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

Fifth and Sixth Semester

Scheme and Syllabus

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

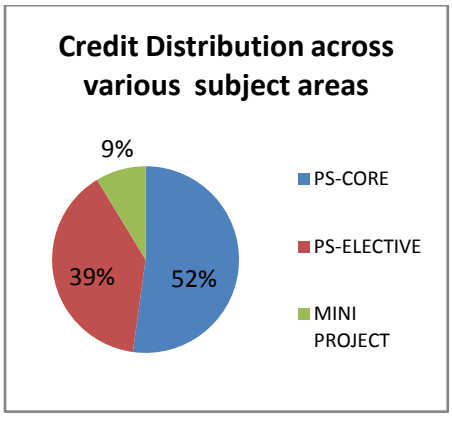
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PEO1	3	3	3	2	3	-	-	-	3	-	3	-
PEO2	3	3	3	2	3	-	-	-	3	-	3	-
PEO3	3	3	3	2	3	-	-	-	3	-	3	-
PEO4	3	3	3	2	3	-	-	-	3	-	3	-

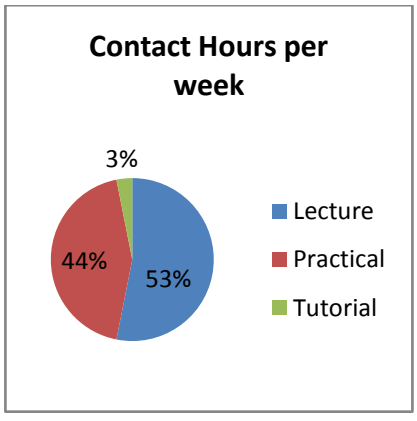
Correlation: 3- High, 2-Medium, 1-Low

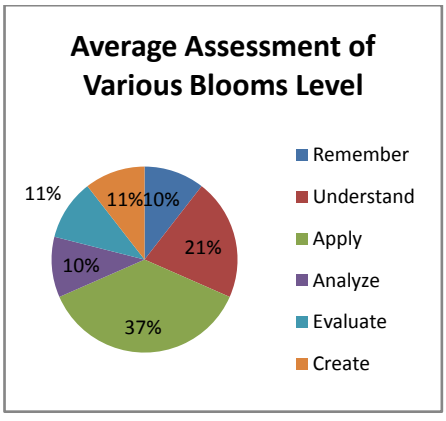
New Horizon College of Engineering
Department of Information Science and Engineering
Fifth Semester B.E Program–Scheme AY: 2020-21

Sl. No.	Course Code	Course Name	BOS	Credit Distribution			Overall Credits	Contact Hours	Marks		
				L	T	P			CIE	SEE	TOTAL
1.	20ISE51	Web Internet Programming	ISE	3	0	0	3	3	50	50	100
2.	20ISE52	Design and Analysis of Algorithms	ISE	3	1	0	4	5	50	50	100
3.	20ISE53	Data Science	ISE	3	0	0	3	3	50	50	100
4.	20ISE54	Mobile Application Development	ISE	3	0	0	3	3	50	50	100
5.	20ISE55X	Professional Elective-1	ISE	3	0	0	3	3	50	50	100
6.	20ISL56	Design and Analysis of Algorithms Lab	ISE	0	0	2	2	4	25	25	50
7.	20ISL57	Data Science Lab	ISE	0	0	1.5	1.5	3	25	25	50
8.	20ISL58	Mobile Application Development Lab	ISE	0	0	1.5	1.5	3	25	25	50
9.	20ISE59	Mini Project	ISE	-	-	-	2	-	25	25	50
Total							**23**	**27**	**350**	**350**	**700**

Professional Elective - 1	
Course Code	**Course Name**
20ISE551	NOSQL
20ISE552	Internet of Things
20ISE553	Unix System Programming
20ISE554	Automata theory and formal languages
20ISE555	File Structures



