

Course No: 59 Course Title: Information Control and Cyber Security

Course Code: CSE 4101

Credit: 3.00

Contact Hours: 3 Hours/Week

Pre-Requisites: Nil

Total Marks: 100

Mark Distribution:

Semester Final Exam: 72 Marks

Class

Test:

20 Marks

Class Attendance: 08 Marks

11.1 Rationale:

The accelerated expansion of security issues in computing products means students need to learn the basics of information security, in both management and technical aspects. Students must understand various types of security incidents and attacks, and learn methods to prevent, detect and react to incidents and attacks. Students also need to learn the basics of application of cryptography which are one of the key technologies to implement security functions.

11.2 Objectives:

1. Explain various Information security threats and controls for it.
2. Analyze security incidents and design countermeasures.
3. Apply information security incident response.
4. Implement the algorithms of Common Key cryptography and Public Key cryptography.
5. Evaluate the mechanism to protect confidentiality and completeness of data.

11.3 Course Learning Outcomes (CLO)

1. Articulate the concepts of Information security
2. Detect the security threats in cyber spaces
3. Detect the security threats in devices
4. Evaluate risk managements of the systems
5. Employ security preserving solutions in the information system

11.4		11.6	11.6	11.7
Learning Outcomes		Course Content	Teaching learning Strategy	Assessment Strategy
a.	Understand the goal and scope of this course through several examples of security incidents.	Information Security, Examples of Information Security Incidents, Information Security Management	Lecture Case Studies	Quiz Assignment
b.	Learn the three concepts of information security and other basic concepts.	1. The three concepts of Information Security (Confidentiality, Integrity, Availability) 2. Basic terminologies in Information Security 3. Human Aspect of Information Security 4. Social Engineering	Lecture Exercise Case Studies	Quiz Assignment
c.	Explain Security Attacks for Server systems and discuss counter measure for attacks	1. Attacks to Server Systems connected to the Internet and countermeasures 2. Attacks to Web Servers and countermeasure 3. Denial of Service Attack 4. Attacks to Network Systems	Lecture Exercise Demonstration	Quiz Assignment Project Task

d.	Explain Information Security for Client devices	1. Attacks for Personal Computers and Smartphones, and countermeasure 2. How the malicious software intrude the device 3. What the malicious software does to the system 4. Stolen and Lost Devices	Lecture Exercise Demonstration	Quiz Assignment Project Task
e.	Learn Risk Management process for Information Systems	1. What is Risk Management process 2. Identifying Information Assets 3. Identifying Security Risk and evaluation 4. Risk Treatment	Lecture Case Studies	Quiz Assignment
f.	Learn how an organization manages security risk, including, establishing policy, building organization and internal rules.	1. Information Security Governance 2. Information Security Management System (ISMS) 3. Information Security Policy, Standards and Procedures 4. Information Security Evaluation	Lecture Exercise Demonstration	Quiz Assignment
g.	Learn organization to handle security incidents and how to react to security incidents through exercise	1. What is Security Incident response 2. Computer Security Incident response team 3. Incident response exercise	Lecture Exercise Demonstration	Quiz Assignment
h.	Learn about basic concept of cryptography	1. Requirements for Secure Communication 2. What is Cryptography? 3. Classic Cryptography 4. Modern Cryptography	Lecture Exercise Demonstration	Quiz Assignment
i.	Apply Common Key Cryptography	1. Common Key Cryptography algorithms: DES, Triple DES, AES 2. Encryption modes 3. Exercise on Common Key Cryptography	Lecture Exercise	Quiz Assignment
j.	Apply Public Key Cryptography and Hybrid encryption.	1. Exercise of Public Key Cryptography 2. Exercise of Hybrid encryption	Lecture Exercise	Quiz Assignment
k.	Detect unauthorized change of data	1. Integrity of Data 2. Hash Function 3. Digital Signature 4. Exercise of Hash functions and Digital Signature	Lecture Exercise	Quiz Assignment

Recommended Books And Periodicals	
Authors	Book Name

1.	Michael E. Whitman and Herbert J. Mattord	Principles of Information Security
2.	Christof Paa and Jan Pelzl	To understand cryptography in depth
3.	David Jamieson	The Social Engineer’s Playbook: A Practical Guide to Pretexting

Course No:	60	Course Title:	Digital Image Processing
-------------------	-----------	----------------------	---------------------------------

Course Code:	CSE-4103	Pre-Requisites:	Nil
Credit:	3.00	Total Marks:	100
Contact Hours:	3 Hours/Week		

Mark Distribution:

Semester Final Exam:	72 Marks	Class Test:	20 Marks	Class Attendance:	08 Marks
-----------------------------	-----------------	--------------------	-----------------	--------------------------	-----------------

11.1 Rationale:

This course presents the fundamentals of digital image processing. It covers principles and algorithms for processing images. Topics include data acquisition, imaging, filtering, coding, feature extraction, and modeling. The focus of the course is a series of labs that provide practical experience in processing physiological data, with examples from cardiology, speech processing, and medical imaging. The labs are done on the MIT Server in MATLAB® during weekly lab sessions that take place in an electronic classroom. Lectures cover image processing topics relevant to the lab exercise.

11.2 Objectives:

- To introduce students to basic image processing techniques.
- To develop the students mathematical, scientific, and computational skills relevant to the field of digital image processing.
- To enhance the students ability in formulating problems and designing analysis tools for digital images.
- To foster effective interaction skills and teamwork communication.

11.3 Course Learning Outcomes (CLO)

- Illustrate the concepts of digital images
- Illustrate the concepts of digital image representations
- Apply transformation technologies in image
- Identify the application of image processing

11.4 Unit Learning Outcomes (ULO)	11.5 Course Content	11.6 Teaching Learning Strategy	11.7 Assessment Strategy
<ul style="list-style-type: none"> ● Explain histograms ● Discuss spatial operations ● Illustrate image segmentation, image representation ,Image rectification, Image interpolation and other transformations ● Illustrate edge detection,boundary extraction and representation. 	Introduction; Point operations; Line and Edge detection, labeling, Histograms; Spatial operations; Affine transformations; Image Segmentation, Image Representation and Modelling, Image rectification; Interpolation and other transformations; Contrast enhancement; Convolution operation, Magnification and Zooming; Fourier transform; Edge detection; Boundary extraction and representation; Mathematical morphology.	<ul style="list-style-type: none"> ● Lecture ● Group Discussion 	<ul style="list-style-type: none"> ● Short Answer ● Group Exercise
<ul style="list-style-type: none"> ● Describe, apply and analyze different image filtering techniques and image enhancement operators 	Point processing; Histogram Processing – Normalization, Matching, Equalization; Average Filter, Weighted Average Filter, Median Filter, Gaussian Filters; 1 st and	<ul style="list-style-type: none"> ● Lecture ● Group Discussion 	<ul style="list-style-type: none"> ● Short Answer ● Group Exercise ● Completion ● Assignment

and algorithms in the spatial domain	2 nd Derivative, Laplacian; Sobel operator		
<ul style="list-style-type: none"> Describe, apply and analyze different image filtering techniques and image enhancement operators and algorithms in the frequency domain 	Frequency domain of an image; Fourier transform, 1D and 2D Discrete Fourier transform, smoothing frequency domain filter - Ideal, Butterworth and Gaussian low pass filters; Sharpening frequency domain filter - Ideal, Butterworth and Gaussian high pass filters;	<ul style="list-style-type: none"> Lecture Group Discussion 	<ul style="list-style-type: none"> Short Answer Group Exercise Completion Assignment
<ul style="list-style-type: none"> Discuss different types of pattern recognition techniques Define optical character recognition Explain scene matching and analysis 	Pattern Recognition: Statistical, Structural, Neural and Hybrid Techniques, Document Analysis and Optical Character Recognition, Object Recognition, Scene Matching and Analysis.	<ul style="list-style-type: none"> Lecture Group Discussion 	<ul style="list-style-type: none"> Short Answer Group Exercise Completion Assignment

RECOMMENDED BOOKS AND PERIODICALS

Text Books:

- R. A. Plastock& G. Kalley : "Theory and Problems of Computer Graphics"
- Gonzalez : "Pattern Recognition Principles"

References:

- Steven Harrington : "Computer Graphics : A Programming Approach"
- NewmannSprocell : "Principles of Interactive Computer Graphics"

Course No:
61

Course Title:
Digital Image Processing Laboratory

Course Code: CSE-4104

Credit: 1.00

Contact Hours: 2 Hours/Week

Pre-Requisites: Nil

Total Marks: 100

Mark Distribution:

Lab Final Exam:
60 Marks

Viva:
30 Marks

Class Attendance:
10 Marks

11.1
Rationale:

This course presents the fundamentals of digital image processing. It covers principles and algorithms for processing images. Topics include data acquisition, imaging, filtering, coding, feature extraction, and modeling. The focus of the course is a series of labs that provide practical experience in processing physiological data, with examples from cardiology, speech processing, and medical imaging. The labs are done on the MIT Server in MATLAB® during weekly lab sessions that take place in an electronic classroom. Lectures cover image processing topics relevant to the lab exercise.

11.2
Objectives:

- To introduce students to basic image processing techniques.
 - To develop the students mathematical, scientific, and computational skills relevant to the field of digital image processing.
 - To enhance the students ability in formulating problems and designing analysis tools for digital images.
 - To foster effective interaction skills and teamwork communication.

11.3
Course Learning Outcomes (CLO)

- Implement the image I/O operations
 - Implement image normalization
 - Exercise the image transformation technologies
 - Apply filtering in the digital images

11.4 Unit Learning Outcomes (ULO)	11.5 Course Content	11.6 Teaching Learning Strategy	11.7 Assessment Strategy
<ul style="list-style-type: none"> Apply & analyze Image conversion algorithms using C/Java /Python program 	Image conversion – RGB to Binary image	<ul style="list-style-type: none"> Demonstration Exercise 	<ul style="list-style-type: none"> Assignment Observation

		Dynamical Mathematical Models; Principles used in Modeling.		
a.	Describe study nature of system	System Studies: Subsystem concepts; A corporate model – Environment Segment, Production Segment, Management Segment; Types of System Study – System Analysis, System Design, and System postulation.	Lecture	Short Answer
a.	Introduce various types of simulation.	System Simulation: The Technique of Simulation; Comparison of Simulation and Analytical Methods; Experimental Nature of Simulation; Parallel and Distributed Simulation; Real time Simulation Types of System Simulation.	Lecture Exercise Assignment	Exercise
a.	Describe different distribution	Probability Concepts in Simulation: Stochastic Variables; Discrete and Continuous Probability Functions; Measures of Probability Functions; The Coefficient of Variation; Generation of Random Variates; Binomial Distribution; Poisson Distribution; Continuous Distribution; Normal Distribution; The Exponential Distribution; The Erlang and Hyper-Exponential Distributions; Uniform Distribution; Beta Distribution.	Lecture	Short Answer
a.	Introduce random number.	Random Numbers: Random Numbers Table; Pseudo Random Numbers; Computer Generation of Random Numbers; A Uniform and non-Uniform Continuously Distributed Random Numbers; Qualities of an efficient Random Number Generator.	Lecture	Short Answer
b.	Generate various types of random number.			
a.	Introduce with queuing system	Arrival Patterns and Service Times: Congestion in Systems; Arrival Patterns; Service Times; Queuing Disciplines, Measure of Queue and Mathematical Solutions of Queuing Problems.	Lecture	Exercise
a.	Introduce with discrete event system simulation	Discrete System Simulation: Discrete Events; Representation of Time; Generation of Arrival Patterns; Simulation of a Telephone System; Simulation.	Lecture Exercise	Assignment
a.	Justify simulation validation	Analysis of Simulation Output: Nature of the Problem; Verification and Validation of Simulation; Estimation Methods.	Lecture	Short Answers.
b.	Describe criteria to validate a system.			

Recommended Books And Periodicals

Authors		Book Name
1.	Byron J. T. Morgan	Elements of Simulation
2.	Law, Keltan	Simulation Modeling and Analysis
3.	D.S.Hira	System Simulation
4.	GeoferryGoedon	System Simulation
5.	R. S. Lehman	Computer Simulation and Modeling
6.	J. A. Spriet	Computer Aided Modeling & Simulation

Course No:	63	Course Title: Robotics and Machine Vision
Course Code: CSE 4107		Pre-Requisites: Nil
Credit: 3.00		Total Marks: 100
Contact Hours: 3 Hours/Week		
Mark Distribution:		
Semester Final Exam:	72 Marks	Class Test: 20 Marks Class Attendance: 08 Marks

COURSE OBJECTIVES:

- ❖ To familiarize students with the concepts and techniques of robot manipulator, itskinematics, programming and build confidence to evaluate, choose and incorporate robots in engineering systems.

COURSE OUTCOMES:

The students will be able to

- Explain the basic concepts like various configurations, classification and parts of robots.
- Explain the concept of kinematics, degeneracy, dexterity and trajectory planning.
- Compare various end effectors (grippers and tools) and sensors used in robots.
- Analyze the concept of Artificial Intelligence in robots, various types of robot programming and its applications.
- Demonstrate the image processing and image analysis techniques by machine vision system.

Learning Outcomes		Course Content	Teaching Strategy/ Learning Experience	Assessment Strategy
a.	Define robotic and identify its uses	Robotics, Introduction, Basic structure, Classification of robot and Robotic systems, laws of robotics, work space, precision movement. Drives and Controls systems: Hydraulic systems, power supply, servo valve, stepper motors, control system, servo control	Lecture Exercise Demonstration	QuizAssignm ent
C	Typical robots applications, laws of robotics			
d.	About representation of robot function; Typical designs			
e.	About drives and Controls systems: Hydraulic systems, power supply, servo valve			
f.	About drives and Controls systems:hydraulic motor, DC servo motors, stepper motors, control system, servo control			
a.	About robot kinematics	Kinematics of Robot: Introduction, Matrix Representation, homogeneous transformation, forward and	Lecture Exercise Demonstration	Quiz Assignment Presentation
b.	About Spatial descriptions and transformations;			

	Homogeneous transformations	inverse kinematics, Inverse kinematics Programming, Degeneracy, dexterity, velocity and static forces, Basics of trajectory planning.		
c.	The theory of forward and inverse kinematics, Inverse kinematics Programming			
d.	About Degeneracy, dexterity, velocity and static forces			
e.	Knowledge about the Basics of trajectory planning			
a.	About the end effectors of Robot: Types, Features, Mechanisms	Robot end effectors: Types of end effectors, Mechanical grippers, Types of Gripper mechanisms, Grippers force analysis, Other types of grippers, Vacuum cups, Magnetic grippers, Adhesive grippers, Robot end effectors interface. Sensors: Position sensors, Potentiometers, encoders, LVDT, Velocity sensors, Acceleration Sensors, Force, Pressure and Torque sensors, Touch and Tactile sensors, Proximity, Range and sniff sensors.	Lecture Exercise Demonstration	Quiz Assignment Presentation
b.	About the interfacing of effectors with robot			
c.	About Sensors and Actuators in Robotics: Position sensors, Potentiometers, encoders, LVDT, Velocity sensors, Acceleration Sensors: Force, Pressure and Torque sensors, Touch and Tactile sensors, Proximity, Range and sniff sensors.			
d.	About Sensors and Actuators in Robotics			
a.	Knowledge of programming languages used in robotics	Types of programming, programming languages sample program for different types of robots, Industrial Applications: Application of robots in processing operations, Assembly and inspections, Material handling, Loading and unloading .AI and Robotics.	Lecture Exercise Demonstration	Quiz Assignment Practical exam
b.	Sample program for different types of robots			
c.	Industrial Applications: Application of robots in processing operations			
d.	About the Assembly and inspections of robots			
e.	Material handling, Loading and unloading			
a.	Introduction to image processing, Classification of images, image acquisition, digital images	Introduction, image processing vs image analysis, image acquisition, digital images, sampling and quantization, image definition, levels of computation. Image processing Techniques: Data reduction, Windowing, digital conversion. Segmentation, Thresholding, Connectivity, Noise reduction, Edge detection, Segmentation, Region growing and Region splitting, Binary morphology and grey morphology operation, feature extraction	Lecture Exercise Demonstration	Quiz Assignment Presentation Practical exam
b.	About image sampling and quantization, image definition, levels of computation			
c.	Techniques of image processing: Data reduction, Windowing, digital conversion. Segmentation			

d.	Techniques of image processing: Thresholding, Connectivity, Noise reduction, Edge detection, Segmentation, Region growing			
e.	Techniques of image processing: Region splitting, Binary morphology and grey morphology operation, feature extraction			

TEXT BOOKS

1. Saeed B.Niku, Introduction to Robotics: Analysis, Systems, Applications, 2nd edition, Pearson Education India, PHI 2003 (ISBN 81-7808-677-8)

2. M.P.Groover, Industrial Robotics – Technology, Programming and Applications, McGraw-Hill, USA, 1986

REFERENCE BOOKS

1. Janakiraman P.A., Robotics and image processing, Tata McGraw Hill, 1995.

2. YoremKoren, Robotics for Engineers, McGraw-Hill, USA, 1992.

3. Richard D.Klafter, Thomas A.Chmielewski and Michael Negin, Robotic Engineering – An Integrated Approach, Prentice Hall Inc, Englewoods Cliffs, NJ, USA, 1989. Ramesh Jam, Rangachari Kasturi, Brain G.Schunck, Machine Vision, Tata McGraw Hill

Course No: 64	Course Title: Robotics and Machine Vision Lab
Course Code:CSE 4112	Pre-Requisites: Nil
Credit: 1.5	Total Marks: 100
Contact Hours: 3 Hours/Week	
<u>Mark Distribution:</u>	
Lab Final Exam: 60 Marks	Viva: 30 Marks Class Attendance: 10 Marks

COURSE OBJECTIVES:

- ❖ To familiarize students about robotics programming and build confidence to develop, evaluate, test and incorporate robots in engineering systems.

COURSE OUTCOMES:

- The students will be able to
- Assemble robot parts like body, hand, sensors etc.
 - Implement programs for controlling robots using programming languages.
 - Inspect and analysis robot actions.

Learning Outcomes		Course Content	Teaching Strategy/ Learning Experience	Assessment Strategy
a.	Assemble robot body	Application of robots in processing operations,Assembly	Demonstration Exercise	Assignment Observation
a.	Integrate sensor modules	Position sensors, Potentiometers, encoders, LVDT, Velocity sensors, Acceleration Sensors, Force, Pressure and Torque sensors, Touch and Tactile sensors, Proximity, Range and sniff sensors.	Demonstration Exercise	Assignment Observation
a.	Develop programs for robot	Programming languages: sample program for different types of robots	Demonstration Exercise	Assignment Observation Practical Exam
a.	Analyze robot actions	Programming languages: sample program for different types of robots	Demonstration Exercise	Assignment Observation

				Practical Exam
a.	Apply & analyze Image Processing techniques	Image processing Techniques: Data reduction, Windowing, digital conversion. Segmentation, Thresholding, Connectivity, Noise reduction, Edge detection, Segmentation, Region growing and Region splitting, Binary morphology and grey morphology operation, feature extraction	Demonstration Exercise	Assignment Observation Practical Exam

TEXT BOOKS

1. Saeed B.Niku, Introduction to Robotics: Analysis, Systems, Applications, 2nd edition, Pearson Education India, PHI 2003 (ISBN 81-7808-677-8)

2. M.P.Groover, Industrial Robotics – Technology, Programming and Applications, McGraw-Hill, USA, 1986

REFERENCE BOOKS

1. Janakiraman P.A., Robotics and image processing, Tata McGraw Hill, 1995.

2. YoremKoren, Robotics for Engineers, McGraw-Hill, USA, 1992.

3. Richard D.Klafter, Thomas A.Chmielewski and Michael Negin, Robotic Engineering – An Integrated Approach, Prentice Hall Inc, Englewoods Cliffs, NJ, USA, 1989. Ramesh Jam, Rangachari Kasturi, Brain G.Schunck, Machine Vision, Tata McGraw Hill

Course No: 63	Course Title: Data Mining and Warehousing
-----------------------------	---

Course Code: CSE-4113

Credit: 3.00

Contact Hours: 3 Hours/Week

Pre-Requisites: Nil

Total Marks: 100

Mark Distribution:

Semester Final Exam: 72 Marks	Class Test: 20 Marks	Class Attendance: 08 Marks
--------------------------------------	-----------------------------	-----------------------------------

11.1 Rationale:

The amount of data collected across a wide variety of domains far exceeds our ability to reduce and analyze without the use of smart and intelligent analysis techniques. It is becoming a challenging task to obtain information from the massive collection of data. Data Science is a set of principles that support and guide the extraction of information and insight from data. Machine learning, on the other hand, is a branch of Artificial Intelligence that deals with the idea that systems can learn from data, identify patterns, and make decisions with minimal human interaction. This course presents the fundamentals of Data Science and Machine Learning. The concept of Data Science will help students to acquire knowledge on various data processing methods, approaches, tools and techniques. The section of Machine Learning will help the students to learn about different algorithms and approaches in order to build models in such a way that the models, when exposed to new data, will be able to produce reliable, repeatable decisions and results by learning from previous computation.

11.2 Objectives:

1. To introduce students to data collection and extraction techniques.
2. To develop the mathematical and logical skill sets for data preprocessing.
3. To develop and enhance data visualization techniques.
4. To understand the concepts of machine learning approaches and algorithms.
5. To acquire the skill for building machine learning problems.

11.3 Learning Outcomes	11.4 Course Content	11.5 Teaching Learning Strategy	11.6 Assessment Strategy
<ul style="list-style-type: none"> To become familiar with data science and its applications To learn different data types in data science 	Introduction to data science: history of data science, aims and objectives of data science, data, categorize of data, data sources, data collection and extraction	<ul style="list-style-type: none"> Lecture Group Discussion 	<input type="checkbox"/> Short Answer <input type="checkbox"/> Group Exercise <input type="checkbox"/> Completion <input type="checkbox"/> Assignment
<input type="checkbox"/> To know the techniques of dealing with missing and noisy values	Data preprocessing: data quality, data cleaning techniques, dealing with missing values, handling noisy	<ul style="list-style-type: none"> Lecture Group Discussion 	<input type="checkbox"/> Short Answer <input type="checkbox"/> Group Exercise

<input type="checkbox"/> To know other data preprocessing techniques	data, linear regression and non-linear regression.		<input type="checkbox"/> Completion <input type="checkbox"/> Assignment
<input type="checkbox"/> Describe, apply and analyze different image filtering techniques and image enhancement operators and algorithms in the spatial domain	Redundancy and correlation analysis, tuple duplication, conflict detection and resolution,	<ul style="list-style-type: none"> • Lecture • Group Discussion 	<input type="checkbox"/> Short Answer <input type="checkbox"/> Group Exercise <input type="checkbox"/> Completion <input type="checkbox"/> Assignment
<input type="checkbox"/> To understand why is data reduction necessary <input type="checkbox"/> To become familiar with data reduction techniques	Data reduction: wavelet transformation, principal component analysis, attribute subset selection,	<ul style="list-style-type: none"> • Lecture • Group Discussion 	<input type="checkbox"/> Short Answer <input type="checkbox"/> Group Exercise <input type="checkbox"/> Completion <input type="checkbox"/> Assignment
<input type="checkbox"/> To learn data transformation techniques <input type="checkbox"/> To know data visualization tools and techniques	Data transformation, and discretization and visualization: overview, normalization, binning, histogram analysis, data visualization tools and techniques.	<ul style="list-style-type: none"> • Lecture • Group Discussion 	<input type="checkbox"/> Short Answer <input type="checkbox"/> Group Exercise <input type="checkbox"/> Completion <input type="checkbox"/> Assignment
<input type="checkbox"/> To become familiar with machine learning and its scope <input type="checkbox"/> To learn different categories of learning	Introduction to machine learning, goals and applications of machine learning, aspects of developing learning systems, supervised, unsupervised and reinforcement learning.	<ul style="list-style-type: none"> • Lecture • Group Discussion 	<input type="checkbox"/> Short Answer <input type="checkbox"/> Group Exercise <input type="checkbox"/> Completion <input type="checkbox"/> Assignment
<input type="checkbox"/> To obtain the fundamental understanding of regression and classification analysis	Regression and classification analysis: linear regression, logistic regression, maximum likelihood and least square, Bias variance decomposition, over fitting and under fitting problems and solutions.	<ul style="list-style-type: none"> • Lecture • Group Discussion 	<input type="checkbox"/> Short Answer <input type="checkbox"/> Group Exercise <input type="checkbox"/> Completion <input type="checkbox"/> Assignment
<input type="checkbox"/> To learn the basic concepts and techniques of classification. <input type="checkbox"/> To understand the mechanism of different classifiers <input type="checkbox"/> To learn how to evaluate and compare different classifiers	Classification: Decision tree classifiers, Naïve Bayes classifiers, Neural networks, Support vector machine, Random forest, Nearest neighbor. Evaluation of classifiers. Ensemble methods.	<ul style="list-style-type: none"> • Lecture • Group Discussion 	<input type="checkbox"/> Short Answer <input type="checkbox"/> Group Exercise <input type="checkbox"/> Completion <input type="checkbox"/> Assignment
<input type="checkbox"/> To learn basic concepts and methods of cluster analysis. <input type="checkbox"/> To learn fundamental clustering techniques <input type="checkbox"/> To learn how to evaluate models	Clustering and reinforcement learning: cluster analysis, partition method, hierarchical method, density based clustering, evaluation of clustering, reinforcement analysis and approaches, model evaluation techniques.	<ul style="list-style-type: none"> • Lecture • Group Discussion 	<input type="checkbox"/> Short Answer <input type="checkbox"/> Group Exercise <input type="checkbox"/> Completion <input type="checkbox"/> Assignment

RECOMMENDED BOOKS AND PERIODICALS

Text Books:

1. Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani. “An introduction to statistical learning with application in R”
2. Trevor Hastie, Robert Tibshirani, Jerome Friedman “The elements of statistical learning”.
3. Christopher Bishop “Pattern Recognition and Machine Learning”

Course No: 64

Course Title: Data Mining and Warehousing Lab

Course Code: CSE-4108

Credit: 1.50

Contact Hours: 3 Hours/Week

Pre-Requisites: Nil

Total Marks: 100

Mark Distribution:

Lab Final Exam: 60 Marks

Viva: 30 Marks

Class Attendance: 10 Marks

11.1 Rationale:

The amount of data collected across a wide variety of domains far exceeds our ability to reduce and analyze without the use of smart and intelligent analysis techniques. It is becoming a challenging task to obtain information from the massive collection of data. Data Science is a set of principles that support and guide the extraction of information and insight from data. Machine learning, on the other hand, is a branch of Artificial Intelligence that deals with the idea that systems can learn from data, identify patterns, and make decisions with minimal human interaction. This course presents the fundamentals of Data Science and Machine Learning. The concept of Data Science will help students to acquire knowledge on various data processing methods, approaches, tools and techniques. The section of Machine Learning will help the students to learn about different algorithms and approaches in order to build models in such a way that the models, when expose to new data, will be able to produce reliable, repeatable decisions and results by learning from previous computation.

11.2 Objectives:

1. To introduce students to data collection and extraction techniques.
2. To develop the mathematical and logical skill sets for data preprocessing.
3. To develop and enhance data visualization techniques.
4. To understand the concepts of machine learning approaches and algorithms.
5. To acquire the skill for building machine learning problems.

11.3 Learning Outcomes	11.4 Course Content	11.5 Teaching Learning Strategy	11.6 Assessment Strategy
<ul style="list-style-type: none">• To learn data preprocessing	preprocessing	<ul style="list-style-type: none">• Demonstration• Exercise	<ul style="list-style-type: none">• Assignment• Observation
<ul style="list-style-type: none">• To learn data visualization techniques	Data visualization techniques	<ul style="list-style-type: none">• Demonstration• Exercise	<ul style="list-style-type: none">• Assignment• Observation
<input type="checkbox"/> To learn linear and logistics regression	Linear and logistics regression	<ul style="list-style-type: none">• Demonstration• Exercise	<ul style="list-style-type: none">• Assignment• Observation
<ul style="list-style-type: none">• To learn data classification	Data classification	<ul style="list-style-type: none">• Demonstration• Exercise	<ul style="list-style-type: none">• Assignment• Observation
<input type="checkbox"/> To learn data clustering	Data clustering	<ul style="list-style-type: none">• Demonstration• Exercise	<ul style="list-style-type: none">• Assignment• Observation

Course No: 63 Course Title: Software Testing & Quality Assurance

Course Code: CSE 4115

Credit: 3.00

Contact Hours: 3 Hours/Week

Pre-Requisites: Nil

Total Marks: 100

Mark Distribution:

Semester Final Exam: 72 Marks

Class Test: 20 Marks

Class Attendance: 08 Marks

11.1 Rationale:

This course provides an elementary introduction to software quality assurance and test. Upon completion of this course, students will have the ability to:

- Design comprehensive test plans.
- Apply software inspection techniques.
- Apply a wide variety of testing techniques.
- Demonstrate knowledge of key techniques and tools in software testing.
- Assess and evaluate software quality.
- Work as a team leader/member of a software testing team

11.2 Objectives:

1. Present effective testing techniques (both black-box and white box) for ensuring high quality software

2. Learn metrics for managing quality assurance
3. Understand capabilities of test tools
4. Establish a testing group and manage the whole testing project;
5. Clearly and correctly report the software defectives;
6. Asses the software product correctly;
7. Distinguish relationship between the software testing and the quality assurance.

11.3		11.4	11.5	11.6
Learning Outcomes		Course Content	Teaching learning Strategy	Assessment Strategy
a.	Know the basic concepts of Software Testing	Basic Testing Vocabulary Quality Assurance versus Quality Control The Cost of Quality Software Quality Factors How Quality is Defined Why Do We Test Software? What is a Defect? The Multiple Roles of the Software Tester(People Relationships) Scope of Testing When Should Testing Occur? Testing Constraints Life Cycle Testing Independent Testing What is a QA Process? Levels of Testing The “V” Concept of Testing	Lecture Exercise Demonstration	Quiz Assignment
a.	Apply Testing Techniques	Structural versus Functional Technique Categories Verification versus Validation Static versus Dynamic Testing Examples of Specific Testing Techniques	Lecture Exercise Demonstration	Quiz Assignment Project Task
a.	Know Test Administration	Test Planning Customization of the Test Process Budgeting Scheduling	Lecture Exercise Demonstration	Quiz Assignment
a.	Create the Test Plan	Prerequisites to test planning Understand the Characteristics of the Software Being Developed Build the Test Plan Write the Test Plan	Lecture Case Studies	Project Task Report Writing
a.	Understand Test Metrics – Guidelines and usage	Test Cases: Test case Design Building test cases Test data mining Test execution Test Reporting Defect Management Test Coverage – Traceability matrix	Lecture Demonstration	Quiz Assignment
a.	Apply Test reporting	Guidelines for writing test reports Test Tools used to Build Test Reports	Lecture Demonstration	Assignment

a.	Learn how to Manage Change	Software Configuration Management Change Management	Lecture Demonstration	Assignment
a.	Learn Risk Analysis and Management, User Acceptance testing	Risks – Risk Analysis and Management with examples User Acceptance testing – in detail explanation with details	Lecture	Case Study

Recommended Books And Periodicals		
	Authors	Book Name
1.	R. Wirfs-Brock et.al.	Designing Object-oriented
2.	Ian Sommerville	Software engineering
3.	R.S. Pressman	Software Engineering: A Practitioners Approach
4.	Robert C. Martin	Writing Effective Use Cases
5.	Alistair Cockburn	Writing Effective Use Cases
6.	Karl E. Wiegers	Software Requirements
7.	KshirasagarNaik, PriyadarshiTripathy	Software Testing and Quality Assurance: Theory and Practice 1st Edition,
8.	Ivan Mistrik, Richard M Soley, Nour Ali, John Grundy, BedirTekinerdogan	Software Quality Assurance: In Large Scale and Complex Software-intensive Systems 1st Edition
9.	Ron Patton.	Software Testing (2nd Edition) 2nd Edition,

Course No:	64	Course Title:	Software Testing & Quality Assurance Lab
-------------------	----	----------------------	---

Course Code: CSE 4116
Credit: 1.50
Contact Hours: 3 Hours/Week

Pre-Requisites: Nil
Total Marks: 100

Mark Distribution:

Continuous Evaluation: 60 Marks
 Lab Final: 30 Marks
 Class Attendance: 10 Marks

11.1

Rationale:

This course provides a practical experience on manual and automated software testing.

11.2

Objectives:

- Understand the effectively strategies of testing, the methods and technologies of software testing;
- Design test plan and test cases;
- Do automatic testing;
- Establish a testing group and manage the whole testing project;
- Clearly and correctly report the software defectives;
- Asses the software product correctly;
- Distinguish relationship between the software testing and the quality assurance.

11.3		11.4	11.5	11.6
Learning Outcomes		Course Content	Teaching learning Strategy	Assessment Strategy
a.	Demonstrate Manual Testing	Manual Testing Concepts, Types, Tool	Lecture Exercise Demonstration	Quiz Assignment
b.	Apply Automated Testing Techniques	Automation Testing: Process, Benefits & Tools	Lecture Exercise Demonstration	Quiz Assignment Project Task
c.	Apply Unit Testing	Unit Testing: What is, Types, Tools, Example	Lecture Exercise Demonstration	Quiz Assignment
d.	Apply Integration Testing, Smoke Testing, Regression Testing	Integration Testing: What is, Types, Top Down & Bottom Up Example System Testing: Types & Definition with Example Sanity Testing Vs Smoke Testing: Introduction & Differences Regression Testing: Definition, Test Cases (Example)	Lecture Case Studies	Project Task Report Writing
e.	Identify and apply Non Functional Testing	Non Functional Testing: Types with Example	Lecture Demonstration	Quiz Assignment
f.	Develop Test Cases	Test Documentation Test Scenario Write Test Cases Test Analysis (Test Basis) in Software Testing	Lecture Exercise Demonstration	Quiz Assignment

		Requirements Traceability Matrix (RTM) Test Data Generation: What is, How to, Example, Tools		
g.	Use Test Management & Control Tool	Software Test Estimation Techniques	Lecture Exercise Demonstration	Quiz Assignment

Recommended Books And Periodicals

	Authors	Book Name
1.	R. Wirfs-Brock et.al.	Designing Object-oriented
2.	Ian Sommerville	Software engineering
3.	R.S. Pressman	Software Engineering: A Practitioners Approach
4.	Robert C. Martin	Writing Effective Use Cases
5.	Alistair Cockburn	Writing Effective Use Cases
6.	Karl E. Wiegars	Software Requirements
7.	KshirasagarNaik, PriyadarshiTripathy	Software Testing and Quality Assurance: Theory and Practice 1st Edition,
8.	Ivan Mistrik, Richard M Soley, Nour Ali, John Grundy, BedirTekinerdogan	Software Quality Assurance: In Large Scale and Complex Software-intensive Systems 1st Edition
9.	Ron Patton.	Software Testing (2nd Edition) 2nd Edition,

Course No:

65

Course Title:

Fault Tolerant System

Course Code: CSE 4121

Credit: 3.00

Nil

Contact Hours: 3 Hours/Week

Pre-Requisites:

Total Marks: 100

Mark Distribution:

Semester Final 72

Exam: Marks

Class Test: 20 Marks

Class Attendance: 08 Marks

11.1

Rationale:

Fault-tolerant systems are used in applications that require high dependability, such as safety-critical control systems in vehicles and airplanes, or business-critical systems for e-commerce, automatic teller machines and financial transactions. This is an introductory course that covers basic techniques for design and analysis of fault-tolerant systems, as well as project management and development processes for safety-critical systems. The course covers techniques for tolerating hardware and software faults, analysis of fault-tolerant systems, project management and development processes for safety-critical systems. The content can be divided into five areas: 1. Terminology and definitions. 2. Design techniques for fault-tolerance. 3. Analysis of fault-tolerant system. 4. Project management and development processes. 5. System examples.

11.2

Objectives:

1. Understand the effectively strategies of testing, the methods and technologies of software testing;
2. Design test plan and test cases;
3. Do automatic testing;
4. Establish a testing group and manage the whole testing project;
5. Clearly and correctly report the software defectives;
6. Asses the software product correctly;
7. Distinguish relationship between the software testing and the quality assurance.

11.3		11.4	11.5	11.6
Learning Outcomes		Course Content	Teaching learning Strategy	Assessment Strategy
1	Understand the fault tolerance basics and applications	Definition of fault tolerance, Redundancy, Applications of fault-tolerance, Fundamentals of dependability	Lecture Exercise Demonstration	Quiz Assignment
2	Understand fault tolerant system attributes like reliability, safety, errors etc	UNIT II- ATTRIBUTES Reliability, availability, safety, Impairments: faults, errors and failures, Means: fault prevention, removal and forecasting	Lecture Exercise Demonstration	Quiz Assignment Project Task
3.	Ability to design and develop dependable systems for mission critical applications	UNIT III- DEPENDABILITY EVALUATION Common measures: failures rate, mean time to failure, mean time to repair, etc. Reliability block diagrams, Markov processes	Lecture Exercise Demonstration	Quiz Assignment
4.	Ability to know about the faults of various systems	UNIT IV- HARDWARE FAULT TOLERANCE Canonical and Resilient Structures; Reliability Evaluation Techniques and Models; Processor-level Fault Tolerance; Byzantine Failures and Agreements.	Lecture Exercise	Quiz
5.	Ability to know about different types of codes	UNIT V- INFORMATION REDUNDANCY and CHECKPOINTS Error Detection/Correction Codes (Hamming, Parity, Checksum, Berger, Cyclic, Arithmetic); Encoding/Decoding circuits; Resilient Disk Systems (RAID) Various checkpoints and shared memory systems.	Lecture Exercise	Spot test
6.	Apply Fault Tolerant in various design	UNIT VI- APPLICATIONS Fault tolerant circuit design: Adder, subtractor, multiplier etc. Defect-tolerance in VLSI Designs; Fault Detection in Cryptographic Systems.	Lecture Exercise Demonstration	Project

Recommended Books And Periodicals		
	Authors	Book Name
1.	<u>Israel Koren</u>	Fault-Tolerant Systems;
2.	<u>Elena Dubrova</u>	Fault Tolerant Design;
3.	Martin L. Shooman	Reliability of Computer Systems and Networks: Fault Tolerance, Analysis, and Design

Course No: 65Course Title: Introduction to DNA Computing

Course Code: CSE-4123Pre-Requisites: Nil

Credit: 3.00Total Marks: 100

Contact Hours: 3 Hours/Week

Mark Distribution:

Semester Final Exam: 72 MarksClass Test: 20 MarksClass Attendance: 08 Marks

11.1 Rationale:

This course is designed to introduce bioinformatics tools and analysis methods. Upon completion of the course, students should be more comfortable working with the vast amounts of biomedical and genomic data and online tools that will be relevant to their work in future.

11.2 Objectives:

1. Define computational genomics and phylogenetics concepts.
2. Apply common bioinformatics tools and techniques effectively.
3. Implement basic algorithms such as sequence alignment.
4. Perform independent genome comparisons and assemblies using gained knowledge.
5. Evaluate on your own the promise and challenges for computing on biological datasets.

11.3	11.4	11.5	11.6
Learning Outcomes	Course Content	Teaching Strategy/ Learning Experience	Assessment Strategy
Explain introductory concepts of bioinformatics	DNA, genes and the genome.	Lecture Exercise	Short Answer Essay
Knowledge about Sequence statistics	Sequence statistics.	Lecture Assignment	Short Answer Essay
Implement basic algorithms on Sequence alignment	Sequence alignment.	Lecture Assignment	Short Answer Essay
Learn about variation and natural selection	Variation and natural selection	Lecture Assignment	Short Answer Essay
Learn and apply Hidden Markov Models	Hidden Markov Models	Lecture Assignment	Short Answer Essay
Learn gene finding	Ab initio gene finding	Lecture Assignment	Short Answer Essay
Perform independent genome comparisons and assemblies using gainedknowledge	Whole genome comparisons	Lecture Assignment	Short Answer Essay
Learn about Genome assembly and validation	Genome assembly and validation	Lecture Assignment	Short Answer Essay
Define phylogenetics concepts	Phylogenetic analysis	Project	Demostration

Recommended Books And Periodicals

Authors	Book Name
1. W. Ewens and G. Grant	Statistical Methods in Bioinformatics
2. C.H. Wu	Neural Networks and Genome Informatics
3. Pierre Baldi and S�yrenBrunak	Bioinformatics; The Machine Learning Approach

Course No: 65Course Title: Software Project Management and Maintenance

Course Code: CSE 4125Pre-Requisites: Nil

Credit: 1.50Total Marks: 100

Contact Hours: 3 Hours/Week

Mark Distribution:

Continuous 60Lab Final: 30 MarksClass Attendance: 10 Marks

Evaluation: Marks

11.1 Rationale:

This course provides a practical experience on manual and automated software testing.

11.2 Objectives:				
1. Understand the effectively strategies of testing, the methods and technologies of software testing; 2. Design test plan and test cases; 3. Do automatic testing; 4. Establish a testing group and manage the whole testing project; 5. Clearly and correctly report the software defectives; 6. Asses the software product correctly; 7. Distinguish relationship between the software testing and the quality assurance.				
11.3		11.4	11.5	11.6
Learning Outcomes		Course Content	Teaching learning Strategy	Assessment Strategy
a.	Learn Introduction to System Analysis	Introduction to System Analysis: a. What is a System? b. System Fundamentals c. Types of Systems d. The Study of Systems Analysis e. Advantages of Systems Analysis f. Limitations of Systems Analysis	Lecture Exercise Demonstration	Quiz Assignment
a.	Learn duties of System Analyst	The Systems Analyst: a. The Duties of the Systems Analyst b. Communications and the Organization c. Job Description d. Skills, Knowledge and Training e. Preparing for a Career in Systems Analysis f. The Future of the Systems Analyst g. Formal Organization Structure	Lecture Exercise Demonstration	Quiz Assignment Project Task
a.	Demonstrate the tools of the Systems Analyst	a. System Modeling b. Advantages of Design Diagrams c. Traditional Design Tools d. The Gantt Chart e. Decision Trees f. Decision Tables g. Flowcharts h. Structured Design Tools i. Data Dictionary j. Data Flow Diagrams k. Hierarchy Plus Input-Process-Output (HIPO) l. Structured English (Pseudocode) m. Warnier-Orr Diagrams n. Nassi-Shneiderman Charts o. Presentation Graphs	Lecture Exercise Demonstration	Quiz Assignment
a.	Learn Project Management Skills	a. Project Concepts b. Need for Project Management c. Why Projects Fail? d. Managing Projects	Lecture Case Studies	Project Task Report Writing

		e. Traditional Project Management f. Computer Project Management g. Microcomputer Project Management Software		
a.	Learn basics of design and analysis phase	a. Systems Design b. Logical and Physical Designs c. Prototype Designs d. Computerized System Design e. Design Principles f. The Data Cycle g. Systems Design Task List	Lecture Demonstration	Quiz Assignment
a.	Learn basics of development phase	a. The Task of Systems Development b. Lead Time Schedules c. Contract Terms d. Hardware Performance e. Software Performance f. Communication Equipment Performance g. Prototype Installation h. Benchmark Testing	Lecture Exercise Demonstration	Quiz Assignment
a.	Learn basics of implementation phase	a. How to Undertake Systems Implementation b. The Changeover Timetable c. The Human Element d. Training and In-Service Education e. Implementation Trouble Spots f. Assistance during Implementation	Lecture Exercise Demonstration	Quiz Assignment
a.	Systems Evaluation and Optimization	a. Need for Documentation b. Guidelines for Preparing Documentation c. Major Systems Documentation d. Distribution of Documentation e. Revision of Documentation	Lecture Exercise Demonstration	Quiz Assignment

Recommended Books And Periodicals

Authors	Book Name
1. R. Wirfs-Brock et.al.	Designing Object-oriented
2. Ian Sommerville	Software engineering
3. R.S. Pressman	Software Engineering: A Practitioners Approach
4. Gerald A. Silver and Myrna L. Silver	Systems Analysis and Design

Course No: 65 Course Title: Distributed System and Cloud Computing

Course Code: CSE 4125

Credit: 1.50

Contact Hours: 3 Hours/Week

Pre-Requisites: Nil

Total Marks: 100

Mark Distribution:

Continuous Evaluation:

60 Marks

Lab Final:

30 Marks

Class Attendance:

10 Marks

Course No: 66		Course Title: E-commerce and Management Information Systems				
Course Code: BUS 4101		Pre-Requisites: Nil				
Credit: 3.00		Total Marks: 100				
Contact Hours: 3 Hours/Week						
<u>Mark Distribution:</u>						
Semester Final Exam:		72 Marks	Class Test:	20 Marks	Class Attendance:	08 Marks

COURSE OBJECTIVES: The students will be able

- To evaluate the role of information systems in transforming business and their relationship to globalization.
- To know about the significance of systems in improving organizational performance.
- To understand ethical, social, and political issues are raised by information systems.
- To know the principal tools and technologies for accessing information from databases to improve business performance and decision making.
- To know the functions of Internet and Internet technology and their support in communication, e-commerce and e-business.

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- Understand management information systems and their role in today’s organizations.
- identify how MIS shapes and controls current business world and improve the performances of organizations.
- Become familiar with the major trends in MIS infrastructures and how these evolutions will affect workplaces and business strategies.
- Understand the different ethical issues raised by information systems and their remedy.

Learning Outcomes		Course Content	Teaching Strategy/ Learning Experience	Assessment Strategy
	Define Management Information System	Definition-Characteristics-MIS services-Limitations-Types of MIS-importance-Potential risks of information systems-data and Information-Difference between data and information-Quality of good information-The process of converting data into information.	Lecture Visual Presentation, Group Discussion, Assignment, Exercise etc.	Quiz, Short Essay, Q/A method, Assignment, Oral Presentation
b.	Mention Characteristics and Limitations of MIS, Classify MIS			
c	Describe importance, Potential risks of information systems			
d.	Differentiate between data and information, Quality of good information			
e.	Explain the process of converting data into information.			
	Define Information Systems	System concepts-Information systems-Information	Lecture	Quiz, Short Essay, Q/A

b.	Differentiate between IS and IT	technology-Differences between IS and IT-The expanding role of information systems-Activities of information systems-Information systems resources-Classifications of information systems	Visual Presentation, Group Discussion, Assignment, Exercise etc.	method, Assignment, Oral Presentation
c.	Explain activities of information systems, Information systems resources			
d.	Classify information systems			
	Describe Information systems and organizational structure	Information systems and organizational structure-Roles of IT and IS in organizational decision making-A system approach to problem solving	Lecture Visual Presentation, Group Discussion, Assignment, Exercise etc.	Quiz, Short Essay, Q/A method, Assignment, Oral Presentation
b.	Mention roles of IT and IS in organizational decision making			
c.	Explain a system approach to problem solving			
	Define Telecommunication, Information superhighway	Telecommunications-Information superhighway-Components of telecommunications network-Network, protocol-Types of telecommunication signal-Communication channel-Communication processor-Communication software-Network topology-Communication channel characteristics-Types of telecommunication network-Telecommunication carriers-Business value of telecommunications	Lecture Visual Presentation, Group Discussion, Assignment, Exercise etc.	Quiz, Short Essay, Q/A method, Assignment, Oral Presentation
b.	Describe components of telecommunications network-Network, protocol-Types of telecommunication signal			
c.	Define Communication channel, Communication processor, Communication software, Network topology, Communication channel characteristics			
d.	Classify and describe telecommunication network, Telecommunication carriers, Business value of telecommunications			
a.	Define management, Mention roles of management information	Information and the roles of management information and the levels of management-Information and decision making-Decision support systems-Different types of business problems-Different types of managerial decision making-Functions, Components and Applications of DSS-GDSS-Executive information systems-functions of an EIS-Rationale for EIS-Characteristics of DSS and EIS-Critical success factors for DSS/EIS-Difference between TPS, MIS, DSS and EIS.	Lecture Visual Presentation, Group Discussion, Assignment, Exercise etc.	Quiz, Short Essay, Q/A method, Assignment, Oral Presentation
b.	Describe the levels of management, Information and decision making			
c.	Explain types of managerial decision making, Functions, Components and Applications of DSS, GDSS			
d.	Executive information systems, functions of an EIS, Rationale for EIS, Characteristics of DSS and EIS			
e.	Describe critical success factors for DSS/EIS-Difference between TPS, MIS, DSS and EIS			

a.	Define Information systems in business, Marketing information systems, Manufacturing information systems	Information systems in business-Marketing information systems-Manufacturing information systems-Human resource information system-Accounting information systems-Financial information systems-Strategic information system. Information systems security and control: Computer security-Reasons of computer systems vulnerability-Types of computer security breaches-Security controls-Audit of information systems.	Lecture Visual Presentation, Group Discussion, Assignment, Exercise etc.	Quiz, Short Essay, Q/A method, Assignment, Oral Presentation
b.	Describe Human resource information system, Accounting information systems, Financial information systems, Strategic information system			
c.	Define computer security, Reasons of computer systems vulnerability, Types of computer security breaches, Security controls, Audit of information systems			

TEXT BOOKS

1. James A. O’Brien : Management Information Systems: Managing Information Technology in the Networked Enterprise
2. Kenneth C. Laudon and Jane P. Laudon : Management Information Systems: Organization and Technology
3. Kenneth C. Laudon and Jane P. Laudon : Management Information Systems: Managing the Digital Firm
4. Uma G. Gupta : Management Information Systems: A Managerial Perspective

Course No: 67		Course Title: Internship	
Course Code: CSE 4210		Pre-Requisites: Nil	
Credit: 9.00		Total Marks: 100	
Contact Hours:			
<u>Mark Distribution:</u>			
Evaluation Committee		60	Industry 40
Course No: 68		Course Title: Industrial Tour	
Course Code: CSE 4212		Pre-Requisites: Nil	
Credit: 1.00		Total Marks: 100	
Contact Hours:			
<u>Mark Distribution:</u>			
Report: 30		Presentation: 50	Industry Visit: 20
Course No:69		Course Title: Thesis/Project	
Course Code: CSE 4000		Pre-Requisites: Nil	
Credit: 6.00		Total Marks: 100	
Contact Hours: 3 Hours/Week			
<u>Mark Distribution:</u>			
Supervisor/External Examiner		60	Defense 40
Course No:70		Course Title: Viva Voce	
Course Code: CSE 4200		Pre-Requisites: Nil	
Credit: 1.00		Total Marks: 100	
Contact Hours:			
<u>Mark Distribution:</u>			
Total Marks		100	

