NEW HORIZON COLLEGE OF ENGINEERING

Autonomous College Permanently Affiliated to VTU, Approved by AICTE & UGC
Accredited by NAAC with 'A' Grade, Accredited by NBA

The Trust is a Recipient of Prestigious Rajyotsava State Award 2012 Conferred by the Government of Karnataka
Awarded Outstanding Technical Education Institute in Karnataka-2016
Ring Road, Bellandur Post, Near Marathalli, Bangalore -560 103, INDIA

Academic Year 2020-21

ISE – Information Science & Engineering

Seventh and Eigth Semester

Scheme and Syllabus

CONTENTS

VISION

To evolve as a centre of academic excellence and advanced research in information science and engineering discipline and to endeavour the computational competence of students for their dream career achievement and enhancing the managerial and technical skills.

MISSION

To inculcate students with profound understanding of fundamentals related to discipline, attitudes, skills and their application in solving real world problems, with an inclination towards societal issues and research.

Program Education objectives (PEOs)

PEO1	To excel in their professional career with expertise in providing solutions to Information Technology problems.
PEO2	To pursue higher studies with profound knowledge enriched with academia and industrial skill sets.
PEO3	To exhibit adaptive and agile skills in the core area of Information Science & Engineering to meet the technical and managerial challenges.
PEO4	To demonstrate interpersonal skills, professional ethics to work in a team to make a positive impact on society.

PEO to Mission Statement Mapping

Mission Statements	PEO1	PEO2	PEO3	PEO4
To prepare the students with academic and industry exposure by empowering and equipping them with necessary domain knowledge.	3	2	2	2
To prepare the students for global career in information technology with relevant technical and soft skills.	3	2	2	2
To encourage students to participate in co-curricular and extracurricular activities leading to the enhancement of their social and professional skills.	2	2	3	3

Correlation: 3- High, 2-Medium, 1-Low

Program Specific Outcomes(PSO's)

PSO1: The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics and networking or efficient design of computer based systems of varying complexity.

PSO2: The ability to apply standard practices and strategies in software project development using innovative ideas and open ended programming environment with skills in teams and professional ethics to deliver a quality product for business success.

Program Outcomes (PO) with Graduate Attributes

	Graduate Attributes	Program Outcomes (POs)
1	Engineering Knowledge	**PO1:** The basic knowledge of Mathematics, Science and Engineering.
2	Problem analysis	**PO2:** An Ability to analyze, formulate and solve engineering problems.
3	Design and Development of Solutions	**PO3:** An Ability to design system, component or product and develop interfaces among subsystems of computing.
4	Investigation of Problem	**PO4:** An Ability to identify, formulate and analyze complex engineering problem and research literature through core subjects of Computer Science.
5	Modern Tool usage	**PO5:** An Ability to use modern engineering tools and equipments for computing practice.
6	Engineer and society	**PO6:** An Ability to assess societal, health, cultural, safety and legal issues in context of professional practice in Computer Science & Engineering.
7	Environment and sustainability	**PO7:** The broad education to understand the impact of engineering solution in a global, economic, environmental and societal context.
8	Ethics	**PO8:** An understanding of professional and ethical responsibility.
9	Individual & team work	**PO9:** An Ability to work both as individual and team player in achieving a common goal.
10	Communication	**PO10:** To communicate effectively both in written and oral formats with wide range of audiences.
11	Lifelong learning	**PO11:** Knowledge of contemporary issues, Management and Finance.
12	Project management and finance	**PO12:** An Ability to recognize the need and thereby to engage in independent and life-long learning for continued professional and career advancement.

Mapping of POs with PEOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PEO1	3	3	3	2	3	-	-	-	3	-	3	-
PEO2	3	3	3	2	3	-	-	-	3	-	3	-
PEO3	3	3	3	2	3	-	-	-	3	-	3	-
PEO4	3	3	3	2	3	-	-	-	3	-	3	-

Correlation: 3- High, 2-Medium, 1-Low

New Horizon College of Engineering
Department of Information Science and Engineering
Seventh Semester B.E Program-Scheme

Sl.No	Course Code	Course	Credit Distribution				Overall Credits	Contact Hours Weekly Theory	Contact Hours Weekly Lab	Marks		
			L	P	T	S				CIE	SEE	TOTAL
1	ISE71	Fundamentals of Machine Learning	3	2	0	0	5	4	4	75	75	150
2	ISE72	Software Testing and Automation	3	1	0	0	4	4	2	75	75	150
3	ISE73x	Professional Elective-2	3	0	0	1	4	4	0	50	50	100
4	ISE74x	Professional Elective-3	3	0	0	1	4	4	0	50	50	100
5	ISE75x	Professional Elective-4	3	0	0	1	4	4	0	50	50	100
6	NHOPx	Open Electives**	3	0	0	1	4	4	0	50	50	100
TOTAL							25	24	5	350	350	700

** Scheme and Syllabus for Open Electives is available separately

Professional Elective-2		Professional Elective-3		Professional Elective-4	
ISE731	OOMD	ISE741	Cryptography & Network Security	ISE751	Enterprise Application Programming
ISE732	C# & .NET	ISE742	Internet of Things	ISE752	Introduction to Social Network Analytics
ISE733	Artificial Intelligence	ISE743	User Interface Design	ISE753	Agile Methodologies
ISE734	Information Retrieval	ISE744	Software Architecture	ISE754	Human Computer Interaction
ISE735	Information Coding Theory	ISE745	Multimedia Systems	ISE755	Storage Area Networks

New Horizon College of Engineering
Department of Information Science and Engineering
Eighth Semester B.E Program-Scheme

Sl. No.	Course Code	Course	Credit Distribution				Overall Credits	Contact Hours Weekly Theory	Contact Hours Weekly Lab	Marks		
			L	P	T	S				CIE	SEE	TOTAL
1	ISE81X	Professional Elective – 5	3	0	0	1	4	4	0	50	50	100
2	ISE82	Internship	0	4	0	0	4	0	0	50	50	100
3	ISE83	Project Work	0	16	0	1	16	0	0	200	200	400
TOTAL							**24**	**4**	**0**	**300**	**300**	**600**

** Scheme and Syllabus for Open Electives is available separately.

Professional Electives-5	
ISE811	Software Architecture and Design Patterns
ISE812	Android Application Development
ISE813	Management and Entrepreneurship
ISE814	Management Information Systems
ISE815	Software Quality Metrics

SEVENTH SEMESTER

SYLLABUS

FUNDAMENTALS OF MACHINE LEARNING

Course Code : ISE71 **Credits: 05**

L:P:T:S : 3:2:0:0 **CIE Marks: 75**

Exam Hours : 3+3 **SEE Marks: 75**

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

CO1	Recall the problems for machine learning and select the either supervised, unsupervised or reinforcement learning.
CO2	Apply Statistics and probability concepts for solving machine learning problems
CO3	Illustrate concept learning, ANN, Bayes classifier, k nearest neighbor, Q
CO4	Apply Regression techniques for predictions and validating the models
CO5	Evaluating Mathematical Models for Machine Learning algorithms
CO6	Construct Instance Based and Reinforcement Learning Algorithms.

Mapping of Course Outcomes to Program Outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	3	2	2	1	-	3	2	2	1	2
CO2	3	3	3	3	2	2	-	3	2	2	1	2
CO3	3	3	3	3	2	2	-	3	2	2	1	2
CO4	3	3	3	3	2	2	-	3	2	2	1	2
CO5	3	3	3	3	2	2	-	3	2	2	1	2
CO6	3	3	3	3	2	2	-	3	2	2	1	2

Mapping of Course Outcomes to Program Specific Outcomes:

	PSO1	**PSO2**
CO1	3	2
CO2	3	2
CO3	3	2
CO4	3	2
CO5	3	2
CO6	3	2

Module No.	**Module Contents**	**Hours**	**Cos**
1	**Introduction**: A brief introduction to machine learning, Supervised Learning, Unsupervised learning, Reinforcement learning, Well posed learning	9+6	CO1

	problems, Designing a Learning system, Perspective and Issues in Machine Learning. Concept Learning: Concept learning task, Concept learning as search, Find-S algorithm, Version space, Candidate Elimination algorithm, Inductive Bias. 1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file. 2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.		
2	**Regression:** Linear Regression, Multiple Regression, Logistic Regression, Weighted Regression .**Decision Tree Learning**: Decision tree representation, Appropriate problems for decision tree learning, Basic decision tree learning algorithm, hypothesis space search in decision tree learning, Inductive bias in decision tree learning, Issues in decision tree learning. 1. Develop a program to demonstrate the prediction of values of a given dataset using Linear regression 2. Develop a program to demonstrate the prediction of values of a given dataset using Multiple linear regression 3. Develop a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.	9+9	CO2
3	**Bayesian Learning**: Introduction, Bayes theorem, Bayes theorem and concept learning, ML and LS error hypothesis, ML for predicting probabilities, MDL principle, Naive Bayes classifier, Bayesian belief networks, EM algorithm 1. Develop a program to implement the naïve Bayesian Classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets. 2. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Calculate the accuracy, precision, and recall for your data set..	9+9	CO3, CO4
4	**Support Vector Machine** : Support Vector Machine, Kernel function and Kernel SVM. **Artificial Neural Networks**: Introduction, Neural Network representation, Appropriate problems, Perceptrons, Back propagation algorithm, Introduction to deep neural network. **Clustering**: k-means, Adaptive Hierarchical Clustering	9+9	CO5

	1. Develop a program to construct Support Vector Machine considering a Sample Dataset. 2. Write a program to construct Recommendation System for Music data.		
5	**Evaluating Hypothesis:** Motivation, Estimating hypothesis accuracy, Basics of sampling theorem, General approach for deriving confidence intervals, Difference in error of two hypothesis, Comparing learning algorithms. **Instance Based Learning**: Introduction, k-nearest Neighbour Learning, radial basis function, cased-based reasoning,Random Forest classifier **Reinforcement Learning**: Introduction, Learning Task, Q Learning	9+9	CO6
	1. Implement K Means algorithm 2. Develop a program to implement K-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. 3.Implement Random Forest algorithm		

TEXT BOOKS:

1. Tom M. Mitchell, Machine Learning, India Edition 2013, McGraw Hill Education.
2. Ethem Alpaydın, "Introduction to machine learning", second edition, MIT press.

REFERENCE BOOKS:

1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, 2nd edition, Springer series in statistics.

2. Dipanjan Sarkar,Raghav Bali ,Tushar Sharma, "Practical Machine Learning with Python-A Problem-Solver's Guide to Building Real-World Intelligent Systems",APress,2018

3. Kevin P. Murphy , Francis Bach , "Machine Learning: A Probabilistic Perspective (Adaptive Computation and Machine Learning) 1st Edition, Massachusets Institute of Technology,2012

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	**Tests**	**Assignments**	**Quizzes**	**Co Curricular**	**Lab**
Marks (out of 50)	**25**	**5**	**10**	**10**	**25**
Remember	5	-	-	-	-
Understand	5	-	5	-	10
Apply	5	5	5	-	15
Analyze	5	-	-	10	-
Evaluate	5	-	-	-	-
Create	-	-	-	-	-

SEE- Semester End Examination (50 Marks)

Blooms Category	Tests	Lab
Remember	10	-
Understand	10	5
Apply	20	20
Analyze	5	-
Evaluate	5	-
Create	-	-

SOFTWARE TESTING AND AUTOMATION

Course Code: ISE72 **Credits: 04**
L:P:T:S : 3:1:0:0 **CIE Marks: 50+25**
Exam Hours: 3+3 **SEE Marks: 50+25**

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

CO1	Understand the fundamental concepts in software testing.
CO2	Discuss the importance of Structural and Regression testing.
CO3	Understand the importance of GUI Testing and software metrics in Software Testing.
CO4	Describe the Defect Management Process.
CO5	Analyze the Risk Management in Software Testing.
CO6	Understand and Analyze the Testing Tools related to Static and Dynamic testing

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	2	2	1	2	2	1	1	2
CO2	3	3	3	3	2	2	1	2	2	1	1	2
CO3	3	3	2	3	2	1	1	2	2	1	1	2
CO4	3	2	2	2	2	2	1	2	2	1	1	2
CO5	3	2	2	2	2	2	1	2	2	1	1	2
CO6	3	2	2	2	2	2	1	2	2	1	1	2

Mapping of Course Outcomes to Program Specific Outcomes:

	PSO1	PSO2
CO1	3	2
CO2	3	2
CO3	3	2
CO4	3	2
CO5	3	2
CO6	3	2

Module No.	Module Contents	Hours	Cos
1	Fundamentals: What Is Software Verification and Validation? - Verification and Validation Techniques – V-Model of Testing – Software Testing - Purpose of Testing - Taxonomy of Bugs - Defect And Failure Analysis – Types of Testing Techniques – Black Box – White Box – Gray Box Testing Test Adequacy and Coverage. Functional Testing Functional testing - Boundary Value Testing - Equivalence class testing - Decision table based testing - Evaluation of the testing – Assessed exercise: Specify and design test cases.	9+8	CO1
	1.) 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 a triangle and determine if the three values represent an equilateral triangle, isosceles triangle, scalene triangle, or they do not form a triangle at all. Assume that the upper limit for the size of any side is 10. Derive test cases for your program based on boundary-value analysis and Equivalence Testing, execute the test cases and discuss the results 2.) Design, develop, code and run the program in any suitable language to solve the commission problem. Analyze it from the perspective of boundary value testing, derive different test cases, execute these test cases and discuss the test results 3.)Design, develop, code and run the program in any suitable language to implement the NextDate function. Analyze it from the perspective of equivalence class value testing, derive different test cases, execute these test cases and discuss the test results.		
2	Structural Testing:Path testing - Data and Control Flow Testing – Graph Based Testing - Evaluation of the testing and summary Regression Testing:Need for Regression Testing – Impact Analysis – Regression Test Selection Techniques - Code and Model Based Techniques – Test Case Optimization Techniques.	9+12	CO2
	1.)Write a program in c language for matrix multiplication. "Introspect the causes for its failure and write down the possible reasons". Analyze the Positive test cases and Negative Test cases. 2.)Create a test plan document for any application (e.g. Employee Management System).Implement the system using Web Technologies.		
3	**Non functional testing** GUI Testing – Domain Based Testing – Performance Testing – Stress Testing – Load Testing – Monkey Testing – Acceptance Testing – Alpha, Beta, Gamma Testing – Software Acceptance Plan. **Metrics:** Importance of Metrics in Testing - Effectiveness of Testing – Defect Density – Defect Leakage Ratio – Residual	9+8	CO3, CO4

	Defect Density – Test Team Efficiency – Test Case Efficiency – Various Test Reports.		
	1. Implement test script in Selenium IDE using recording, playing back/executing and saving processes, Use Selenium IDE Commands Assertions and Actions to directly interact with page elements. 2. Using Selenium IDE, create a test suite containing minimum 4 test cases (for any two web sites). 3. Install Selenium server and demonstrate using a script in java.		
4	**Test Management** Defect Management – Defect Classification – Defect Life Cycle – Defect Management Process – Reporting Defect – Defect Analysis – Fish Bone Techniques – Risk Analysis – Risk Based Testing – Test Plan – Test Strategy – Test Estimation – Code Reviews.	9+4	CO5
	1. Write and test a program to login a specific web page. 2. Write and test a program to update 10 student records into table into Excel file using Selenium.		
5	**Testing Tools** Features of Testing Tools – Guidelines for Selecting Tools – StaticTesting Tools – Dynamic Testing Tools – Advantages and Disadvantages of Testing Tools – When to use Test Tools? Junit, selenium, Automation scripts practice.	9+8	CO6
	1. Write and test a program to provide total number of objects present on a web page using selenium.		

Text Books:

1. M G Limaye, "Software Testing – Principles, Techniques and Tools", Tata McGraw Hill,
   2009.

2. Boris Beizer, "Software Testing Techniques", 2nd Edition, Dream tech press, 2003.

Reference Books:

1. Edward Kit, "Software Testing in the Real World - Improving the Process", Pearson Education, 2004.

2. William E. Perry, "Effective methods for software testing", 2nd Edition, John Wiley, 2000.

CIE - Continuous Internal Evaluation (50+25 Marks)

Bloom's Category	Tests	Assignments	Quizzes	Co-Curricular
Marks (out of 50)	**25**	**10**	**5**	**10**
Remember	5		5	
Understand	5			
Apply	5	5		
Analyze	5			
Evaluate	5	5		
Create				

SEE – Semester End Examination (50+25marks)

Bloom's Taxonomy	Tests	Lab
Remember	10	5
Understand	10	5
Apply	10	5
Analyze	10	5
Evaluate	10	5
Create	-	-

Object Oriented Modeling and Design

Course Code: ISE731 **Credits: 04**

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

Exam Hours: 3 **SEE Marks: 50**

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

CO1	Understand Object Oriented Modeling techniques
CO2	Develop class models using class diagrams from the requirements specified for a particular problem
CO3	Develop state models using state diagrams from the requirements specified for a particular problem
CO4	Construct use case models, sequence models and activity models from the requirements specified for a particular problem
CO5	Understand Object Oriented methodology.
CO6	Understand, analyse and compare different software architecture patterns.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	3	-	-	-	-	-	1	-	2
CO2	2	2	2	3	-	-	-	-	-	1	-	2
CO3	2	2	2	3	-	-	-	-	-	1	-	2
CO4	2	2	2	3	-	-	-	-	-	1	-	2
CO5	2	2	2	3	-	-	-	-	-	1	-	2
CO6	2	2	2	3	-	-	-	-	-	1	-	2

Mapping of Course Outcomes to Program Specific Outcomes:

	PSO1	PS02
CO1	2	3
C02	2	3
CO3	2	3
CO4	2	3
CO5	2	3
CO6	2	3

Module No.	Module Contents	Hours	COs
1	**INTRODUCTION, MODELING CONCEPTS-1:** What is Object Orientation?What is OO development? OO themes; Modeling, Concepts -1: The three models, Class Modeling: Object and class concepts; Link and associations concepts; Generalization and inheritance; A sample class model, Advanced Class Modeling: Advanced object and class concepts; Association ends; N-ary associations; Aggregation; Abstract classes; Multiple inheritance; Metadata; Reification; Constraints; Derived data.	10	CO1, CO2
2	**MODELING CONCEPTS-2:** State Modeling**:** Events, States, ransitions an Conditions; State diagrams; State diagram behavior, Advanced Stat Modeling: Nested state diagrams; Nested states; Signal generalization Concurrency; A sample state model; Relation of class and state models.	9	CO1, CO3
3	**MODELING CONCEPTS-3**: Interaction Modeling: Use case models; Sequence models; Activity models. Use case relationships; Procedural sequence models; Special constructs for activity models.	9	CO1, CO4
4	**MODELING CONCEPTS-4:** Implementation Modeling: Overview of implementation; Fine-tuning classes; Fine-tuning generalizations; Realizing associations; Testing.	7	CO5
5	**DESIGN PATTERNS:** What is a pattern and what makes a pattern? Pattern categories; Relationships between patterns; Pattern description. Communication Patterns: Forwarder-Receiver; Client-Dispatcher-Server. Management Patterns: View handler, Idioms: Introduction; What can idioms provide? Idioms and style; Counted Pointer example.	10	CO6

TEXT BOOKS:

1. Michael Blaha, James Rumbaugh: Object-Oriented Modeling and Design with UML, 2nd Edition, Pearson Education, 2005. (Chapters 1 to 17, 23)

2. Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, Michael Stal: Pattern-Oriented Software Architecture, A System of Patterns, Volume 1, John Wiley and Sons, 2007. (Chapters 1, 3.5, 3.6, 4)

REFERENCES:

1. Grady Booch et al: Object-Oriented Analysis and Design with Applications, 3rd Edition, Pearson Education, 2007.

2. Brahma Dathan, Sarnath Ramnath: Object-Oriented Analysis, Design, and Implementation, Universities Press, 2009.

3. Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado: UML 2 Toolkit, Wiley-Dreamtech India, 2004.

4. Simon Bennett, Steve McRobb and Ray Farmer: Object-Oriented Systems Analysis and Design Using UML, 2nd Edition, Tata McGraw-Hill, 2002.

CIE - Continuous Internal Evaluation (50 Marks)

Bloom's Taxonomy	**Tests**	**Assignments**	**Quizzes**	**Self Study**
Marks (Out of 50)	**25**	**10**	**5**	**10**
Remember	5	5	5	-
Understand	10	5	-	-
Analyze	5	-	-	5
Evaluate	-	-	-	5
Create	-	-	-	-

SEE – Semester End Examination (50 Marks)

Bloom's Taxonomy	**Tests**
Remember	10
Understand	20
Apply	10
Analyze	10
Evaluate	-
Create	-

C# AND .NET

Course Code: ISE732 **Credits : 04**
L:P:T:S : 3:0:0:1 **CIEMarks : 50**
Exam Hours: 3 **SEE Marks : 50**

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

CO1	Explain the basics of .Net platform and the role of base class libraries, role of common intermediate language and namespaces.
CO2	Explain the method to Define and deploy the different command line compiler options.
CO3	Discuss the fundamentals of C# and to build the basic C# program using different constructs.
CO4	Review the basic pillars of object oriented programming concepts, Exception Handling and basics of object lifetime .
CO5	Discuss the different system defined interfaces and collections
CO6	Define the custom interfaces with examples.

Mapping of Course Outcomes to Program Outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	1	1	-	1	-	-	-	2	3	-	1
CO2	2	1	2	-	3	-	-	-	2	3	-	1
CO3	3	2	3	1	3	-	-	-	2	3	-	2
CO4	3	2	3	1	3	-	-	-	3	3	-	2
CO5	3	2	3	1	3	-	-	-	3	3	-	2
CO6	3	2	3	1	3	-	-	-	3	3	-	2

Module No.	**Module Contents**	**Hours**	**COs**
1	**The Philosophy of .NET :**Understanding the Previous State of Affairs, The .NET Solution, The Building Block of the .NET Platform (CLR,CTS, and CLS), The Role of the .NET Base Class Libraries, What C# Brings to the Table, An Overview of .NET Binaries (aka Assemblies), the Role of the Common Intermediate Language , The Role of .NET Type Metadata, The Role of the Assembly Manifast, Compiling CIL to Platform –Specific Instructions, Understanding the Common Type System, Intrinsic CTS Data Types, Understanding the Common Languages Spec ification, Understanding the Common Language Runtime A tour of the .NET Namespaces,	9	CO1
2	**Building C# Applications**:The Role of the Command Line Complier (csc.exe), Bui lding C # Application using csc.exe Working with csc.exe Response Files, Generating Bug Reports , Remaining C# Compiler Options , Visual Studio .NET IDE, Other Key Aspects of the VS.NET IDE, C# “Preprocessor:” Directives, An Interesting Aside: The System. Environment Class.	9	CO2

3	**C# Language Fundamentals**:. The Anatomy of a Basic C# Class, Creating objects: Constructor Basics, The Composition of a C# Application, Default Assignment and Variable Scope, The C# Member Initialization Syntax, Basic Input and Output with the Console Class, Understanding Value Types and Reference Types, The Master Node: System, Object, The System Data Types (and C# Aliases), Converting Between Value Types and Reference Types: Boxing and Unboxing, Defining Program Constants, C# Iteration Constructs, C# Controls Flow Constructs, The Complete Set of C# Operators, Defining Custom Class Methods, Understating Static Methods, Methods Parameter Modifies, Array Manipulation in C#, String Manipulation in C#, C# Enumerations,	9	CO3
4	**Object - Oriented Programming with C# :**Forms Defining of the C# Class, Definition the "Default Public Interface" of a Type, Recapping the Pillars of OOP, The First Pillars: C#'s Encapsulation Services, Pseudo- Encapsulation: Creating Read-Only Fields The Second Pillar: C#'s Inheritance Supports, keeping Family Secrets: The " Protected" Keyword, Nested Type Definitions, The Third Pillar: C #'s Polymorphic Support, Casting Between . **Exceptions and Object Lifetime**: Ode to Errors, Bugs, and Excepti ons, The Role of .NET Exception Handing, the System. Exception Base Class, Throwing a Generic Exception, Catching Exception, CLR System – Level Exception (System, System Exception), Custom Application- Level Exception (System. System Exception), Handling Multiple Exception, The Family Block, the Last Chance Exception Dynamically Identifying mApplication – and System Level Exception Debugging System Exception Using VS. NET, Understanding Object Lifetime, the CIT of "new', The Basics of Garbage Collection,, Finalization a Type, The Finalization Process, Building an Ad Hoc Destruction Method.	9	CO4
5	**Interfaces and Collections** :Defining Interfaces Using C# Invoking Interface Members at th e object Level, Exercising the Shapes Hierarchy, Understanding Explicit Interface Implementation, Interfaces As Polymorphic Agents, Building Interface Hierarchies, Implementing, Implementation, Interfaces Using VS .NET, understanding the IConvertible Inter face, Building a Custom Enumerator (IEnumerable and Enumerator), Building Cloneable objects (ICloneable), Building Comparable Objects (I Comparable), Exploring the system. Collections Namespace,	8	CO5

Text Books:

1. Andrew Troelsen: Pro C# with .NET 3.0, Special Edition, Dream tech Press, India, 2007.
2. E. Balagurusamy: Programming in C#, , 5th Reprint, Tata McGraw Hill, 2004.

Reference Books:

1. Tom Archer: Inside C#, WP Publishers, 2001.
2. Herbert Schildt: C# The Complete Reference, Tata McGraw Hill, 2004.

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Tests	Assignments	Quizzes	Self Study
Marks (out of 50)	**25**	**10**	**5**	**10**
Remember	5			
Understand	5	5	5	
Apply	5	5		10
Analyze	5			
Evaluate	5			
Create	-			

SEE- Semester End Examination (50 Marks)

Blooms Category	Tests
Remember	10
Understand	15
Apply	20
Analyze	5
Evaluate	-
Create	-

Artificial Intelligence

Course Code : ISE733 **Credits : 04**
L:P:T:S : 3:0:0:1 **CIE Marks : 50**
Exam Hours : 3 **SEE Marks : 50**

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

CO1	Apply potential benefits of Artificial Intelligence Concepts.
CO2	Understand and comprehend Efficient Knowledge and Reasoning in AI.
CO3	Implement basic Machine Learning Techniques.
CO4	Implement basic Adaptive Learning Techniques.
CO5	Understand and comprehend AI in Neural Networks.
CO6	Apply PROLOG programming in AI

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	2	-	2	-	-	3	-	3
CO2	3	1	3	3	1	-	3	-	-	-	-	3
CO3	3	2	3	2	3	-	2	-	-	2	-	2
CO4	3	2	3	2	3	-	2	-	-	2	-	2
CO5	1	2	3	-	3	-	2	-	-	2	-	2
CO6	3	1	-	2	3	-	2	-	-	2	-	3

Module No.	Module Contents	Hours	COs
1	**Introduction To AI:** What is Artificial Intelligence: The AI Problems, The Underlying Assumption, What is an AI Technique?, The Levels of the Model, Criteria of Success, Some General References, One Final Word and Beyond. Problems, Problem Spaces, and Search: Defining the Problem as a State Space Search, Production Systems, Problem Characteristics, Production System Characteristics, Issues in the Design of Search Programs.	9	CO1
2	Knowledge and Reasoning: Logical Agents, Knowledge–Based Agents, The Wumpus World, Logic, Propositional Logic a Very Simple Logic, Reasoning Patterns in Propositional Logic, Effective Propositional Inference, Agents Based on Propositional Logic.	8	CO2
3	**Planning and Machine Learning**: Basic plan generation systems - Strips -Advanced plan generation systems – K strips -Strategic explanations -Why, Why not and how explanations. Learning Machine learning, adaptive Learning.	9	CO3
4	**Connectionist Models:** Introduction: Hopfield Network, Learning In Neural Network, Application Of Neural Networks, Recurrent Networks, Distributed Representations, Connectionist AI And Symbolic AI.	9	CO4 , CO5
5	**Introduction to AI Programming Languages:** Introduction To Prolog: Syntax and Numeric Function, Basic List Manipulation Functions In Prolog, Functions, Predicates and Conditional, Input, Output and Local Variables, Iteration and Recursion, Property Lists and Arrays, Miscellaneous Topics, LISP and Other AI Programming Languages.	9	CO6

TEXT BOOKS

1. Kevin Night, Elaine Rich, Nair B., "Artificial Intelligence (SIE)",McGraw Hill-2008.

2. Introduction to Prolog Programming By Carl Townsend.

REFERENCES:

1. Peter Jackson, "Introduction to Expert Systems", 3rd Edition, Pearson Education, 2007.
2. Stuart Russel, Peter Norvig "AI – A Modern Approach", 2nd Edition, Pearson Education 2007.
3.Artificial Intelligence: A Modern Approach, Stuart Russel, Peter Norvig, PHI
4. "PROLOG Programming For Artificial Intelligence" -By Ivan Bratko (Addison-Wesley)
5. "Programming with PROLOG" –By Klocksin and Mellish.

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Tests	Assignments	Quizzes	SSA
Marks (out of 50)	25	10	5	10
Remember	5	-	-	-
Understand	5	5	-	-
Apply	5	-	5	10
Analyze	5	-	-	-
Evaluate	5	-	-	-
Create	-	-	-	-

SEE- Semester End Examination (50 Marks)

Blooms Category	Tests
Remember	10
Understand	10
Apply	10
Analyze	10
Evaluate	10
Create	-

Information Retrieval

Course Code : ISE734 **Credits : 04**
L:P:T:S : 3:0:0:1 **CIEMarks : 50**
Exam Hours : 3 **SEE Marks : 50**

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

CO1	Build an Information Retrieval system using the available tools
CO2	Identify and design the various components of an Information Retrieval system
CO3	Apply machine learning techniques for text classification and clustering to effectively use Information Retrieval.
CO4	Analyze the Web content structure
CO5	Understand and deploy efficient techniques for the indexing of document objects that are to be retrieved
CO6	Implement features of retrieval systems for web-based and other search task.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	2	3	2	1	-	-	-	-	-	2
CO2	2	2	3	2	3	-	-	-	-	-	-	2
CO3	2	2	3	2	3	-	-	-	-	2	-	2
CO4	3	2	3	2	3	-	-	-	-	2	-	2
CO5	1	2	3	-	2	3	-	-	-	2	-	2
CO6	2	2	2	1	1	2	-	-	-	2	-	2

Mapping of Course Outcomes to Program SPecific Outcomes:

	PSO1	PSO2
CO1	2	2
CO2	2	2
CO3	2	2
CO4	2	2
CO5	2	2
CO6	2	2

Module No.	Module Contents	Hours	Cos
1	Introduction: Motivation, Basic concepts, Past, present, and future, The retrieval process. Modeling: Introduction, A taxonomy of information retrieval models, Retrieval: Adhoc and filtering, A formal characterization of IR models, Classic information retrieval, Alternative set theoretic models, Alternative algebraic models, Alternative probabilistic models, Structured text retrieval models, Models for browsing.	9	CO1, CO2
2	Retrieval Evaluation: Introduction, Retrieval performance evaluation, Reference collections. Query Languages: Introduction, keyword-based querying, Pattern matching, Structural queries, Query protocols. Query Operations: Introduction, User relevance feedback, Automatic local analysis, Automatic global analysis.	9	CO2,
3	Text and Multimedia Languages and Properties: Introduction, Metadata, Text, Markup languages, Multimedia. Text Operations: Introduction, Document preprocessing, Document clustering, Text compression, Comparing text compression techniques.	8	CO3, CO4
4	Indexing and Searching: Introduction; Inverted Files; Other indices for text; Boolean queries; Sequential searching; Pattern matching; Structural queries; Compression. Parallel and Distributed IR: Introduction, Parallel IR, Distributed IR	8	CO5
5	User Interfaces and Visualization: Introduction, Human-Computer interaction, The information access process, Starting pints, Query specification, Context, Using relevance judgments, Interface support for the search process. Searching the Web: Introduction, Challenges, Characterizing the web, Search engines, Browsing, Meta searchers, Finding the needle in the haystack, Searching using hyperlinks.	9	CO6

TEXT BOOKS:

1. Ricardo Baeza-Yates, Berthier Ribeiro-Neto: Modern Information Retrieval, Pearson, 1999.

REFERENCE BOOKS:

1. David A. Grossman, Ophir Frieder: Information Retrieval Algorithms and Heuristics, 2nd Edition, Springer, 2004.

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Taxonomy	**Tests (25 Marks)**	**Assignments (10 Marks)**	**Quizzes (5 Marks)**	**Self Study (10 Marks)**
Remember	5	-	-	-
Understand	10	5	-	5
Apply	10	5	5	5
Analyze	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

SEE- Semester End Examination (50 Marks)

Blooms Category	**Tests**
Remember	10
Understand	20
Apply	20
Analyze	-
Evaluate	-
Create	-

Information Coding Theory

Course Code :ISE735 **Credits : 04**
L:P:T:S : 3:0:0:1 **CIE Marks : 50**
Exam Hours : 3 **SEE Marks : 50**

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

CO1	Understand the basic notions of information and channel capacity.
CO2	Understand and analyze error codes
CO3	Understand linear block codes, decoding techniques
CO4	Understand and analyze convolution and block codes, decoding techniques
CO5	Understand and analyze BCH AND RS CODES
CO6	understand the basic concepts of cryptography.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	2	3	2	1	2	1	-	-	-	2
CO2	2	2	3	2	3	-	1	-	-	-	-	2
CO3	2	2	3	2	3	-	2	-	-	2	-	2
CO4	3	2	3	2	3	-	2	-	2	2	-	2
CO5	1	2	3	-	2	3	2	3	-	2	-	2
CO6	3	1	-	2	2	-	2	-	3	-	-	3

Module No.	Module Contents	Hours	Cos
1	INFORMATION THEORY:Entropy, Information rate, source coding: Shannon-Fano and Huffmancoding techniques, Mutual Information, Channel capacity of DiscreteChannel, Shannon- Hartley law, Trade-off between bandwidth and SNR.	9	CO1, CO2
2	ERROR CONTROL CODES:Examples of the use of error control codes,basic notations, coding gain,Characterization of Error control codes, performance of error controlcodescomparison of uncoded and coded systems.	9	CO2
3	LINEAR BLOCK CODES:Linear block codes and their properties, standard arrays, syndromes,weight distribution. Error detection/correction properties, modified linear block codes.	8	CO3
4	CONVOLUTION CODES:Convolution encoders, structural properties of convolution codes, trellis diagrams, Viterbi algorithm, performance analysis.	8	CO4, CO6
5	BCH AND RS CODES:Algebraic Description, Frequency Domain Description, DecodingAlgorithms for BCH and RS Codes.INTRODUCTION TO CRYPTOGRAPHY:Simple classical cryptosystems, Cryptanalysis , Perfect Secrecy, Information theoretic security, One time pad.	9	CO5

TEXT BOOKS:

[1] Andre Neabauer, “Coding Theory: Algorithms, Architectures& Applications”, Wiley Publications, 2010.

[2] Kennedy, “Electronic Communication systems”, McGrawHill, 4th Ed., 1999.

REFERENCE BOOKS:

[1] John Proakis, “Digital Communications”, TMH, 5th Ed., 2008.

[2] Simon Haykin, "Communication System", Wiley, 2008.

[3] Jorge Castineira, Moreira, "Essentials of Error Control Coding", Wiley, 2006.

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	**Tests**	**Assignments**	**Quizzes**	**Self Study**
Marks (out of 50)	**25**	**10**	**5**	**10**
Remember	10	-	-	-
Understand	5	-	-	-
Apply	5	-	5	5
Analyze	5	5	-	5
Evaluate	-	-	-	-
Create	-	-	-	-

SEE- Semester End Examination (50 Marks)

Blooms Category	**Tests**
Remember	20
Understand	10
Apply	10
Analyze	10
Evaluate	-
Create	-

CRYPTOGRAPHY AND NETWORK SECURITY

Course Code : ISE741 **Credits: 04**
L:P:T:S : 3:0:0:1 **CIE Marks: 50**
Exam Hours : 3 **SEE Marks: 50**

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

CO1	Compare various encryption techniques and learn the basic security technology.
CO2	Encrypt and decrypt messages using block ciphers, sign and verify messages using well known signature generation and verification algorithms.
CO3	Summarize the functionality of public key cryptography.
CO4	Apply various message authentication functions and secure algorithms.
CO5	Demonstrate different types of security systems and applications.
CO6	Analyze the E-MAIL, IP & WEB SECURITY

Mapping of Course Outcomes to Program Outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	1	3	2	3	2	1	2	1	-	-	-	2
CO2	2	2	3	2	3	-	1	-	-	-	-	2
CO3	2	2	3	2	3	-	2	-	-	2	-	2
CO4	3	2	3	2	3	-	2	-	2	2	-	2
CO5	1	2	3	-	2	3	2	3	-	2	-	2
CO6	3	1	-	2	2	-	2	-	3	-	-	3

Mapping of Course Outcomes to Program Specific Outcomes:

	PSO1	PS02
CO1	2	3
C02	2	3
CO3	2	3
CO4	2	3
CO5	2	3
CO6	2	3

Module No	Module Contents	Hours	Cos
1	**INTRODUCTION & SECURITY TECHNOLOGY:**Services, Mechanisms and attacks-the OSI security architecture-Network security model-Classical Encryption techniques (Symmetric cipher model, substitution techniques, transposition techniques, steganography). **SECURITY TECHNOLOGY:**Firewalls,Honey Pots,Honey Nets,and Padded cell system.	8	CO1
2	**BLOCK CIPHERS & PUBLIC KEY CRYPTOGRAPHY:**Stream ciphers and block ciphers, Data Encryption standard (DES) with example, strength of DES, Design principles of block cipher, AES with structure, example , Multiple encryption and triple DES, **PUBLIC KEY CRYPTOGRAPHY:** Principles of public key cryptosystems-The RSA algorithm-Key management - Diffie Hellman Key exchange.	10	CO2,CO3
3	**HASH FUNCTIONS AND DIGITAL SIGNATURES:**Authentication requirement – Authentication function – MAC – Hash function – Security of hash function and MAC –MD5 - SHA - HMAC – CMAC - **DIGITAL SIGNATURE** and authentication protocols – DSS – EI Gamal – Schnorr.	8	CO4
4	**SECURITY PRACTICE & SYSTEM SECURITY:** Key management and distribution, symmetric key distribution using symmetric and asymmetric encryptions, distribution of public keys, X.509 certificates, Public key infrastructure Remote user authentication with symmetric and asymmetric encryption, Kerberos. Intruder – Intrusion detection system – Virus and related threats – Countermeasures .	10	CO4,CO5

5	**E-MAIL, IP & WEB SECURITY:E-mail Security:** Security Services for E-mail-attacks possible through E-mail - establishing keys privacy-authentication of the source-Message Integrity-Non-repudiation-Pretty Good Privacy-S/MIME. **IPSecurity:** Overview of IPSec - IP and IPv6-Authentication Header-Encapsulation Security Payload (ESP). **Web Security:** SSL/TLS Basic Protocol-computing the keys- client authentication- Secure Electronic Transaction (SET).	9	CO6

TEXT BOOKS:

1. William Stallings, "Cryptography and Network security", 4th ed., Pearson Education, 2010.
2. W illiam Stallings "Network Security Essentials Applications and Standards", 2nd ed.,Pearson Education, 2009.
3. Data Communications and Networking - Behrouz A. Forouzan, Fifth Edition TMH, 201

REFERENCE BOOKS:

1.Data and Computer Communication,WilliamStallings,10thEdition,PearsonEducation,2014

2.Computer Networks - Andrew S Tanenbaum, 4th Edition, Pearson Education.

3. Larry L. Peterson and Bruce S. Davie: Computer Networks – A Systems Approach, 4th Edition, Elsevier, 2007.

4. Wayne Tomasi: Introduction to Data Communications and Networking, Pearson Education, 2005.

CIE - Continuous Internal Evaluation (50 Marks)

Bloom's Taxonomy	Tests (25 Marks)	Assignments (10 Marks)	Quizzes (5 Marks)	Self Study (10 Marks)
Remember	5			
Understand	5	5		
Apply	5	5	5	5
Analyze	5			5
Evaluate	5			
Create				

SEE – Semester End Examination (50 marks)

Bloom's Taxonomy	Tests
Remember	10
Understand	10
Apply	10
Analyze	10
Evaluate	10
Create	

INTERNET OF THINGS (IOT)

Course Code : ISE742 **Credits : 04**
L:P:T:S : 3:0:0:1 **CIE Marks : 50**
Exam Hours : 3 **SEE Marks : 50**

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

CO1	Identify IoT concepts, stack and underlying technologies.
CO2	Analyze the migration of M2M to IoT and the real world applications
CO3	Recognize the real world IoT design constraints and challenges.
CO4	Discuss the importance of data and knowledge management in IoT.
CO5	Analyze the State of the Art – IoT Architecture and contribution in standardization process
CO6	Design and Develop real world IoT application using system like Raspberry pi.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	2	-	2	-	-	3	-	3
CO2	3	1	3	3	1	-	3	-	-	-	-	3
CO3	3	2	3	2	3	-	2	-	-	2	-	2
CO4	3	2	3	2	3	-	2	-	-	2	-	2
CO5	1	2	3	1	3	-	2	-	-	2	-	2
CO6	3	3	3	2	3	1	1	1	1	2	1	3

Module No.	Module Contents	Hours	COs
1	**Introduction to IoT**- IoT Overview, Definition, Hardware and Software, principle, IoT technologies and protocols, market perspective,M2M : The Vision- From M2M to IoT, M2M towards IoT-the global context,A use case example, Differing Characteristics.	9	CO1
2	**M2M to IoT-An Architectural Overview**– Building architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations.	8	CO2
3	**M2M and IoT Technology Fundamentals-** Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service(XaaS), M2M and IoT Analytics, Knowledge Management.	9	CO3
4	**IoT Architecture-State of the Art –** Introduction, State of the art, **Architecture Reference Model-** Introduction, Reference Model and architecture, IoT reference Model.	9	CO4, CO5
5	**IoT Programming :** Introduction to Raspberry PI-interfaces(serial,SPI,I2C) Programming -python program with Raspberry PI with focus of interfacing external gadgets, I/O controlling output, reading input from pins.	9	CO6

TEXT BOOKS:

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.

2. Getting Started with Raspberry Pi, Matt Richardson and Shawn Wallace, O'Reilly (SPD), 2014

3. Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things: Key Applications and Protocols", Wiley publication, 2nd Edition, 2012

.

REFERENCE BOOKS:

1. **"Internet of Things (A Hands-on-Approach)",** Vijay Madisetti and Arshdeep Bahga, 1st Edition, VPT, 2014.

2. **"Rethinking the Internet of Things: A Scalable Approach to Connecting Everything",** Francis daCosta, 1st Edition, Apress Publications, 2013

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Tests	Assignments	Quizzes	Curricular/Co-Curricular
Marks (out of 50)	**25**	**10**	**5**	**10**
Remember	5	-	5	-
Understand	5	5	-	-
Apply	5	-	-	-
Analyze	5	-	-	-
Evaluate	5	5	-	-
Create	-	-	-	-

SEE- Semester End Examination (50 Marks)

Blooms Category	Tests
Remember	10
Understand	10
Apply	10
Analyze	10
Evaluate	10
Create	-

USER INTERFACE DESIGN

Course Code : ISE743 **Credits : 04**
L:P:T:S : 3:0:0:1 **CIE Marks : 50**
Exam Hours : 3 **SEE Marks : 50**

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

CO1	Identify the basic user interface engineering definitions, concepts, principles and theories.
CO2	Recognize the importance of user interactions/interfaces, legal, ethical, and social issues.
CO3	Apply design principles, guidelines and heuristics to create a user-interaction strategy that solves a real-world problem.
CO4	Evaluate the effectiveness of various user interface by employing a series of evaluation methods available in usability engineering.
CO5	Design a usable and compelling user-interface given a set of requirements and available technologies.
CO6	Design and develop user manuals, tutorials and guides as per user requirements and expertise level.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	1	3	2	2	2	-	-	-	3
CO2	3	3	3	2	3	2	2	2	-	-	-	3
CO3	2	2	3	3	2	2	2	2	-	-	-	3
CO4	2	2	3	3	2	2	2	2	-	-	1	3
CO5	3	1	3	3	3	2	2	2	1	1	1	3
CO6	2	2	3	2	2	2	2	2	3	1	2	3

Mapping of Course Outcomes to Program Outcomes:

	PSO1	PS02
CO1	2	3
C02	2	3
CO3	2	3
CO4	2	3
CO5	2	3
CO6	2	3

Module No.	Module Contents	Hours	COs
1	**Usability of Interactive Systems**: Usability Requirements, Usability measures, Usability Motivations, Universal Usability, Goals for our profession, **Guideline, principles, and Theories:** Introduction, Guidelines, principles, Theories, Object-Action Interface Model.	9	CO1
2	**Managing Design Processes:** Introduction, Organizational Design to support Usability, The Three pillars of design, Development Methodologies, Ethnographic Observation, **Evaluating Interface Designs**: Expert Reviews, Usability Testing and Labs, Acceptance Tests, Evaluation During Active Use.	8	CO2
3	**Direct Manipulation and Virtual Environments:** Introduction, Examples of Direct Manipulation, 3D Interfaces, Teleoperation, Virtual and Augmented Reality. **Menu Selection, Form Fillin, and Dialog Boxes:** Introduction, Task-Related Menu Organization, Single Menus, Combinations of Multiple Menus, Content Organization, Fast Movement Through Menus, Data Entry with Menus: Form Fillin, Dialog Boxes, and Alternatives, Audio Menus and Menus for small Displays.	9	CO3
4	**Command and Natural Languages:** Introduction, Functionality to SupportUser's Tasks, Command-Organization Strategies, The Benefits of Structure, Naming and Abbreviations, Natural Language in Computing.**Multimedia:** Text For Web Pages, Effective Feedback, Guidance &Assistance, Internationalization, Accessibility, Icons, Image, Multimedia, Coloring.	9	CO4, CO5

5	**User Manuals, Online Help, and Tutorials:** Reading from Paper Verses from Displays, Shaping the Content of the Manuals, Online Manuals and Help, Online Tutorials, Demonstrations, and Guides, Online Communities for User Assistance, **Information Search and Visualization:** Introduction, Search in Textual Documents and Database Querying, Multimedia Document Searches, Advanced Filtering and Search Interfaces, Information Visualization.	9	CO6

TEXT BOOKS:

1. "The Essential Guide to User Interface Design",Wilbent. O. Galitz ,John Wiley& Sons.
2. "Design the User Interface", Ben Sheiderman, 5th Edition,Pearson Education

REFERENCE BOOKS:

1. "The Essential Of User Interface Design",Alan Cooper, Wiley – Dream Tech Ltd., 2012.
2. "Human-Computer Interaction",Alan J Dix et. Al., II Edition, Prentice-Hall India, 1998

SELF-STUDY

Students should design and develop dynamic and responsiveweb sites considering User interface principles, guidelines and theories.

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	**Tests**	**Assignments**	**Quizzes**	**Curricular/Co-Curricular**
Marks (out of 50)	**25**	**10**	**5**	**10**
Remember	5	-	5	-
Understand	5	5	-	-
Apply	5	-	-	-
Analyze	5	-	-	-
Evaluate	5	5	-	-
Create	-	-	-	-

SEE- Semester End Examination (50 Marks)

Blooms Category	**Tests**
Remember	10
Understand	10
Apply	10
Analyze	10
Evaluate	10
Create	-

SOFTWARE ARCHITECTURE

Course Code : ISE744 **Credits : 04**
L:P:T:S : 3:0:0:1 **CIEMarks : 50**
Exam Hours : 3 **SEE Marks : 50**

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

CO1	To Understand the architecture business cycle
CO2	To understand the architectural styles and Process Control
CO3	To understand the quality attributes for functionalities and architecture
CO4	To understand architectural patterns
CO5	To learn designing software architecture and documentation of software architecture
CO6	Analyze various Software architectures

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	2	-	2	2	-	-	-	2
CO2	3	2	3	2	3	-	1	-	-	-	-	2
CO3	3	2	3	2	3	-	2	-	-	2	-	2
CO4	3	2	3	2	3	-	2	-	-	2	-	2
CO5	1	2	3	-	3	-	2	-	-	2	-	2
CO6	1	2	3	-	3	-	2	-	-	2	-	2

Module No.	Module Contents	Hours	Cos
1	Introduction: The Architecture Business Cycle: Where do architecturescome from? Software processes and the architecture business cycle; Whatmakes a “good” architecture? What software architecture is and what it isnot; Other points of view; Architectural patterns, reference models andreference architectures; Importance of software architecture; Architecturalstructures and views.	8	CO1
2	Architectural Styles and Case Studies: Architectural styles; Pipes and filters; Data abstraction and object-oriented organization; Event-based,implicit invocation; Layered systems; Repositories; Interpreters; Processcontrol; Other familiar architectures; Heterogeneous architectures. CaseStudies: Keyword in Context; Instrumentation software; Mobile robotics;Cruise control; Three vignettes in mixed style.	9	CO2
3	Quality: Functionality and architecture; Architecture and quality attributes;System quality attributes; Quality attribute scenarios in practice; Othersystem quality attributes; Business qualities; Architecture qualities.Achieving Quality: Introducing tactics; Availability tactics; Modifiabilitytactics; Performance tactics; Security tactics; Testability tactics; Usabilitytactics; Relationship of tactics to architectural patterns; Architectural patternsand styles.	9	CO3
4	Architectural Patterns: Introduction; From mud to structure: Layers,Pipes and Filters, Blackboard Distributed Systems: Broker; InteractiveSystems: MVC, Presentation-Abstraction-Control. Adaptable Systems: Microkernel; Reflection	9	CO4

5	Designing and Documenting Software Architecture: Architecture in thelife cycle; Designing the architecture; Forming the team structure; Creating askeletal system. Uses of architectural documentation; Views; Choosing therelevant views; Documenting a view; Documentation across views.	9	CO5

TEXT BOOKS:

1. Len Bass, Paul Clements, Rick Kazman: Software Architecture inPractice, 2nd Edition, Pearson Education, Re print 2015.
2. Frank Buschmann, Regine Meunier, Hans Rohnert, PeterSommerlad, Michael Stal: Pattern-Oriented Software Architecture,A System of Patterns, Volume 1, John Wiley and Sons, Reprint 2015.
3. Mary Shaw and David Garlan: Software Architecture- Perspectiveson an Emerging Discipline, PHI, Re print 2015.

REFERENCE BOOKS:

1. E. Gamma, R. Helm, R. Johnson, J. Vlissides: Design Patterns-Elements of Reusable Object-Oriented Software, Pearson Education,Re print 2012.

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	**Tests**	**Assignments**	**Quizzes**	**SSA**
Marks (out of 50)	**25**	**10**	**5**	**10**
Remember	10	-	-	-
Understand	10	-	-	-
Apply	5	5	5	-
Analyze	-	5	-	10
Evaluate	-	-	-	-
Create	-	-	-	-

SEE- Semester End Examination (50 Marks)

Blooms Category	**Tests**
Remember	10
Understand	20
Apply	10
Analyze	10
Evaluate	-
Create	-

MULTIMEDIA SYSTEMS

Course Code : ISE745 **Credits: 04**
L:P:T:S : 3:0:0:1 **CIE Marks: 50**
Exam Hours : 3 **SEE Marks: 50**

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

CO1	Understand the basics of multimedia and its hardware peripherals
CO2	Analyze the basic tools and authoring tools needed for the multimedia
CO3	Apply different text in the multimedia
CO4	Apply images and video in the multimedia
CO5	Analyze planning, cost and design in multimedia
CO6	Apply the algorithms on multimedia systems

Mapping of Course Outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	1	1	2	2	2	-	2	2	2	2
CO2	3	1	2	2	3	-	2	-	2	1	2	2
CO3	3	2	2	2	3	-	1	-	1	2	1	1
CO4	3	2	2	3	1	1	2	-	2	1	2	2
CO5	2	2	-	3	3	2	1	-	1	2	1	1
CO6	2	2	-	3	2	2	1	-	1	2	1	1

Module No	Module Contents	Hours	COs
1	**What is multimedia**: Definitions, CD-ROM and the Multimedia highway, where to use multimedia. **Introduction to Making Multimedia**: The stages of a project, what you need**, Multimedia skills and Training**: The terms,**Macintosh and windows production platforms**: Macintosh Versus PC, The Macintosh and Windows Computers**, Hardware Peripherals**: connection, Memory and storage Devices, Input Devices, Output Hardware, Communication Devices.	9	CO2, CO4
2	**Basic Tools**: Text Editing and Word Processing Tools, OCR Software, Painting and Drawing Tools, 3-D Modeling and Animation Tools, Image Editing Tools, Sound Editing Tools, Animation, Video and Digital Movies Tools, Helpful Accessories. **Making Instant Multimedia** : Linking Multimedia Object, Office suites, Word Processors, spread sheets, Databases, presentation Tools. **Multimedia Authoring Tools** : Types of Authoring Tools, card and page Based Authoring Tools, Icon Based Authorized Tools, Time Based Authoring Tools, Object Oriented Authoring Tools, Cross Platform Authoring Notes.	9	CO1, CO4
3	**Text :** The Power of Meaning, About Fonts and Faces, Using Text in Multimedia, Computers and Text, Font Editing and Design Tools, Hypermedia and Hypertext. **Sound:** The Power of Sound, Multimedia System Sounds, MIDI Versus Digital Audio, Digital Audio, Making MIDI Audio, Audio file formats, Working with sound on the Macintosh, Notation Interchange File Format (NIFF): Adding Sound to your multimedia project, Towards professional sound, The Red Books standard	9	CO2, CO3

	production tips.		
4	**Images:** Making Still Images, color Image File formats. **Animation**: The Power of motion, Principles of Animation , Making Animation That Work. **Video :** Using video, How video works, Broadcast Video Standards, Integrating Computers and Television, shooting and Editing Video, Video Tips, Recording Formats, Digital video.	9	CO2 , CO3
5	**Planning and Costing** : Project planning, Estimating, RFPs and Bid proposals. **Designing and producing** : Designing, Producing. **Content and Talent** : Acquiring Content, Using content created by others, Using Contents created for a project, Using Talent. **Delivering** : Testing, preparing for Delivery, Delivering on CD-ROM, Compact Disc Technology. Wrapping It Up:Delivering on the World Wide Web. **MULTIMEDIA AUTHORING AND APPLICATIONS** Creating interactive multimedia, Multimedia Authoring Systems, Multimedia Authoring Software Applications, Video On demand, Virtual Reality, Augmented Reality, Contentbased retrieval in digital libraries.	9	CO2 ,CO 5

TEXT BOOKS:

1. Tay Vaughan - 1999– Multimedia : Making it work – Fourth Edition – Tata McGraw – Hill Edition.

2. Walterworth john A– 1991- Multimedia Technologies and Application - Ellis Horwood Ltd. – London.

3. John F koegel Buford – Multimedia Systems – Addison Wesley – First Indian Reprint.

REFERENCES:

1. Elsom Cook – "Principles of Interactive Multimedia" – McGraw Hill

2 Prabhat K Andleigh, Kiran Thakrar, "Multimedia systems design", First Edition, PHI, 2007

CIE - Continuous Internal Evaluation (50 Marks)

Bloom's Taxonomy	**Tests**	**Assignments**	**Quizzes**	**SSA**
Marks (Out of 50)	**25**	**10**	**5**	**10**
Remember	5	-	-	-
Understand	10	5	-	-
Apply	10	5	5	10
Analyze	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

SEE – Semester End Examination (50marks)

Bloom's Taxonomy	**Tests**
Remember	5
Understand	20
Apply	10
Analyze	10
Evaluate	5
Create	

ENTERPRISE APPLICATION PROGRAMMING

Course Code : ISE751 | **Credits : 04**
L:P:T:S : 3:0:0:1 | **CIE Marks : 50**
Exam Hours : 3 | **SEE Marks : 50**

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

CO1	Recognize the importance of Angular 2 framework for responsive UI development.
CO2	Identify the various knowledge representation languages for the semantic web.
CO3	Define, compare and use the different types of NoSQL Databases, Document-oriented, Key value pairs, Column-oriented and Graph
CO4	Illustrate aspect oriented programming using Spring framework
CO5	Analyse and apply Spring framework for enterprise application development.
CO6	Design and develop enterprise applications based on latest web technology framework.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	1	3	2	2	2	-	-	-	3
CO2	3	3	3	2	3	2	2	2	-	-	-	3
CO3	2	2	3	3	2	2	2	2	-	-	-	3
CO4	2	2	3	3	2	2	2	2	-	-	1	3
CO5	3	1	3	3	3	2	2	2	1	1	1	3
CO6	2	2	3	2	2	2	2	2	3	1	2	3

Mapping of Course Outcomes to Program Specific Outcomes:

	PSO1	PS02
CO1	2	3
C02	2	3
CO3	2	3
CO4	2	3
CO5	2	3
CO6	2	3

Module No.	Module Contents	Hours	COs
1	**Angular 2** : Angular CLI, Typescript, Components, Directives, Router, Guards, Forms, Form Validators, Observables, Modules.	9	CO1
2	**Semantic Web Technologies:** Introduction to the Semantic Web, Introduction to Ontology, Ontology Languages for the Semantic Web,Resource Description Framework (RDF), SPARQL, OWL, Triples	9	CO2

3	**Introduction to NoSQL**: Definition, History of NOSQL and Different NOSQL products, Exploring MongoDB, Data format, schema , data types, model, Data Management, Search API	9	CO3
4	**Spring Framework:** Aspect-oriented Programming with Spring (AOP),Spring MVC, Spring and Web service, REST APIs	9	CO4, CO5
5	**Spring Framework:** Introduction to Object Relational Mapping, Spring hibernate framework, Spring Boot, Spring HATEOAS	9	CO4, CO5, CO6

TEXT BOOKS:

1. "Angular 2 Cookbook",Matt Frisbie , Packt Publication
2. "Thinking on the Web", Berners Lee, Godel and Turing, Wiley interscience,2008.
3. Social Networks and the Semantic Web, Peter Mika,Springer,2007.
4. NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence , Author: Sadalage, P. & Fowler, Publication: Pearson Education
5. Spring 4 for Developing Enterprise Applications: An End-to-End Approach", Henry H. Liu, PerfMath Publications

REFERENCE BOOKS:

1. https://angular.io/guide/quickstart
2. *W3C Semantic Web Activity*, http://www.w3.org/2001/sw/
3. W3C *RDF Working Group*, http://www.w3.org/2011/rdf-wg/wiki/Main_Page
4. W3C *OWL Working Group*, http://www.w3.org/2007/OWL/wiki/OWL_Working_Group
5. https://spring.io/

SELF-STUDY

Students should design and develop small enterprise applications based on the concepts studied.

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Tests	Assignments	Quizzes	Curricular/Co Curricular
Marks (out of 50)	**25**	**10**	**5**	**10**
Remember	5		5	
Understand	5	5		
Apply	5			10
Analyze	5			
Evaluate	5	5		
Create	-			

SEE- Semester End Examination (50 Marks)

Blooms Category	Tests
Remember	10
Understand	10
Apply	10
Analyze	10
Evaluate	10
Create	-

INTRODUCTION TO SOCIAL NETWORK ANALYSIS

Course Code : ISE752 **Credits : 04**
L:P:T:S : 3:0:0:1 **CIE Marks : 50**
Exam Hours : 3 **SEE Marks : 50**

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

CO1	Explain the basic concepts and terminologies of social network analysis
CO2	Identify and represent social network data
CO3	Identify and describe types of nodes and network relationships
CO4	Apply the basics of social network analysis at the network level (density, clustering, degree distribution, etc.) and at the node level (degree, betweenness, closeness)
CO5	Discuss and Summarize various Social Media in terms of its importance and marketing
CO6	Explain how various types of analysis are carried out in Social media.

MAPPING OF COs v/s POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	3	-	3	3	-	-	3
CO2	3	-	-	-	-	3	-	3	3	-	-	3
CO3	3	-	-	-	-	3	-	3	3	-	-	3
CO4	3	-	-	-	-	3	-	3	3	-	-	3
CO5	3	-	-	-	-	3	-	3	3	-	-	3
CO6	3	-	-	-	-	3	-	3	3	-	-	3

Module No	Module Contents	Hours	COs
1	**INTRODUCTION:**Understand what social networking is, history of social network analysis, social media characteristics, types of social media, core values, challenges, advantages and disadvantages, future of social networking.	**8**	**CO1**

2	**BUILDING A NETWORK:**Networks as graphs – actors, ties, networks, multiplex networks, weighted ties, group, geodesic distance, Graph connectivity, Degree of an actor – indegree and outdegree, types of nodes – carrier, transmitter, receiver, isolate, Representation of social network data – sociomatrix and edge list, matrix permutuation and blocks, network relationships & structures – reciprocity, transitivity, popularity structural equivalence, clique, star.	**9**	**CO2, CO3**
3	**NETWORK PROPERTIES:** Network density,Properties of nodes – degree centrality, closeness centrality, betweeness centrality, Eigen vector centrality, Page rank centrality	**9**	**CO4**
4	**SOCIAL MEDIA FUNDAMENTALS:**Various social networking sites - What is Social Media and Why It's Important; FACEBOOK, INSTAGRAM, TWITTER, LINKEDIN - Why and how they matter, history, statistics, demographics, Time Spent, Key Features, Marketing - What You Need to Know	**9**	**CO5**
5	**SOCIAL MEDIA ANALYSIS:** Four dimension of analysis,Criteria of effectiveness, metrics, social network analysis, semantic analysis, online sentiment analysis, tools, social media management, centrality, measures opinion mining, feature based sentiment analysis.	**9**	**CO6**

Literature:

1) James M Cook, University of Maine at Augusta, " What is a Social Network "
2) Robert A Hanneman, Department of Sociology, University of California, Riverside, "Introduction to Social Network methods".
3) Christina Falci, Department of Sociology, University of Nebraska, Lincoln, "Social Network Analysis"
4) Matthew Ganis&AvinashKohirkar, "Social Media Analytics"
5) Bobbi J Carothers, American Evaluation Association, Denver, Colorado, "Network Analysis from Start to finish: Techniques, Tools and Tips for Evaluating your Network."
6) Matthew Denny, Institute for Social Science Research, University of Massachusetts, AMHERST, "Social Network Analysis."
7) Timothy Baldwin, University of Melbourne, "Semantic Analysis of Social Media."
8) The Social Media Analytics Compass: What and How to Measure http://www.razorsocial.com/social-media-analytics-tools/
9) https://www.youtube.com/watch?v=P33xa4l4GTM
10) overview of SNA https://www.youtube.com/watch?v=fgr_g1q2ikA
11) https://www.teachengineering.org/activities/view/uno_graphtheory_lesson01_activity
12) The History of Social Media: social Networking Evolution! http://historycooperative.org/ the-history-of-social-media/
13) Social Media Fact Sheet http://www.pewinternet.org/fact-sheet/social-media/

14) https://www.meaningcloud.com/solutions/media-analysis
15) https://www.enotes.com/homework-help/what-hypotheses-social-media-intimate-relationship-488912

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Tests	Assignments	Quizzes	SSA
Marks (out of 50)	**25**	**10**	**5**	**10**
Remember	5	-	-	-
Understand	5	5		
Apply	5	5	5	10
Analyze	5			
Evaluate	5			
Create				

SEE – Semester End Examination (50 Marks)

Bloom's Taxonomy	Tests
Remember	10
Understand	10
Apply	10
Analyze	10
Evaluate	10
Create	-

AGILE METHODOLOGIES

Course Code : ISE753 **Credits: 04**
L:P:T:S : 3:0:0:1 **CIE Marks: 50**
Exam Hours: 3 **SEE Marks: 50**

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

CO1	Understand the importance and roadmap to mastery of agile technologies.
CO2	Understand The XP Lifecycle, XP Concepts,Adopting XP the essence of agile development methods
CO3	Understand Work on Pair Programming, Root-Cause Analysis, Retrospectives, Planning, Incremental Requirements, Customer Tests and the principles and practices of extreme programming
CO4	Mastering Agility and Implement Concepts to improve the process
CO5	Apply prototyping in the software process with an iterative, incremental development process leading to faster delivery of more useful software
CO6	Understand agile design principles

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	2	2	-	-	1	-	2	1	1	2
CO2	2	3	2	2	-	-	1	-	2	1	1	2
CO3	2	2	3	1	-	-	1	-	2	1	-	2
CO4	2	2	3	1	-	-	1	-	2	1	-	2
CO5	1	2	3	1	1	-	1	-	2	1	-	3
CO6	1	2	3	1	1	-	1	-	2	1	-	3

Mapping of Course Outcomes to Program Specific Outcomes(PSOs):

	PSO1	PSO2
CO1	2	2
CO2	2	2
CO3	3	2
CO4	3	1
CO5	3	1
CO6	3	1

Module No.	Module Contents	Hours	COs
1	**Why Agile?:** Understanding Success, Beyond Deadlines, The Importance of Organizational Success, Enter Agility, **How to Be Agile?:** Agile Methods, Don't Make Your Own Method, The Road to Mastery, Find a Mentor	9	CO1
2	**Understanding XP:** The XP Lifecycle, The XP Team, XP Concepts, **Adopting XP:** Is XP Right for Us?, Go!,Assess Your Agility	9	CO2
3	**Practicing XP:Thinking:** Pair Programming, Energized Work, Informative Workspace, Root-Cause Analysis, Retrospectives, **Collaborating:** Trust, Sit Together, Real Customer Involvement, Ubiquitous Language, Stand-Up Meetings, Coding Standards, Iteration Demo, Reporting, **Releasing:**"Done Done", No Bugs, Version Control, Ten-Minute Build, Continuous Integration, Collective Code Ownership, Documentation. **Planning:** Vision, Release Planning, The Planning Game, Risk Management, Iteration Planning, Slack, Stories, Estimating. **Developing:**Incremental requirements, Customer Tests, Test-Driven Development, Refactoring, Simple Design ,Incremental Design and Architecture, Spike Solutions, Performance Optimization, Exploratory Testing	9	CO3
4	**Mastering Agility:Values and Principles:** Commonalities, About Values, Principles, and Practices, Further Reading, **Improve the Process:** Understand Your Project, Tune and Adapt, Break the Rules,	9	CO4

	Rely on People : Build Effective Relationships, Let the Right People Do the Right Things, Build the Process for the People, **Eliminate Waste :**Work in Small, Reversible Steps, Fail Fast, Maximize Work Not Done, Pursue Throughput		
5	**Deliver Value:** Exploit Your Agility, Only Releasable Code Has Value, Deliver Business Results, Deliver Frequently, **Seek Technical Excellence :**Software Doesn't Exist, Design Is for Understanding, Design Tradeoffs, Quality with a Name, Great Design, Universal Design Principles, Principles in Practice, Pursue Mastery	8	CO5

TEXT BOOKS:

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

REFERENCES:

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

CIE - Continuous Internal Evaluation (50 Marks)

Bloom's Taxonomy	**Tests**	**Assignments**	**Quizzes**	**SSA**
Marks (Out of 50)	**25**	**10**	**5**	**10**
Remember	5	-	-	-
Understand	10	5	-	-
Apply	10	5	5	10
Analyze	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

SEE – Semester End Examination (50 Marks)

Bloom's Taxonomy	**Tests**
Remember	5
Understand	20
Apply	25
Analyze	-
Evaluate	-
Create	-

HUMAN-COMPUTER INTERCATION

Course Code :ISE754 **Credits: 04**
L:P:T:S : 3:0:0:1 **CIE Marks: 50**
Exam Hours : 3 **SEE Marks: 50**

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

CO1	Recognize the importance of Human Computer Interaction
CO2	Identify the various design process, guidelines and principles in Human computer interaction.
CO3	Discuss about windows strategies and design process management
CO4	Apply and design different components and tools in user interface design.
CO5	Recognize the improvements in various interaction devices in human computer interaction.
CO6	Recognize and apply the strategies for Non anthropomorphic Design.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	1	3	2	2	2	-	-	-	3
CO2	3	3	3	2	3	2	2	2	-	-	-	3
CO3	2	2	3	3	2	2	2	2	-	-	-	3
CO4	2	2	3	3	2	2	2	2	1	1	1	3
CO5	3	1	3	3	3	2	2	2	1	1	1	3
CO6	2	2	3	2	2	2	2	2	-	-	-	3

Mapping of Course Outcomes to Program Specific Outcomes:

	PSO1	PS02
CO1	2	3
C02	2	3
CO3	2	3
CO4	2	3
CO5	2	3
CO6	2	3

Module No	Module Contents	Hours	Cos
1	**Introduction:** Importance of user interface, definition, importance of good design, Benefits of good design, A brief history on screen design. Graphical User Interface: Popularity of Graphics, the concept of direct manipulation, graphical system, characteristics, web user interface popularity, characteristics-principles ofuser interface.	9	CO1

2	**Design process:** Interactive Design basics, process, scenarios, navigation, Design rules, principles, standards, guidelines, rulesHuman interaction with computers, importance of human characteristics, human considerations, human interaction speeds, understanding business junctions.	9	CO2
3	**Screen Designing & Window**: Design goals, screen planning and purpose, organizing screen elements, ordering of screen data and content, screen navigation and flow, visually pleasing composition, amount of information, focus and emphasis, presentation information simply and meaningfully, information retrieval on web, statistical graphics, technological consideration in interface design Windows new and Navigation schemes selection of window, selection of devices based and screen based controls.	9	CO3,CO4
4	**Components and Software tools:** Components: text and messages, Icons and increases, multimedia, colors, user problems, choose colors. Software tools: Specification methods interface, building tools.	9	CO4
5	**Interaction Devices:** Introduction, Keyboards and Functions, Pointing Devices, Speech recognition, Digitization and Generation Image and Video Displays, Printers, Theoretical Foundations, Expectations and Attitudes, User Productivity, Variability, Error Messages, Non anthropomorphic Design, Display Design, color-Reading from Paper versus from Displays, Preparation of Printed Manuals, Preparation of Online Facilities.	9	CO5,CO6

TEXT BOOKS:

1. Human Computer Interaction, Alan Dix, Janet Fincay, Gre Goryd, Abowd, RusselBealg, PEA.
2. The Essential guide to user interface design, Wilbert O Galitz, Wiley Dreama Tech.

REFERENCE BOOKS:

1. Ben Shneiderman, “Designing the User Interface”, 4th Edition, Pearson, 2010.
2. Dr. Jonathan Lazar, Dr. Jinjuan Heidi Feng, Dr. Harry Hochheiser, “ResearchMethods in Human Computer Interaction”–John Wiley 2010.
3. Jef Raskin , “The Human Interface ", Addison – Wesley – 2008.

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Tests	Assignments	Quizzes	SSA
Marks (out of 50)	**25**	**10**	**5**	**10**
Remember	5	-	-	-
Understand	5	5		10
Apply	5	5	5	-
Analyze	5	-	-	-
Evaluate	5	-	-	-
Create	-	-	-	-

SEE- Semester End Examination (50 Marks)

Blooms Category	Tests
Remember	10
Understand	10
Apply	10
Analyze	10
Evaluate	10
Create	-

STORAGE AREA NETWORK

Course Code : ISE755 **Credits : 04**
L:P:T:S : 3:0:0:1 **CIEMarks : 50**
Exam Hours : 3 **SEE Marks : 50**

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

CO1	Distinguish between various physical and logicalcomponents of storage systems and their behavior, whichis critical for successful design of storage infrastructure.
CO2	Determine efficient storage provisioning technique andRAID implementation to meet applications capacity,availability and performance requirements.
CO3	Identify different components of FC SAN and fabric login types
CO4	Understand appropriate storage networking option such as IPSAN, NAS, and object-based and unified storage solutions to meet customer's requirements.
CO5	Apply IP SAN, NAS technologies to design data center based on the customer business requirements.
CO6	Analyze the importance of backup, replication requirements and solutions, forbusiness critical data.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	2	-	2	1	-	3	-	3
CO2	2	3	3	2	2	-	2	-	-	-	-	3
CO3	2	2	3	3	3	-	2	-	-	2	-	2
CO4	1	3	3	3	3	-	2	-	-	2	-	2
CO5	1	3	3	3	3	-	3	1	1	2	-	2
CO6	1	3	3	3	3	-	3	1	1	2	-	2

Mapping of Course Outcomes to Program Specific Outcomes:

	PSO1	PS02
CO1	2	3
C02	2	3
CO3	2	3
CO4	2	3
CO5	2	3
CO6	2	3

Module No.	Module Contents	Hours	COs
1	**Introduction to Information Storage:** Information Storage,Evolution of Storage Architecture, Data Center Infrastructure,**DataCenter Environment:** Application, DBMS, Host, Connectivity,Storage, Disk Drive Components, Disk Drive Performance, Host Access to Data, Direct-Attached Storage, Storage Design Based on Application Requirements and Disk Performance, Disk Native Command Queuing, Introduction to Flash Drives.	8	CO1
2	**Data Protection:** RAID, RAID Implementation Methods, RAID Array Components, RAID Techniques, RAID Levels, RAID Impact on Disk Performance, RAID Comparison, Hot Spares. **Intelligent Storage Systems**: Components of an Intelligent Storage System, Storage Provisioning, Types of Intelligent Storage System.	9	CO2
3	**Fibre Channel Storage Area Networks:** Fibre Channel: Overview, The SAN and Its Evolution, Components of FC SAN, FC Connectivity, Switched Fabric Ports, Fibre Channel Architecture, Fabric Services, Switched Fabric Login Types, Zoning, FC SAN Topologies, Virtualization in SAN.	9	CO3
4	**IP SAN and FCoE**: iSCSI, FCIP, FCoE **Network-Attached Storage:** General-Purpose Servers versus NAS Devices, Benefits of NAS, File Systems and Network File Sharing, Components of NAS, NAS I/O Operation, NAS Implementations, NAS File-Sharing Protocols, Factors Affecting NAS Performance, File-Level Virtualization. **Object-Based and Unified Storage**: Object-Based Storage Devices, Content-Addressed Storage, Unified Storage.	9	CO4

5	**Backup and Archive**: Backup Purpose, Backup Considerations, Backup Granularity, Recovery Considerations, Backup Methods, Backup Architecture, Backup and Restore Operations, Backup Topologies, Backup in NAS Environments, Backup Targets, Data Deduplication for Backup, Backup in Virtualized Environments, Data Archive**. Local Replication**: Replication Terminology, Uses of Local Replicas, Replica Consistency, Local Replication Technologies, **Remote Replication:** Modesof Remote Replication, Remote Replication Technologies, Three-Site Replication, Data Migration Solutions.	9	CO5

TEXT BOOKS:

1. "Information Storage and Management", 2nd Edition, John Wiley- India 2012, G. Somasundaram, Alok Shrivastava (Editors)

REFERENCE BOOKS:

1.Storage Networks Explained,Ulf Troppens, Rainer Erkens and Wolfgang Muller, Wiley India, 2nd Edition.

2. Storage Networks: The Complete Reference, Rebert Spalding, Tata McGraw Hill, 2nd Edition.

3. Storage Area Networks: Essentials A Complete Guide to Understanding and Implementing SANs, Richard Barker and Paul Massiglia, Wiley India.

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	**Tests**	**Assignments**	**Quizzes**	**SSA**
Marks (out of 50)	**25**	**10**	**5**	**10**
Remember	5	-	-	-
Understand	5	5		10
Apply	10	5	5	-
Analyze	5	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

SEE- Semester End Examination (50 Marks)

Blooms Category	**Tests**
Remember	10
Understand	10
Apply	20
Analyze	10
Evaluate	-
Create	-

EIGHT SEMESTER

SYLLABUS

Software Architecture & Design Patterns

Course Code : ISE811 **Credits : 04**
L:P:T:S : 3:0:0:1 **CIE Marks : 50**
Exam Hours : 3 **SEE Marks : 50**

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

CO1	To learn the architecture business cycle
CO2	To interpret the architectural styles and Process Control
C03	To learn quality attributes for functionalities and architecture
C04	To evaluate architectural patterns
C05	To learn designing software architecture
C06	To learn documentation of software architecture

Mapping of Course Outcomes to Program Outcomes :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	-
CO2	-	2	1	-	-	-	-	-	-	1	1	-
CO3	-	2	2	-	-	-	-	-	-	2	2	-
CO4	-	3	3	-	-	-	-	-	-	3	3	-
CO5	-	3	3	-	-	-	-	-	-	3	3	-
CO6	-	3	3	-	-	-	-	-	-	3	3	-

Module No.	Module Contents	Hours	COs
1	Introduction: The Architecture Business Cycle: Where do architectures come from? Software processes and the architecture business cycle; What makes a "good" architecture? What software architecture is and what it is not; Other points of view; Architectural patterns, reference models and reference architectures; Importance of software architecture; Architectural structures and views.	9	CO1
2	Architectural Styles and Case Studies: Architectural styles; Pipes and filters; Data abstraction and object-oriented organization; Event-based, implicit invocation; Layered systems; Repositories; Interpreters; Process control; Other familiar architectures; Heterogeneous architectures. Case Studies: Keyword in Context; Instrumentation software; Mobile robotics; Cruise control; Three vignettes in mixed style.	09	CO2

3	Quality: Functionality and architecture; Architecture and quality attributes; System quality attributes; Quality attribute scenarios in practice; Other system quality attributes; Business qualities; Architecture qualities. Achieving Quality: Introducing tactics; Availability tactics; Modifiability tactics; Performance tactics; Security tactics; Testability tactics; Usability tactics; Relationship of tactics to architectural patterns; Architectural patterns and styles.	9	CO3
4	Architectural Patterns: Introduction; From mud to structure: Layers, Pipes and Filters, Blackboard Distributed Systems: Broker; Interactive Systems: MVC, Presentation-Abstraction-Control. Adaptable Systems: Microkernel; Reflection	9	CO4
5	Designing and Documenting Software Architecture: Architecture in the life cycle; Designing the architecture; Forming the team structure; Creating a skeletal system. Uses of architectural documentation; Views; Choosing the relevant views; Documenting a view; Documentation across views.	9	CO5 CO6

TEXT BOOKS:

1. Len Bass, Paul Clements, Rick Kazman: Software Architecture in Practice, 2nd Edition, Pearson Education, Re print 2015.
2. Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, Michael Stal: Pattern-Oriented Software Architecture, A System of Patterns, Volume 1, John Wiley and Sons, Reprint 2015.
3. Mary Shaw and David Garlan: Software Architecture- Perspectives on an Emerging Discipline, PHI, Re print 2015.

REFERENCE BOOKS:

1. E. Gamma, R. Helm, R. Johnson, J. Vlissides: Design Patterns-Elements of Reusable Object-Oriented Software, Pearson Education , Re print 2012.

CIE-Continuous Internal Evaluation (50 Marks)

Bloom's Category	**Tests(25 marks)**	**Assignments (10)**	**Quizzes(5)**	**Self-Study(10)**
Remember	5	-	-	-
Understand	5	-	-	-
Apply	5	5	5	-
Analyze	5	5	-	10
Evaluate	5	-	-	-
Create	-	-	-	-

SEE – Semester End Examinations (50 Marks)

Blooms Category	Tests
Remember	10
Understand	10
Apply	10
Analyze	10
Evaluate	10
Create	-

Android Application Development

Course Code : ISE812 **Credits : 4**
L:P:T:S : 3:0:0:1 **CIE Marks : 50**
Exam Hours : 3 **SEE Marks : 50**

Course Outcomes :

CO1	Learn to setup Android application development environment
CO2	Illustrate user interfaces for interacting with apps and triggering actions
CO3	Interpret tasks used in handling multiple activities
CO4	Identify options to save persistent application data
CO5	Appraise the role of performance in Android applications
CO6	Appraise the role of security in Android applications

Mapping of Course Outcomes to Program Outcomes :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	3	-	-	1	-	-	-	-	-	-
CO2	3	-	3	-	-	-	2	-	-	-	2	-
CO3	3	3	3	-	-	-	-	1	-	-	2	-
CO4	3	3	3	-	3	-	2	1	-	-	2	-
CO5	3	-	3	-	3	-	2	1	-	-	2	-
CO6	3	-	3	-	3	-	2	1	-	-	2	-

Mapping of Course Outcomes to Program Specific Outcomes:

	PSO1	PS02
CO1	2	3
C02	2	3
CO3	2	3
CO4	2	3
CO5	2	3
CO6	2	3

Module No.	Module Contents	Hours	COs
1	Get started, Build your first app, Activities, Testing, debugging and using support Libraries	**9**	CO1
2	User Interaction, Delightful user experience, Testing the UI	**9**	CO2
3	Background Tasks, Triggering, scheduling and optimizing background tasks	**9**	CO3
4	All about data, Preferences and Settings, Storing data, Sharing data with content providers, Loading data using Loaders	**9**	CO4
5	Permissions, Performance and Security, Firebase and AdMob, Publish.	**9**	CO5 CO6

TEXT BOOKS :

1. Google Developer Training, "Android Developer Fundamentals Course – Concept Reference", Google Developer Training Team, 2017.

REFERENCE BOOKS:

1. Best All-Rounder: Android Studio 3.0 Development Essentials - Android 8 Edition

2. Best for Visual Learners: Head First Android Development: A Brain-Friendly Guide

3. Best for a Light-Hearted Approach: Android Development for Gifted Primates: A Beginner's Guide

4. Best for Quick Answers: Android Cookbook: Problems and Solutions for Android Developers

5. Best for Rapid Development: Practical Android: 14 Complete Projects on Advanced Techniques and Approaches

CIE-Continuous Internal Evaluation (50 Marks)

Bloom's Category	Tests (25)	Assignments (10)	Quizzes (5)	Self Study(10)
Remember	5	-	5	-
Understand	5	5	5	-
Apply	5	-	-	5
Analyze	5	5	-	5
Evaluate	5	-	-	-
Create		-	-	-

SEE – Semester End Examinations (50 Marks)

Blooms Category	Tests
Remember	10
Understand	15
Apply	10
Analyze	10
Evaluate	5
Create	-

MANAGEMENT AND ENTREPRENEURSHIP

Course Code	**:**	**ISE813**	**Credits**	**:**	**4**
L:P:T:S	**:**	**3:0:0:1**	**CIE Marks**	**:**	**50**
Exam Hours	**:**	**3**	**SEE Marks**	**:**	**50**

Course Outcomes :

CO1	Use the basic principles and concepts of management.
CO2	Analyze the internal/external factors affecting a business/organization to evaluate business opportunities.
C03	Manage people, processes, and resources within a diverse organization.
C04	Demonstrate the functions, types and roles of an entrepreneur.
C05	Describe the features of small scale industries and understand the institutional support provided for entrepreneurship.
C06	Summarize the preparation of project report, need significance of report. Also to explain about industrial ownership

Mapping of Course Outcomes to Program Outcomes :

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	-	-	1	3	2	3	2	3	3	2	3	2
CO2	-	-	1	3	2	3	2	3	3	2	3	2
CO3	-	-	1	3	2	3	2	3	3	2	3	2
CO4	-	-	1	3	2	3	2	3	3	2	3	2
CO5	-	-	1	3	2	3	2	3	3	2	3	2
CO6	-	-	1	3	2	3	2	3	3	2	3	2

Module No.	**Module Contents**	**Hours**	**COs**
1	Introduction – Meaning, nature and characteristics of management, scope and functional areas of management, goals of management, levels of management, brief overview of evolution of management. Planning- Nature, importance, types of plans, steps in planning, Organizing- nature and purpose, types of organization.	9	CO1
2	Staffing- meaning, process of recruitment and selection. Directing and controlling- meaning and nature of directing, leadership styles, motivation theories. Controlling- meaning, steps in controlling, methods of establishing control, Communication- Meaning and importance, Coordination- meaning and importance	9	CO3

3	Entrepreneur – meaning of entrepreneur, types of entrepreneurship, stages of entrepreneurial process, role of entrepreneurs in economic development, entrepreneurship in India, barriers to entrepreneurship. Identification of business opportunities- market feasibility study, technical feasibility study, financial feasibility study and social feasibility study.	9	CO2, CO4
4	Preparation of project and ERP - meaning of project, project identification, project selection, project report, need and significance of report, contents, formulation, guidelines by planning commission for project report Enterprise Resource Planning: Meaning and Importance- ERP and Functional areas of Management – Marketing / Sales- Supply Chain Management – Finance and Accounting – Human Resources – Types of reports and methods of report generation	9	CO6
5	Micro and Small Enterprises: Definition of micro and small enterprises, characteristics and advantages of micro and small enterprises, steps in establishing micro and small enterprises, Government of India industrial policy 2007 on micro and small enterprises, case study (Microsoft), case study (N R Narayana Murthy & Infosys), Institutional support: MSME-DI, NSIC, SIDBI, KIADB, KSSIDC, TECSOK, KSFC, DIC and District level single window agency, Introduction to IPR.	9	CO5 CO6

TEXT BOOKS :

1. Principles of Management -P. C. Tripathi, P. N. Reddy; Tata McGraw Hill, 4th / 6th Edition, 2010.

2. Dynamics of Entrepreneurial Development & Management -Vasant Desai Himalaya Publishing House. 3. Entrepreneurship Development -Small Business Enterprises -Poornima M Charantimath Pearson Education – 2006.

3. Management and Enterpreneurship- Kanishka Bedi- Oxford University Press-2017

REFERENCE BOOKS :

1. Management Fundamentals -Concepts, Application, Skill Development Robert Lusier – Thomson.

2. Entrepreneurship Development -S S Khanka -S Chand & Co.

CIE-Continuous Internal Evaluation (50 Marks)

Bloom's Category	Tests (25)	Assignments (10)	Quizzes (5)	Self Study(10)
Remember	5	-	-	-
Understand	5	5	5	-
Apply	5	-	-	5
Analyze	5	5	-	5
Evaluate	5	-	-	-
Create	-	-	-	-

SEE – Semester End Examinations (50 Marks)

Blooms Category	Tests
Remember	10
Understand	10
Apply	10
Analyze	10
Evaluate	10
Create	-

Management Information Systems

Course Code : ISE814 **Credits : 04**

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

Exam Hours : 3 **SEE Marks : 50**

Course Outcomes :

CO1	To understand the concepts of management information systems and their impacts
CO2	To understand the e-business systems and learn the tools
CO3	Evaluate the various decision making process and intelligent agents
CO4	Apply the system development process and create a prototype
CO5	Gain knowledge about the various security management tools and its usage
CO6	Usage of MIS for strategic usage of IT

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	3	-	-	1	-	-	-	-	-	-
CO2	3	-	3	-	-	-	2		-	-	2	-
C03	3	3	3	-	-	-	-	1	-	-	2	-
CO4	3	3	3	-	3	-	2	1	-	-	2	-
CO5	3	-	3	-	3	-	2	1	-	-	2	-
C06	3	-	3	-	3	-	2	1	-	-	2	-

Mapping of Course Outcomes to Program Specific Outcomes:

	PSO1	PS02
CO1	2	3
C02	2	3
CO3	2	3
CO4	2	3
CO5	2	3
CO6	2	3

Module No.	Module Contents	Hours	COs
1	Components of an Information Systems: Information system resources, Information system activities. Using Information technology for strategic advantage: strategic uses of IT, agile company, virtual company and knowledge creating company. Managing Data resources: data resource management	9	CO1, CO6
2	e-Business Systems: Cross-functional enterprise applications architecture, enterprise application integration, Transaction processing systems, Enterprise collaboration systems and tools. Functional Business Systems: Marketing systems, Manufacturing systems, Human resource systems, Accounting systems, Financial management systems.	9	CO1, CO2, CO6
3	Decision making: Introductory and definitions, Models, Phases of the decision making process, Decision making: Intelligent Phase, Design phase. Intelligent Systems over the Internet: Web-based intelligent systems, Intelligent agents: an overview, Characteristics of Intelligent agents, Classification and types of intelligent agents, Internet based software agents, Agents and multi agents.	9	CO1, CO3
4	System development and acquisition: The landscape and framework of management support systems application development, Development options for management support system application, Prototyping: A practical management support system development methodology, Criteria for selecting an management support development approach, Third-party providers of management support system software packages and suites, Connecting to databases and other enterprise systems, User-developed management support	9	CO1, CO4

	system, Types of management support system integration, Integration with enterprise systems and knowledge management, The impacts of management support systems		
5	Security management of IT: Introduction, Tools of security management, Internetworked security defenses, Other security measures, System Controls and audits. Enterprise and Global Management of IT: Managing IT, Business / IT planning, Managing the IT function, organizing IT, Managing global IT: The International Dimension, Global IT Management, Global Business/ IT strategies, Global Business / IT applications, Global IT Platforms, Global data access issues, Global Systems development.	9	CO1,CO5,CO6

TEXT BOOKS :

1. Management Information Systems by James A. O' Brien, George M. Marakas, 9th Edition, Tata McGraw Hill, 2006.
2. Decision support and Business Intelligence systems by Efraim turban, Jay E Aronson, Teng-peng liang, Ramesh sharda, 8th Edition, Pearson Prentice hall, 2009.

REFERENCE BOOKS :

1. Management Information systems – S. Sadogopan. – PHI – 1998Edn. ISBN 81-203-1180-9.

2. Information systems for modern management – G.R. Murdick – PHI – 2nd Edition.

CIE-Continuous Internal Evaluation (50 Marks)

Bloom's Category	Tests (25)	Assignments (10)	Quizzes (5)	Self Study(10)
Remember	5	-	5	
Understand	5	5	5	
Apply	5	-	-	
Analyze	5	5	-	5
Evaluate	5	-	-	5
Create		-	-	

SEE – Semester End Examinations (50 Marks)

Blooms Category	Tests
Remember	10
Understand	15
Apply	10
Analyze	10
Evaluate	5
Create	-

Software Quality Metrics

Course Code : ISE815 **Credits : 4**
L:P:T:S : 3:0:0:1 **CIE Marks : 50**
Exam Hours : 3 **SEE Marks : 50**

Course Outcomes :

CO1	To Understand the concepts of software metrics and its scope
CO2	To learn from case studies various empirical investigations and its principals
CO3	Evaluate the correctness and worthiness of software measurement data that will be used for metric analysis
CO4	To Analyze of the software measurement data
CO5	To analyze the internal software attributes
CO6	To do a case study based on the terminology learnt

Mapping of Course Outcomes to Program Outcomes :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	3	-	-	1	-	-	-	-	-	-
CO2	3	-	3	-	-	-	2	-	-	-	2	-
C03	3	3	3	-	-	-	-	1	-	-	2	-
CO4	3	3	3	-	3	-	2	1	-	-	2	-
CO5	3	-	3	-	3	-	2	1	-	-	2	-
CO6	-	-	3	-	3	-	2	1	-	-	2	-

Module No.	Module Contents	Hours	COs
1	Fundamentals of measurements: Measurement in everyday life, in Software Engineering, Scope of software metrics, The basics of measurements - Representational theory of measurement, measurement and models, measurement scale and scale types, meaningfulness in measurement, A goal framework for software measurement	9	CO1

2	Classifying software measures; determining what to measure, applying the framework, software measurement validation and in practice. Empirical investigation – Four principals of investigation, planning formal experiments, planning case studies, Software metrics data collection – What is good data, how to define the data, how and when to collect data, how to store and extract data.	9	CO2 CO3
3	Analyzing software measurement data – Analyzing the results of experiments, examples of simple analysis techniques, more advanced methods, overview of statistical tests. Measuring internal software attributes: size – Aspects of software size, length, reuse, functionality, complexity	9	CO3 CO4 CO6
4	Measuring internal software attributes: structure – Types of structural measures, control-flow structure, modularity and information flow attributes, object-oriented metrics, data structure, difficulties with general complexities measures, Measuring external software attributes – Modeling software quality, measuring aspects of quality.	9	CO5
5	Software Reliability – measurement and predication: Basics of reliability theory, the software reliability problem, parametric reliability growth models, predictive accuracy, the recalibration of software reliability growth predictions, the importance of the operational environment, wider aspects of software reliability	9	CO5 CO6

TEXT BOOKS :

1. Norman Fenton, James Bieman, Software metrics : A Rigorous and practical approach. Third edition, CRC press 2014

2. Stefhan H Kan, Metrics and Models in Software Quality Engineering, Pearson Education , 2003

REFERENCE BOOKS :

1. Paul C. Jorgensen: Software Testing, A Craftsman's Approach, 3rd Edition, Auerbach Publications, 2013.ISBN: 9670201785602

2. Mauro Pezze, Michal Young: Software Testing and Analysis – Process, Principles and Techniques, John Wiley & Sons, 2008 ISBN: 978-81-203-1351-4

CIE-Continuous Internal Evaluation (50 Marks)

Bloom's Category	Tests (25)	Assignments (10)	Quizzes (5)	Self Study(10)
Remember	5	-	5	-
Understand	5	5	-	10
Apply	5	-	-	-
Analyze	5	5	-	-
Evaluate	5	-	-	-
Create	-	-	-	-

SEE – Semester End Examinations (50 Marks)

Blooms Category	Tests
Remember	10
Understand	15
Apply	10
Analyze	10
Evaluate	5
Create	-

APPENDIX A

Outcome Based Education

Outcome-based education (OBE) is an educational theory that bases each part of aneducational system around goals (outcomes). By the end of the educational experience each student should have achieved the goal. There is no specified style of teaching or assessment in OBE; instead classes, opportunities, and assessments should all help students achieve the specified outcomes.

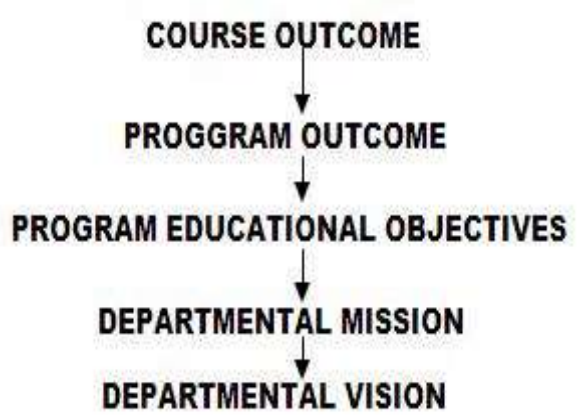
There are three educational Outcomes as defined by the National Board of Accreditation:

Program Educational Objectives: The Educational objectives of an engineering degreeprogram are the statements that describe the expected achievements of graduate in their career and also in particular what the graduates are expected to perform and achieve during the first few years after graduation. [nbaindia.org]

Program Outcomes: What the student would demonstrate upon graduation. Graduateattributes are separately listed in Appendix C

Course Outcome: The specific outcome/s of each course/subject that is a part of theprogram curriculum. Each subject/course is expected to have a set of Course Outcomes

Mapping of Outcomes



APPENDIX B

The Graduate Attributes of NBA

Engineering knowledge: Apply the knowledge of mathematics, science, engineeringfundamentals, and an engineering specialization to the solution of complex engineering problems.

Problem analysis: Identify, formulate, research literature, and analyze complex engineeringproblems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

Design/development of solutions: Design solutions for complex engineering problems anddesign system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

Conduct investigations of complex problems: The problems that cannot be solved bystraightforward application of knowledge, theories and techniques applicable to the engineering discipline that may not have a unique solution. For example, a design problem can be solved in many ways and lead to multiple possible solutions that require consideration of appropriate constraints/requirements not explicitly given in the problem statement (like: cost, power requirement, durability, product life, etc.) which need to be defined (modeled) within appropriate mathematical framework that often require use of modern computational concepts and tools.

Modern tool usage: Create, select, and apply appropriate techniques, resources, andmodern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

The engineer and society: Apply reasoning informed by the contextual knowledge to assesssocietal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

Environment and sustainability: Understand the impact of the professional engineeringsolutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

Ethics: Apply ethical principles and commit to professional ethics and responsibilities andnorms of the engineering practice.

Individual and team work: Function effectively as an individual, and as a member or leaderin diverse teams, and in multidisciplinary settings.

Communication: Communicate effectively on complex engineering activities with theengineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

Project management and finance: Demonstrate knowledge and understanding of theengineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

Life-long learning: Recognize the need for, and have the preparation and ability to engage inindependent and life-long learning in the broadest context of technological change.

APPENDIX C

BLOOM'S TAXONOMY

Bloom's taxonomy is a classification system used to define and distinguish differentlevels of human cognition—i.e., thinking, learning, and understanding. Educators have typically used Bloom's taxonomy to inform or guide the development of assessments (tests and other evaluations of student learning), curriculum (units, lessons, projects, and other learning activities), and instructional methods such as questioning strategies.