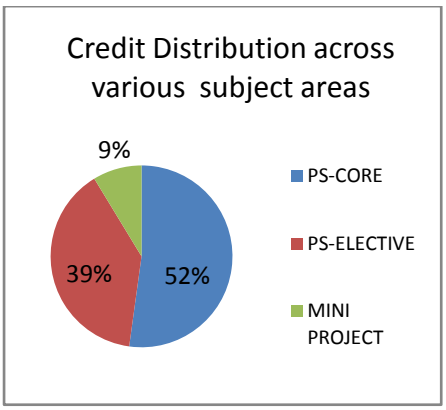


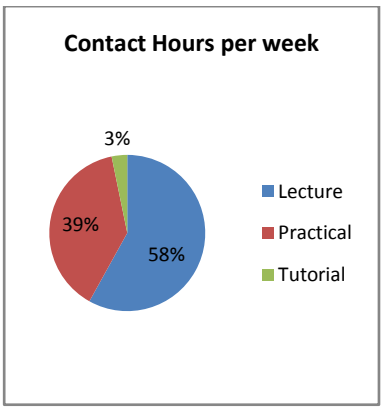


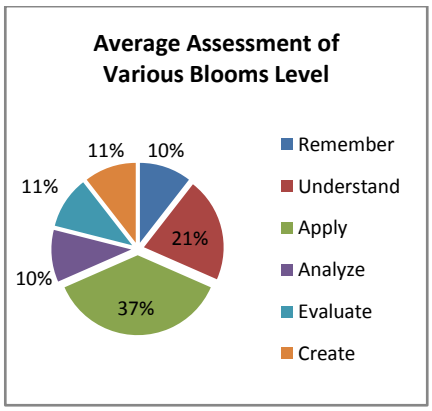
New Horizon College of Engineering
Department of Information Science and Engineering
Sixth Semester B.E Program-Scheme AY: 2020-21

Sl. No.	Course Code	Course Name	BOS	Credit Distribution			Overall Credits	Contact Hours	Marks		
				L	T	P			CIE	SEE	TOTAL
1.	20ISE61	Software Engineering & Project Management	ISE	3	0	0	3	3	50	50	100
2.	20ISE62	Advanced Java	ISE	3	0	0	3	3	50	50	100
3.	20ISE63	Machine Learning	ISE	3	0	0	3	3	50	50	100
4.	20ISE64X	Professional Elective-2	ISE	3	0	0	3	3	50	50	100
5.	20ISE65X	Professional Elective-3	ISE	3	0	0	3	3	50	50	100
6.	NHOPXX	Open Elective - 1	COE's	3	0	0	3	3	50	50	100
7.	20ISL66	Advanced Java Lab	ISE	0	0	1.5	1.5	3	25	25	50
8.	20ISL67	Machine Learning Lab	ISE	0	0	1.5	1.5	3	25	25	50
9.	20ISE68	Mini Project	ISE	-	-	-	2	-	25	25	50
Total							**23**	**24**	**375**	**375**	**750**

Professional Elective – 2		Professional Elective – 3	
Course Code	**Course Name**	**Course Code**	**Course Name**
20ISE641	Data Visualization	20ISE651	User Interface Design
20ISE642	System Modeling & Simulation	20ISE652	Virtual Reality
20ISE643	Object Oriented Modeling & Design	20ISE653	C# & .Net
20ISE644	Compiler Design	20ISE654	Computer Graphics using OpenGL
20ISE645	Operations Research	20ISE655	Soft Computing







FIFTH SEMESTER

(SYLLABUS)

WEB INTERNET PROGRAMMING

Course Code : 20ISE51 **Credits : 03**
L:T:P : 3:0:0 **CIE Marks: 50**
Exam Hours : 3 **SEE Marks: 50**

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

CO1	Design web pages using XHTML and HTML5.
CO2	Apply Cascading Style Sheets to web pages.
CO3	Develop JavaScript programs to validate and create dynamic WebPages.
CO4	Develop server side programs using PHP and accessing database through PHP.
CO5	Describe the methods to handle data through the web and design XML document.
CO6	Inspect the management of state in web applications and JavaScript frameworks like jQuery and Backbone which facilitates developer to focus on core features.

Mapping of Course Outcomes to Program Outcomes:

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

Mapping of Course Outcomes to Program Specific Outcomes:

CO	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	**XHTML:** Basic syntax, Standard XHTML document structure; Basic text markup, Images; Hypertext Links, Lists, Tables, Forms, Syntactic differences between HTML and XHTML. **Cascading Style Sheets:** Introduction, Levels of style sheets, Style specification formats, Selector forms, The Box model, Background images, The and tags, Advanced CSS: Layout, Normal Flow, Positioning Elements, Floating Elements.	9	CO1 CO2
2	**HTML 5:** Detecting HTML 5 features – Canvas, video, local storage, web workers, offline applications, geo-location,input types. What does it all mean – doctype, root, headers, articles, dates and times, navigation and footers. Let's call it drawing surface - Simple shapes, canvas, Paths, texts, gradients and images. A Form of madness.	9	CO1
3	**JAVASCRIPT:** Overview of JavaScript, General syntactic characteristics, Screen output and keyboard input, Control statements, Object creation and modification, Arrays, Functions, Constructor, Pattern matching using regular expressions. **JavaScript and DHTML Documents:** The Document Object Model, Element access in JavaScript, Events and event handling.Moving elements, Element visibility, Dynamic content, Slow movement of elements.	9	CO3
4	**PHP Programming** Origins and uses of PHP, Overview of PHP, General syntactic characteristics, Output, Control statements, Arrays, Functions, Pattern matching, Form handling, Files, Cookies, Session tracking, Database access with PHP and MySQL.	9	CO4
5	**XML:** Introduction to XML, The Syntax of XML, Document structure, Document Type Definition (DTD),Displaying XML documents with CSS, XSLT style sheets. **Managing State**, Passing Information via Query Strings, Passing Information via the URL Path, Serialization, jQuery Foundations, AJAX, Animation, JSON.	9	CO5 CO6

Text Books:

1. Robert W. Sebesta,"Programming the World Wide Web", 8th Edition, Pearson Education, 2015.
2. Randy Connolly, Ricardo Hoar, "Fundamentals of Web Development", 1st Edition, Pearson Education India.
3. Mark Pilgrim,"HTML5: Up and Running:Dive into HTML5",1st EditionO'Reilly/Google Press Publishers & Distributors Pvt Ltd.

Reference Books:

1. Paul Deitel, Harvey Deitel, Abbey Deitel, "Internet & World Wide Web How to program", 5th Edition, Pearson Education / PHI, 2012.
2. Erik Bruchez, Danny Ayers, Eric Van Der Vlist, "Professional Web 2.0 Programming",1stEdition, Wiley India Pvt. Ltd, 2014.
3. Robin Nixon, "Learning PHP, MySQL &JavaScript with jQuery, CSS and HTML5", 4thEdition, O'Reilly Publications, 2015.

Web References:

1. https://www.w3schools.com
2. https://swayam.gov.in/nd1_noc20_cs52

CIE - Continuous Internal Evaluation (50 Marks)

Bloom's Taxonomy	**Tests (25 Marks)**	**Assignments (15 Marks)**	**Quizzes (10 Marks)**
Remember	5	-	5
Understand	10	5	5
Apply	5	5	-
Analyze	-	-	-
Evaluate	-	-	-
Create	5	5	-

SEE – Semester End Examination (50marks)

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

DESIGN AND ANALYSIS OF ALGORITHMS

Course Code	**: 20ISE52**	**Credits**	**: 04**
L:T:P	**: 3:1:0**	**CIE Marks**	**: 50**
Exam Hours	**: 3**	**SEE Marks**	**: 50**

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

CO1	Analyze algorithms in terms of space and time complexity.
CO2	Analyze and solve problems using brute force, divide and conquer, decrease and conquer and transform and conquer techniques.
CO3	Analyze and solve problems using greedy, dynamic programming, backtracking and branch and bound approaches.
CO4	Compare different classes of computational complexity.
CO5	Use string matching and parallel algorithm.
CO6	Apply appropriate algorithm design techniquefor a given problem.

Mapping of Course Outcomes to Program Outcomes:

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

Mapping of Course Outcomes to Program Specific Outcomes:

CO/PSO	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:** Fundamentals of Algorithms, Problem Solving-Important Problem Types, Performance Analysis: Space complexity, Time complexity–Asymptotic notations and Basic efficiency classes: Big-Oh notation (O), Omega notation (Ω), Theta notation (Θ),Mathematical analysis for Recursive and Non-recursive algorithms. **Brute Force Approach:**General Method, Simple string matching	9	CO1
2	**Divide and Conquer:** General method-Recurrence equation for divide and conquer-Analysis of quick sort and merge sort	9	CO2, CO6

	algorithm- Advantages and disadvantages of divide and conquer approach. **Decrease and Conquer:**General Method, Topological sorting. **Transform and Conquer:**General Method, Heaps and Heap Sort		
3	**Greedy Approach:** General method,Prim's Algorithm,Kruskal's Algorithm,Single source shortest paths: Dijkstra's Algorithm,0/1 Knapsack problem. **Dynamic Programming:**General method, All pair shortest path problem, Longest common subsequence, Traveling salesperson problem	9	CO3, CO6
4	**Backtracking:**General method, N-Queens problem,Sum of subsets problem, Hamiltonian cycles. **Branch and Bound:**General method,Travelling Sales Person problem, Knapsack problem, LC Programme and Bound solution.	9	CO3, CO6
5	**NP Complete and NP-Hard problems:**Basic concepts-non-deterministic algorithms-P, NP, NP-Complete, and NP-Hard classes **String matching algorithm:**KMP String matching algorithm-Boyer Moore String matching algorithm **Parallel algorithms:**PRAM models, Prefix computation, Odd even merge sort, Sorting on a mesh.	9	CO4, CO5

TEXT BOOKS:

1. Anany Levitin , "Introduction to the Design and Analysis of Algorithms,3rd Edition,Pearson, 2012
2. Ellis Horowitz, Satraj Sahni and Rajasekaran, "Computer Algorithms/C++", 2nd Edition, Universities Press, 2014
3. Cormen T.H., Leiserson C.E., Rivest R.L., Stein C, "Introduction to Algorithms", 3rd Edition, , PHI Publications, 2010

REFERENCE BOOKS:

1. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, Reprint 2006.
2. S. Sridhar, "Design and Analysis of Algorithms", Oxford (Higher Education).

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Taxonomy	Tests (25 marks)	Assignments (15 Marks)	Quizzes (10 Marks)
Remember	-	-	-
Understand	5	-	5
Apply	10	10	5
Analyze	5	5	-
Evaluate	5	-	-
Create	-	-	-

SEE- Semester End Examination (50 Marks)

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

DATA SCIENCE

Course Code : 20ISE53 **Credits : 03**
L:T:P : 3:0:0 **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 probability, statistics and linear algebra concepts essential for data science.
CO2	Model the real world dataset and apply algebric and geometric view for the data.
CO3	Apply linear regression & multiple linear regression for model building and prediction.
CO4	Develop the classification models using classification algorithms.
CO5	Develop the clustering models using clustering algorithms.
CO6	Model the real world dataset and apply optimization techniques.

Mapping of Course Outcomes to Program Outcomes:

CO/PO	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:

CO/PSO	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	**Foundations of Data Science :** Introduction to Data Science,Data mining and Datawarehousing,Descriptive Analytics, Probability Theory, Probability distribution, Confidence Interval ,Hypothesis Testing,	9	CO1
2	**Data Preprocessing :**Types of Data, Sampling Theory, Feature selection, Dimentionality reduction techniques: Algebric view, vectors,rank , null space, pseudo inverse, Geometric View, Projections, Eigen value decomposition, Pricipal component Analysis(PCA)	9	CO2
3	**Linear Regression:**Simple Linear Regression - Steps in Building a Regression Model,Model Diagnostics,Multiple Linear Regression - Developing Multiple Linear Regression Model , Multi collinearity, Residual analysis,Detecting Influencers	9	CO3
4	**Classification:** Logistic regression, Naiive Bayes, K Nearest Neighbor, Decision Trees, Random Forest	9	CO4
5	**Clustering, Optimization:** K Means, Hierarchical clustering, Optimization for Data Science	9	CO5,CO6

TEXT BOOKS:

1. U Dinesh Kumar, “Busuness Analytics :The Science of Data Driven decission making”,First Edition, Wiley Publishers, 2017
2. Manaranjan Pradhan, U Dinesh Kumar, “Machine Learning using Python”, First Edition, Wiley Publishers, 2019
3. Gilbert Strang, “Introduction to Linear Algebra, Fifth Edition”, Wellesley-Cambridge Press and SIAM, 2016
4. Jiawei Han , Micheline Kamber , Jian Pei Professor, “Data Mining: Concepts and Techniques”, Third Edition, Morgan Kaufmann Series,2011

REFERENCE BOOKS:

1. Bruce M King, Edward W Minium , “Statistical Reasoning in the Behavioral Sciences”, 5th Edition, Wiley Publishers, 2018
2. Douglas C. Montgomery, Douglas C. Montgomery, George C. Runger, “Applied Statistics and Probability for Engineers”,6th Edition, Wiley Publishers, 2016
3. McKinney W. “Python for data analysis: Data wrangling with Pandas, NumPy, and IPython.” O'Reilly Media, Inc., 2012
4. EMC Education Services , “Data Science & Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data”, John Wiley & Sons, Inc.

WEB RESOURCES:

1. https://machinelearningmastery.com/
2. https://towardsdatascience.com/data-science/home
3. https://mastersindatascience.com/resources/top-100-data-science-resources/
4. https://swayam.gov.in/nd1_noc19_cs60/preview
5. https://swayam.gov.in/nd1_noc20_cs46/preview

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Taxonomy	Tests (25 marks)	Assignments (15 Marks)	Quizzes (10 Marks)
Remember	5	-	-
Understand	5	5	5
Apply	5	5	5
Analyze	5	-	-
Evaluate	-	-	-
Create	5	5	-

SEE- Semester End Examination (50 Marks)

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

MOBILE APPLICATION DEVELOPMENT

Course Code	**: 20ISE54**	**Credits**	**: 03**
L:T:P	**: 3:0:0**	**CIE Marks**	**: 50**
Exam Hours	**: 3**	**SEE Marks**	**: 50**

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

CO1	Know the components and structure of mobile application development frameworks for Android and windows OS based mobiles.
CO2	Understand how to work with various mobile application development frameworks.
CO3	Apply the basic and important design concepts and issues of development of mobile applications.
CO4	Analyze the capabilities and limitations of mobile devices.
CO5	Develop the skills in designing and building mobile applications using android platform.
CO6	Build mobile applications using multimedia graphics and animations.

Mapping of Course Outcomes to Program Outcomes:

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

Mapping of Course Outcomes to Program Specific Outcomes:

CO/PSO	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 TO ANDROID OPERATING SYSTEM:** Android OS design and Features – Android development framework, SDK features, Installing and running applications on Eclipse platform, Creating AVDs, Types of Android applications, Android tools, Android Applicationcomponents – Android Manifest file,Android Application Lifecycle – Activities, Activity lifecycle, activity states, monitoring state changes	9	CO1

2	**ANDROID UI ARCHITECTURE & UI WIDGETS** Fundamental Android UI design Layouts, Drawable resources, UIwidgets, Notification, Toasts, Menu, Dialogs, Building dynamic UI with fragments.	9	CO2
3	**INTENTS AND BROADCASTS:** Intent, Native Actions, using Intent to dial a number or to send SMS. Broadcast Receivers - Using Intent filters to service implicit Intents, Resolving Intent filters, finding and using Intents received within an Activity. Notifications – Creating and Displaying notifications, Displaying Toasts	9	CO3, CO5
4	**DATA STORAGE, SERVICES & CONTENT PROVIDERS:** Saving Data, Interacting with other Apps, Apps with content sharing, Shared Preferences, Preferences activity, Files access, SQLite database, Overview of services in Android, Implementing a Service, Service lifecycle, Inter Process Communication.	9	CO4
5	**ADVANCED APPLICATIONS:** Building apps with Multimedia, Building apps with Graphics & Animations, Building apps with Sensors, Bluetooth, Camera, Telephony Services, Building apps with Location Based Services and Google maps.	9	CO6

Text Books:

1. Google Developer Training, "Android Developer Fundamentals Course – Concept Reference", Google Developer Training Team, 2017. https://www.gitbook.com/book/google-developer-training/android-developerfundamentals-course-concepts/details (Download pdf file from the above link)
2. Reto Meier , "Professional Android2 Application Development", Wiley India Pvt.ltd, 1st Edition;2012
3. Phillips, Stewart, Hardy and Marsicano, "Android Programming", 2nd edition -Big Nerd Ranch Guide;2015
4. James C Sheusi , "Android Application Development for Java Programmers", , Cengage Learning, 2013

Reference Books:

1. Mark Murphy, "BeginningAndroid3" , Apress Springer India Pvt Ltd, 1st Edition; 2011
2. EricHellman, "AndroidProgramming–Pushing the limits" , Wiley, 2013
3. Wei-Meng Lee , "Beginning Android 4 Application Development",Wiley India (Wrox), 2013

WEB RESOURCES:

1. https://developer.android.com/studio/intro
2. https://www.tutorialspoint.com/android/index.htm
3. https://www.javatpoint.com/android-tutorial

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Taxonomy	Tests (25 marks)	Assignments (15 Marks)	Quizzes (10 Marks)
Remember	5	-	-
Understand	5	-	5
Apply	5	10	5
Analyze	-	-	-
Evaluate	5	-	-
Create	5	5	-

SEE- Semester End Examination (50 Marks)

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

NOSQL

Course Code : 20ISE551 **Credits : 03**
L:T:P : 3:0:0 **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, compare and use the four types of NoSQL Databases (Document-oriented, KeyValue Pairs, Column-oriented and Graph).
CO2	Illustrate the Application and Integration of Databases.
CO3	Apply the detailed architecture, define objects, load data, query data and performance tune Document-oriented NoSQL databases.
CO4	Understanding of the detailed architecture, define objects, load data, query data and performance tune Column-oriented NoSQL databases.
CO5	Understanding of the detailed architecture, define objects, load data, query data and performance Key-Value Databases.
CO6	Understanding of the detailed architecture, define objects, load data, query data and performance Graph NoSQL databases.

Mapping of Course Outcomes to Program Outcomes:

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

Mapping of Course Outcomes to Program Specific Outcomes:

CO/PSO	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:**Overview, and History of NoSQL Databases Definition of the Four Types of NoSQL Database, The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, The Emergence of NoSQL, Key Points.	9	CO1
2	**NoSQL Key/Value databases using MongoDB**: Document Databases, What Is a Document Database? Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Web Analytics or Real-Time Analytics, E-Commerce Applications, When Not to Use, Complex Transactions Spanning Different Operations, Queries against Varying Aggregate Structure.	9	CO2
3	**Column- oriented NoSQL databases using Cassandra**: Column-oriented NoSQL databases using Apache Cassandra, Architecture of Cassandra, What Is a Column-Family Data Store? Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Counters, Expiring Usage, When Not to Use.	9	CO3
4	**NoSQL Key/Value databases:** Key-Value Databases, What Is a Key-Value Store, Key-Value Store Features, Consistency, Transactions, Query Features, Structure of Data, Scaling, Suitable Use Cases, Storing Session Information, User Profiles, Preferences, Shopping Cart Data, When Not to Use, Relationships	9	CO4

	among Data, Multioperation Transactions, Query by Data, Operations by Sets.		
5	**Graph NoSQL databases**:NoSQL database development tools and programming languages, Graph Databases, What Is a Graph Database? Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Connected Data, Routing, Dispatch, and Location-Based Services, Recommendation Engines, When Not to Use.	9	CO5, CO6

TEXT BOOKS:

1. R. Elmasri S. B. Navathe, "Fundamentals of Database Systems", Addison Wesley, 2018.
2. Raghu Ramakrishnan, "Database Management Systems" , Mcgraw-Hill,4th edition,2018.

REFERENCE BOOKS:

1. Pramod J. Sadalage and Marin Fowler, NoSQL Distilled: A brief guide to merging world of Polyglot persistence, Addison Wesley, 2018.
2. Thomas Connolly, Carolyn Begg, Database Systems: A Practical Approach to Design, Implementation and Management,6th Edition,2018.

WEB RESOURCES:

1. "Introduction to NOSQL",https://www.simplilearn.com/introduction-to-nosql-databases-tutorial-video.

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Taxonomy	Tests (25 marks)	Assignments (15 Marks)	Quizzes (10 Marks)
Remember	5	-	-
Understand	10	-	5
Apply	10	10	5
Analyze	-	-	-
Evaluate	-	-	-
Create	-	5	-

SEE- Semester End Examination (50 Marks)

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

INTERNET OF THINGS

Course Code	**: 20ISE552**	**Credits**	**: 03**
L:T:P	**: 3:0:0**	**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 IoT concepts, underlying technologies and migration of M2M to IoT.
CO2	Understand the M2M fundamentals and data management
CO3	Analyze the various features of IoT standard protocols and platforms
CO4	Implement programs using Raspberry pi model
CO5	Understand the interface concepts with networks
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	3	2	2	3	2	1	1	2	2	2	2
CO2	3	3	2	2	3	2	1	1	2	2	2	2
CO3	3	3	2	2	3	2	1	1	2	2	2	2
CO4	3	3	2	2	3	2	1	1	2	2	2	2
CO5	3	3	2	2	3	2	1	1	2	2	2	2
CO6	3	3	2	2	3	2	1	1	2	2	2	2

Mapping of Course Outcomes to Program Specific Outcomes:

CO/PSO	**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 to IoT:** IoT Overview, Definition, Hardware and Software, market perspective, Introduction to M2M, The Vision- From M2M to IoT, M2M towards IoT-the global context, A use case example, Architecture Reference Model- IoT reference Model	9	CO1
2	**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	CO2

3	**IoT Protocols and Platforms:** 6LowPAN,Wi-fi,Bluetooth, COAP, MQTT, RESTAPI,OP-CUA **Platforms:** Microsoft Azure, Google cloud, Think Speak, IBM Watson , Adafrui	9	CO3
4	**IoT Programming :**Introduction to Raspberry PI, Rasbian OS, interfacing analog and digital devices, enabling network connectivity ,Connecting with web Server	9	CO4, CO5
5	**Applications of IoT:** Home Automation, Automated Street light, Environment Monitoring, Soil Monitoring, Smart city-Transport, Water supply, Garbage collection, Parking.	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. Matt Richardson and Shawn Wallace, "Getting Started with Raspberry Pi",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. Vijay Madisetti and Arshdeep Bahga "Internet of Things (A Hands-on-Approach)", , 1st Edition, VPT, 2014.
2. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013
3. Simone Cirani, Gianluigi Ferrari, Marco Picone, Luca Veltri, "Internet of Things: Architectures, Protocols and Standards", Wiley, Nov 2018
4. Colin Dow, "Internet of Things Programming Projects: Build modern IoT solutions with the Raspberry Pi 3 and Python", 1st edition, Packt Publishing,2018
5. Abdulrahman Yarali , "IoT: Platforms, Connectivity, Applications and Services ",Nova Science Publishers Inc ,Apr 2018

WEB RESOURCES:

1. "Raspberry pi", https://www.raspberrypi.org/
2. IoT protocols,https://www.postscapes.com/internet-of-things-protocols/
3. IoT Platforms, https://www.javatpoint.com/iot-tutorial

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Taxonomy	Tests (25 marks)	Assignments (15 Marks)	Quizzes (10 Marks)
Remember	-	-	-
Understand	10	-	5
Apply	5	10	5
Analyze	5	5	-
Evaluate	5	-	-
Create	-	-	-

SEE- Semester End Examination (50 Marks)

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

UNIX SYSTEM PROGRAMMING

Course Code : 20ISE553 **Credits : 03**
L:T:P : 3:0:0 **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 UNIX architecture and basics of UNIX files.
CO2	Understand importance of Unix and POSIX standards.
CO3	Use UNIX APIs for file manipulation.
CO4	Illustrate the concept of Unix process control including process creation, process environment and process relationship.
CO5	Apply Unix API for signal handling and daemon process control.
CO6	Illustrate the client/server paradigm of computing with IPC mechanism: PIPES, FIFOs, Message Queues, Semaphores and shared memory using their APIs

Mapping of Course Outcomes to Program Outcomes:

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

Mapping of Course Outcomes to Program Specific Outcomes:

CO/PSO	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: Unix Components/Architecture. Features of Unix. The UNIX Environment and UNIX Structure, Posix and Single Unix specification. General features of Unix commands/ command structure. Command arguments and options. Basic Unix commands such as echo, printf, ls, who, date, passwd, cal, Combining commands. Meaning of Internal and external commands. The type command: knowing the type of a command and locating it.The root login. Becoming the super user: su command.	9	CO1
2	Introduction: UNIX and ANSI Standards: The ANSI C Standard, The UNIX and POSIX Development Environment, API Common Characteristics. UNIX Files and APIs: File Types, The UNIX and POSIX File System, Attributes, Inodes, API to Files, UNIX Kernel Support, Relationship of C Stream Pointers and File Descriptors, Directory Files, Hard and Symbolic Links. UNIX File APIs: General File APIs, File and Record Locking, Directory File APIs, Device File APIs, FIFO File APIs, Symbolic Link File APIs.	9	CO2,CO3
3	UNIX Processes and Process Control: The Environment of a UNIX Process, Memory Layout of a C Program, Memory Allocation, Environment Variables, setjmp, longjmp, getrlimit,setrlimit Functions, UNIX Kernel Support for Processes. Process Control:Introduction, Process Identifiers, fork, vfork, exit, wait, waitpid, wait3, wait4 Functions, Race Conditions, exec Functions	9	CO4
4	Signals and Daemon Processes: Signals: The UNIX Kernel Support for Signals, signal, Signal Mask, sigaction, The SIGCHLD Signal and the waitpid Function, The sigsetjmp and siglongjmp Functions, Kill, Alarm Timers. Daemon Processes: Introduction, Daemon Characteristics, Coding Rules	9	CO5

5	InterprocessCommunication : Overview of IPC Methods, Pipes, popen, pclose Functions, Coprocesses, FIFOs, Message Queues, Semaphores. Shared Memory, Client-Server Properties, Stream Pipes, Passing File Descriptors, Client-Server Connection Functions.	9	CO6

TEXT BOOKS:

1. Sumitabha Das, "Unix Concepts and Applications", Tata McGraw Hill, 4th Edition
2. Terrence Chan, "Unix System Programming Using C++", PHI, 1999.
3. W.Richard Stevens, Stephen A.Rago, "Advanced Programming in the UNIX Environment", Pearson Education / PHI, 3rd Edition,2005

REFERENCE BOOKS:

1. M.G. Venkatesh Murthy,"UNIX & Shell Programming", Pearson Education.
2. Richard Blum , Christine Bresnahan, "Linux Command Line and Shell Scripting Bible", Wiley,2nd Edition,2014.

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Taxonomy	Tests (25 marks)	Assignments (15 Marks)	Quizzes (10 Marks)
Remember	5	-	-
Understand	10	10	5
Apply	10	5	5
Analyze	-	-	-
Evaluate	-	-	-
Create	-	-	-

SEE- Semester End Examination (50 Marks)

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

AUTOMATA THEORY AND FORMAL LANGUAGES

Course Code : 20ISE554 **Credits : 03**
L:T:P : 3:0:0 **CIE Marks:50**
Exam Hours : 3 **SEE Marks:50**

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

CO1	Acquire a fundamental understanding of the core concepts in automata theory, construct Deterministic Finite Automata (DFA) and Non-deterministic Finite Automata (NFA) and ability to transform between equivalent finite automata.
CO2	Construct Epsilon-NFA and transform between equivalent finite automata also understand the power and the limitations of regular expressions and design regular expressions.
CO3	Compute transformation between finite automata and regular expressions and to minimize the DFA with equivalence technique.
CO4	Describe and construct Context Free Grammar and Pushdown Automata, transformation between them.
CO5	Construct and analyze the use and properties of Turing machines performing simple tasks, with recent trends and applications in the area of finite state machines.
CO6	Comprehend and manipulate the different concepts in automata theory and formal languages.

Mapping of Course Outcomes to Program Outcomes:

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

Mapping of CO v/s PSO:

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

Module No.	Module Contents	Hours	COs
1	**Introduction to Finite Automata:** Prerequisites- Set Theory concepts; Introduction to Finite Automata; The central concepts of Automata theory- Alphabets, Strings, Languages; Deterministic finite automata (DFA)- Definition & problems; Non-deterministic finite automata (NFA) - Definition & problems; Conversion from NFA to DFA- Subset Construction Method & Lazy Evaluation Method; An Application of finite automata.	9	C01, CO6
2	**Finite Automata and Regular Expressions (1):**Finite automata with Epsilon-transitions (Epsilon –NFA) – Definition, Epsilon Closure, Conversion from Epsilon-NFA to DFA; Differences between DFA, NFA, Epsilon-NFA; Moore and Mealy machines, Simulators for Finite Automata. **Regular expressions-**Definition, Operators of Regular Expressions, Building Regular Expressions, Properties of Regular Expressions, Applications of Regular Expressions.	9	CO2, CO6
3	**Finite Automata and Regular Expressions (2):**Converting Regular Expressions to Automata– Theorem & problems; Converting DFA to Regular Expressions–Kleene's Theorem & problems, State Elimination method; Equivalence and minimization of automata, Pumping Lemma and related problems.	9	CO3, CO6
4	**Context Free Grammar (CFG) and Pushdown Automata(PDA):** Definition of Grammar, Chomsky Hierarchy and problems; Derivations- Leftmost and Rightmost, Parse trees, Ambiguity in grammars; Definition of Pushdown automata; Construction of PDA;Equivalence of PDA's and CFG's – From CFG to PDA, From PDA to CFG.	9	CO4, CO6
5	**Turing Machines:** The Turing machine model, definition, Types,Techniques for Turing Machineconstruction. **Recent Trends and Applications:** Matrix Grammar, Programmed Grammar, Random Context Grammar,Lindermayer Systems, A glance on DNA computing and Membrane Computing	9	C05, CO6

TEXT BOOKS:

1. Elaine Rich: " Automata, Computability and Complexity", 1st Edition, Perason Education, 2012/2013.
2. John E. Hopcroft, Rajeev Motwani, Jeffrey D.Ullman, "Introduction to Automata Theory, Languages and Computation", 3rd Edition, Pearson Education,2007.

REFERENCES:

1. Kavi Mahesh, "Theory of Computation-A Problem Solving Approach", Wiley India Pvt. Ltd.
2. Michael Sipser, "Introduction to the Theory of Computation", 3rd Edition, Tata McGraw Hill Publishing Company Limited,2013.
3. K.L.P. Mishra, "Theory of Computer Science, Automata, Languages, and Computation", 3rd Edition, PHI, 2007.
4. John C Martin, "Introduction to Languages and Automata Theory", 3rd Edition, Tata McGraw- Hill,2007.

CIE - Continuous Internal Evaluation (50Marks)

Bloom's Taxonomy	Tests (25 marks)	Assignments (15 Marks)	Quizzes (10 Marks)
Remember	5	-	-
Understand	10	-	5
Apply	10	10	5
Analyze	-	-	-
Evaluate	-	-	-
Create	-	5	-

SEE – Semester End Examination (50 Marks)

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

FILE STRUCTURES

Course Code	**: 20ISE555**	**Credits**	**: 03**
L:T:P	**: 3:0:0**	**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 fundamental concepts of file processing operations and storage structures.
CO2	Choose appropriate file structure for storage representation and performance.
CO3	Apply object orientation concepts to manipulate records.
CO4	Apply concepts of sorting and merging on multiple files.
CO5	Analyze the sequential and indexing file accessing techniques with appropriate data structures.
CO6	Illustrate the usage of hashing techniques to organize file structures.

Mapping of Course Outcomes to Program Outcomes:

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

Mapping of Course Outcomes to Program Specific Outcomes:

CO/PSO	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 to File Processing Operations:** Physical Files and Logical Files, File operations:-Opening, Closing, Reading and Writing, Seeking Special Characters in Files, The Unix Directory Structure, Physical Devices and Logical Files. **Secondary Storage and System Software**: Disks, Introduction to CD-ROM, Physical Organization of CD-ROM, CD-ROM Strengths and Weaknesses; Storage as a Hierarchy, A Journey of a Byte, Buffer Management, I/O in UNIX.	9	CO1

2	F**undamental File structure Concepts**: Field and Record Organization, Using Classes to Manipulate Buffers, Using Inheritance for Record Buffer Classes, Managing Fixed Length and Fixed Field Buffers. A Simple Index for Entry-Sequenced File, Entry-Sequenced Files of Data Objects, