCESSING FOUNDATIONS:</b> Review of image processing techniques – classical filtering operations – thresholding techniques –	9	CO1

	edge detection techniques – corner and interest point detection – mathematical morphology – texture.		
2	<b>SHAPES AND REGIONS:</b> Binary shape analysis – connectedness – object labeling and counting – size filtering – distance functions – skeletons and thinning – deformable shape analysis – boundary tracking procedures – active contours – shape models and shape recognition – centroidal profiles – handling occlusion – boundary length measures – boundary descriptors – chain codes – Fourier descriptors – region descriptors – moments.	9	CO2, CO3
3	<b>HOUGH TRANSFORM:</b> Line detection – Hough Transform (HT) for line detection – foot-of-normal method – line localization – line fitting – RANSAC for straight line detection – HT based circular object detection – accurate center location – speed problem – ellipse detection – Case study: Human Iris location – hole detection – generalized Hough Transform (GHT) – spatial matched filtering – GHT for ellipse detection – object location – GHT for feature collation.	9	CO4
4	<b>3D VISION AND MOTION:</b> Methods for 3D vision – projection schemes – shape from shading – photometric stereo – shape from texture – shape from focus – active range finding – surface representations – point-based representation – volumetric representations – 3D object recognition – 3D reconstruction – introduction to motion – triangulation – bundle adjustment – translational alignment – parametric motion – spline-based motion – optical flow – layered motion.	9	CO5
5	<b>Applications:</b> Photo album – Face detection – Face recognition – Eigen faces – Active appearance and 3D shape models of faces Application: Surveillance – foreground-background separation – particle filters – Chamfer matching, tracking, and occlusion – combining views from multiple cameras – human gait analysis Application: In-vehicle vision system: locating roadway – road markings – identifying road signs – locating pedestrians.	9	CO6

#### TEXT BOOKS:

1. R. Szeliski, —Computer Vision: Algorithms and Applications, Springer 2011.
2. E. R. Davies, —Computer & Machine Vision, Fourth Edition, Academic Press, 2012.

**REFERENCE BOOKS:**

1. Jan Erik Solem, —Programming Computer Vision with Python: Tools and algorithms for analyzing images, O'Reilly Media, 2012.
2. Mark Nixon and Alberto S. Aquado, —Feature Extraction & Image Processing for Computer Vision, Third Edition, Academic Press, 2012.
3. Simon J. D. Prince, —Computer Vision: Models, Learning, and Inference, Cambridge University Press, 2012.
4. D. L. Baggio et al., —Mastering OpenCV with Practical Computer Vision Projects, Packt Publishing, 2012.

**CIE- Continuous Internal Evaluation: Theory (50 Marks)**

<b>Bloom's Category</b>	<b>Tests</b>	<b>Assignments</b>	<b>Quizzes</b>	<b>Cocurricular</b>
<b>Marks (out of 50)</b>	<b>25</b>	<b>10</b>	<b>5</b>	<b>10</b>
Remember	2.5	-	-	
Understand	2.5	2.5	2.5	
Apply	10	2.5		
Analyze	05	2.5	2.5	5
Evaluate	05	2.5	-	5
Create	-	-	-	

**SEE- Semester End Examination: Theory (50 Marks)**

<b>Bloom's Category</b>	<b>Marks</b>
Remember	05
Understand	10
Apply	15
Analyze	15
Evaluate	05
Create	



## SERVICE ORIENTED ARCHITECTURE

Course Code : 21CSE745  
L:T: P : 3:0:0  
Exam Hours : 3

Credits : 3  
CIE Marks : 50  
SEE Marks : 50

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

CO #	COURSE OUTCOME
21CSE745.1	Understand fundamentals of XML and understand the overview of Service Oriented Architecture and Web services
21CSE745.2	Compare different IT architecture
21CSE745.3	Analyze and design of SOA based applications
21CSE745.4	Implement web service and realize SOA.
21CSE745.5	Implement REST full services
21CSE745.6	Design and implement of SOA based Application Integration using BPEL

### Mapping of Course Outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
21CSE745.1	3	3	-	-	-	-	-	-	-	-	-	3	-	3
21CSE745.2	3	3	3	-	-	-	-	-	-	-	-	3	-	3
21CSE745.3	3	3	3	3	-	-	-	-	-	-	-	3	3	3
21CSE745.4	3	3	3	3	-	-	-	-	-	-	-	3	3	3
21CSE7x.5	3	3	3	3	-	-	-	-	-	-	-	3	3	3
21CSE745.6	3	3	3	3	-	-	-	-	-	-	-	3	3	3

Correlation levels: 1-Slight (Low)      2-Moderate (Medium)      3-Substantial (High)

Module No	Module Contents	Hours	COs
1	<b>XML AND SOA BASICS</b> <b>XML document structure</b> – Well-formed and valid documents – DTD – XML Schema – Parsing XML using DOM, SAX – XPath – XML Transformation and XSL – Xquery <b>SOA BASICS:</b> Software Architecture;Need for Software Architecture, Objectives of Software Architecture, Characteristics of SOA, Benefits of SOA	9	CO1
2	<b>SERVICE ORIENTED ARCHITECTURE (SOA)</b> Types of IT Architecture, Comparing SOA with Client-Server and Distributed architectures,Architecture Patterns and Styles, Service oriented Architecture;Service Orientation in Daily Life,Drives for SOA,	9	CO2

	Dimension of SOA, Key components, perspective of SOA, Enterprise-wide SOA; Considerations for Enterprise-Wide SOA, Strawman Architecture For Enterprise-Wide-SOA-Enterprise, SOA-Layers, Application Development Process, SOA Methodology For Enterprise		
<b>3</b>	<b>SOA GOVERNANCE:</b> SOA implementation and Governance – strategy – SOA development – SOA governance – trends in SOA – event-driven architecture – software as a service – SOA technologies – proof-of-concept – process orchestration – SOA best practices.	<b>9</b>	<b>CO3</b>
<b>4</b>	<b>SOA IMPLEMENTATION:</b> SOA based integration – integrating existing application – development of web services – Integration - SOA using REST – RESTful services – RESTful services with and without JWS – Role of WSDL,SOAP and Java/XML mapping in SOA – JAXB Data binding.	<b>9</b>	<b>CO4</b>
<b>5</b>	<b>APPLICATION INTEGRATION:</b> JAX –WS 2.0 client side/server side development – Packaging and Deployment of SOA component – SOA shopper case study –WSDL centric java WS with SOA-J – related software – integration through service composition (BPEL) – case study - current trends.	<b>9</b>	<b>CO5</b>

### Text Books:

1. Service-Oriented Architecture for Enterprise Applications Shankar Kambhampaly Wiley Second Edition, 2014
2. XML and Web Services,Ron Schmelzer et al.-Pearson Education, 2002.

### Reference Books:

1. SOA using Java Web Services, Mark D. Hansen, Practice Hall, 2007.
2. SOA-Based Enterprise Integration, Waseem Roshen, Tata McGraw-HILL, 2009.

### Continuous Internal Evaluation: Theory (50 Marks)

Bloom's Taxonomy	Tests	Assignments	Quizzes	Cocurricular
<b>Marks (Out of 50)</b>	<b>25</b>	<b>10</b>	<b>5</b>	<b>10</b>
Remember				
Understand	10	5	2.5	
Apply	5	5	2.5	
Analyze	5			5
Evaluate	5			5
Create				

**SEE – Semester End Examination: Theory (50 Marks)**

<b>Bloom's Taxonomy</b>	<b>Tests</b>
<b>Marks (Out of 50)</b>	
Remember	
Understand	20
Apply	10
Analyze	10
Evaluate	10
Create	

## Software Testing Lab

**Course Code : 21CSL75**

**L:T:P : 0:0:2**

**Exam Hours : 3**

**Credits : 2**

**CIE Marks : 25**

**SEE Marks : 25**

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

<b>21CSL75.1</b>	Apply the fundamentals of testing in solving real world problems.
<b>21CSL75.2</b>	Apply the concepts of test case and test suite based on unit testing and integration testing.
<b>21CSL75.3</b>	Design and evaluate test cases for various black box testing techniques using open source tools.
<b>21CSL75.4</b>	Design and evaluate test cases for various white box testing techniques using open source tools.
<b>21CSL75.5</b>	Apply the concepts of the software automation testing process using Selenium IDE
<b>21CSL75.6</b>	Understand the installation procedure of Selenium web driver and create programs to assert various web elements.

### Mapping of Course Outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
<b>CO1</b>	3	3	3	-	3	-	-	-	-	-	-	2	-	2
<b>CO2</b>	3	3	3	-	3	-	-	-	-	-	-	2	3	2
<b>CO3</b>	3	3	3	-	3	-	-	-	-	-	-	-	3	-
<b>CO4</b>	3	3	3	-	3	-	-	-	-	-	-	-	3	-
<b>CO5</b>	3	3	3	-	3	-	-	2	-	-	-	-	3	-
<b>CO6</b>	3	3	3	-	3	-	-	2	-	-	-	-	3	-

Exp. No	Experiment	Hours
1	<p>Consider any ATM system, design and develop a program in a language of your choice for the same. Create the test cases for the following scenarios:</p> <p>Unsuccessful operation due to invalid account type.</p> <ul style="list-style-type: none"> <li>i) Successful selection of amount to be withdrawn.</li> <li>ii) Expected message due to amount to withdraw is greater than possible balance..</li> <li>iii) Unsuccessful operation due to enter wrong PIN number 3 times</li> </ul> <p>Execute the test cases manually and discuss the result.</p>	4
2	<p>Design and develop a program in a language of your choice to solve the triangle problem defined as follows: Accept three integers which are supposed to be the three sides of triangle and determine if the three values represent an equilateral triangle, isosceles triangle, scalene triangle, or they do not form a triangle at all. Create the test cases for the following scenarios:</p> <ul style="list-style-type: none"> <li>i) Represents not a triangle</li> <li>ii) Represents a valid scalene triangle</li> <li>iii) Represents a valid equilateral triangle</li> <li>iv) Represents a valid isosceles triangle</li> </ul> <p>Execute the test cases manually and discuss the result.</p>	4
3	<p>Design, develop, code and run the program in any suitable language to implement the NextDate function. Analyze it from the perspective boundary value testing. Create different test cases based on the following variants, execute the test cases by using Junit and discuss the test results.</p> <ul style="list-style-type: none"> <li>i) Normal Boundary Value Testing</li> <li>ii) Robust Boundary Value Testing</li> <li>iii) Worst-Case Boundary Value Testing</li> <li>iv) Robust Worst-Case Boundary Value Testing</li> </ul>	4
4	<p>Design, develop, code and run the program in any suitable language to implement the NextDate function. Analyze it from the perspective boundary value testing. Create different test cases, execute these test cases by using JUnit and discuss the test results.</p> <ul style="list-style-type: none"> <li>i) Weak Normal Equivalence Class Testing</li> <li>ii) Strong Normal Equivalence Class Testing</li> <li>iii) Weak Robust Equivalence Class Testing</li> <li>iv) Strong Robust Equivalence Class Testing</li> </ul>	4
5	<p>Demonstrate White box testing techniques using open source testing tool JUnit and ECLEMMMA. Implement and execute test cases for achieving full</p>	4

	statement coverage, decision/branch coverage and condition coverage for the triangle program.	
<b>6</b>	Demonstrate White box testing techniques using open source testing tool JUnit and ECLEMMMA. Implement and execute test cases for achieving full statement coverage, decision/branch coverage and condition coverage for Next Date function	<b>4</b>
<b>7</b>	Designing Test Cases using Selenium IDE	<b>2</b>
<b>8</b>	Write an automated selenium script to login into a web page	<b>3</b>
<b>9</b>	Write a test program to list the total number of objects present on a web page	<b>4</b>
<b>10</b>	Write a test program to demonstrate URL and title check point	<b>4</b>
<b>11</b>	Write a test program to demonstrate selecting and deselecting option from multi select dropdown	<b>4</b>
<b>12</b>	Write a test program to demonstrate Synchronization.	<b>4</b>

#### Reference Material(s):

1. Selenium WebDriver Practical Guide- Satya Avasarala

#### CIE – Continuous Internal Evaluation: Theory (25 Marks)

<b>Blooms Taxonomy</b>	<b>Tests</b>
<b>Marks (Out of 25)</b>	<b>25</b>
L1: Remember	
L2: Understand	5
L3: Apply	5
L4: Analyze	5
L5: Evaluate	10
L6: Create	

#### SEE – Semester End Examination: Theory (25 Marks)

<b>Blooms Taxonomy</b>	<b>Marks (Out of 25)</b>
L1: Remember	
L2: Understand	5
L3: Apply	5
L4: Analyze	5
L5: Evaluate	10
L6: Create	

## MOBILE APPLICATION DEVELOPMENT LAB

**Course Code : 21CSL76**

**L: T: P : 0:0:2**

**Exam Hours : 3**

**Credits : 2**

**CIE Marks : 25**

**SEE Marks : 25**

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

<b>21CSL76.1</b>	Develop single screen mobile applications by setting up Android development environment
<b>21CSL76.2</b>	Develop mobile applications using Intents
<b>21CSL76.3</b>	Develop mobile applications using Services
<b>21CSL76.4</b>	Develop mobile applications using files
<b>21CSL76.5</b>	Demonstrate methods of storing and retrieving data using Database
<b>21CSL76.6</b>	Develop mobile applications using SMS and location based services

### Mapping of Course Outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
<b>21CSL76.1</b>	3	-	3	-	3	-	-	3	3	-	-	-	3	-
<b>21CSL76.2</b>	3	3	3	-	3	-	-	3	3	-	-	-	3	-
<b>21CSL76.3</b>	3	3	3	-	3	-	-	3	3	-	-	-	3	-
<b>21CSL76.4</b>	3	3	3	-	3	3	-	3	3	-	-	-	3	-
<b>21CSL76.5</b>	3	3	3	-	3	3	-	3	3	-	-	-	3	-
<b>21CSL76.6</b>	3	3	3	-	3	-	-	3	3	-	-	-	3	-

Exp. No	Experiment	Hours
1	Develop an Android application using Button, TextView and EditText for designing a Calculator having basic functionality like Addition, Subtraction, Multiplication and Division.	3
2	Develop an Android application that displays information about a small business. Your design must include:	3

	<ul style="list-style-type: none"> <li>• Business name</li> <li>• Photo of business</li> <li>• Contact information and</li> <li>• Description of Business</li> </ul>	
3	Develop an Android application to design a Visiting card. The visiting card should have a company logo at the top right corner. The company name should be displayed in capital letters, aligned to the center. Information like Name of the employee, Designation, Phone number, Address, Email, and the Website address is to be displayed.	3
4	Develop an Android application The Easy Unit Converter using Radio Buttons	3
5	Develop an Android application Currency Converter using Spinners	3
6	Develop an Android application using Explicit intent to display the login page. On giving the wrong credentials it should display the toast message and if credentials are correct it should display Welcome and the username	3
7	Develop an Android application using Implicit intent to display the Gallery and Call buttons. On clicking these buttons, it should goto the respective pages	3
8	Develop an Android application Tourist spot with three activities : Welcome page, Display attractions of tourist spot and Webpage of the tourist spot	3
9	Develop an Android application to play music in background	3
10	Develop an Android application Hospital Database App using Android. The app should store Hospital ID, Hospital name and location of hospital in a file	3
11	Develop an Android application The Expense Manager using Android. The application should store all the expenses in a file	3
12	Develop an Android application Student Database App using Android. The app should store USN, Student name and Semester of student in SQLite database	3
13	Develop an Android application Health Monitoring App using Android. The app should store Name, Age, blood pressure, blood group and glucose level of patient in SQLite database	3
14	Develop an Android application to display Map of your college locality	3
15	Develop an Android application to alert SMS to one given phone number	3



**Reference Material(s):**

1. Reto Meier; Professional Android 4 Application Development; Wiley India Pvt.ltd; 1st Edition; 2012; ISBN-13: 9788126525898.

2. [www.developer.android.com](http://www.developer.android.com)

**CIE – Continuous Internal Evaluation: Theory (25 Marks)**

<b>Blooms Taxonomy</b>	<b>Tests</b>
<b>Marks (Out of 25)</b>	<b>25</b>
L1: Remember	-
L2: Understand	-
L3: Apply	15
L4: Analyze	5
L5: Evaluate	5
L6: Create	-

**SEE – Semester End Examination: Theory (25 Marks)**

<b>Blooms Taxonomy</b>	<b>Marks (Out of 25)</b>
L1: Remember	-
L2: Understand	-
L3: Apply	15
L4: Analyze	5
L5: Evaluate	5
L6: Create	-

## MINI PROJECT IN MOBILE APPLICATION DEVELOPMENT

**Course Code : 21CSE77**

**L: T: P : 0:0:0**

**Exam Hours : 03**

**Credits: 02**

**CIE Marks: 25**

**SEE Marks: 25**

### Objectives

1. Student should be able to understand Mobile Application Development concepts
2. Student should be able to implement project based on Mobile Application

### Description:

The student shall be capable of identifying a problem related to the field of Computer Science and Engineering and carry out a mini project on the problem defined. Each student to be expected to do the mini project individually. The code developed for the project will be reviewed by panel of experts during the course of the semester. Plagiarized projects will automatically get an **“F” GRADE** and the student will be liable for further disciplinary action. At the completion of a project the student will submit a project report, which will be evaluated by duly appointed examiner(s).

### Evaluation Stages:

Activity	Evaluation Attribute
Synopsis Submission	Problem Statement
Review-I	Algorithm of the project and outline design of project
Review-II	Partial code development and or partial execution
Review-III	Final Implementation PPT (10-12 slides) + Results verification + Report Submission in defined format

### Sample Mini Projects (Mobile based Applications):

1. Pizza Delivery
2. GPS based Search
3. Hospital Management
4. Billing Management system
5. Interdisciplinary application

**CIE - Continuous Internal Evaluation (25 Marks)**

<b>Bloom's Taxonomy</b>	<b>Mini Project</b>
<b>Marks (Out of 25)</b>	
Remember	-
Understand	5
Apply	5
Analyze	5
Evaluate	5
Create	5

**SEE – Semester End Examination (25 marks)**

<b>Bloom's Taxonomy</b>	<b>Mini Project</b>
Remember	-
Understand	5
Apply	5
Analyze	5
Evaluate	5
Create	5

## PROJECT PHASE- I

**Course Code : 21CSE78**

**L: T: P : 0:0:0**

**Exam Hours : 3**

**Credits : 2**

**CIE Marks : 25**

**SEE Marks : 25**

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

<b>21CSE78.1</b>	Prepare the students to solve/work on the real world/ Practical/Theoretical problems involving issues in computer science and Engineering
<b>21CSE78.2</b>	Able to summarize their work by proper Software Engineering Documents after evaluating the testing plans.
<b>21CSE78.3</b>	Practice presentations, Communications and team work skills
<b>21CSE78.4</b>	Able to learn and develop new concepts in multidisciplinary area
<b>21CSE78.5</b>	Use different Programming languages/software tools/ Hardware technologies
<b>21CSE78.6</b>	Apply algorithmic strategies while solving problems

### **Mapping of Course Outcomes to Program Outcomes**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
<b>21CSE78.1</b>	3	3	3	3	3	2	3	3	3	3	3	2	3	3
<b>21CSE78.2</b>	3	3	3	3	3	2	3	3	3	3	3	2	3	3
<b>21CSE78.3</b>	3	3	3	3	3	-	-	3	3	3	3	2	3	3
<b>21CSE78.4</b>	3	3	3	3	3	2	3	3	3	3	3	2	3	3
<b>21CSE78.5</b>	3	3	3	3	3	2	-	3	3	3	3	2	3	3
<b>21CSE78.6</b>	3	3	3	3	3	-	-	3	3	3	-	2	3	3

This course will be conducted largely as group of 2-4 student members under the direct supervision of a member of academic staff.

### **Students will be required to**

- 1) Identify the Problem and choose the specific project topic which will reflect the common interests and expertise of the student and supervisor.
- 2) Perform a literature search to review current knowledge and developments in the chosen technical area.
- 3) Conduct a Feasibility study of the Project.
- 4) Submit the main Project Proposal.

**CIE - Continuous Internal Evaluation (50 Marks)**

<b>Bloom's Taxonomy</b>	<b>Project</b>
<b>Marks (Out of 50)</b>	
Remember	-
Understand	10
Apply	10
Analyze	10
Evaluate	10
Create	10

**SEE – Semester End Examination (50 marks)**

<b>Bloom's Taxonomy</b>	<b>Project</b>
<b>Marks (Out of 50)</b>	
Remember	-
Understand	10
Apply	10
Analyze	10
Evaluate	10
Create	10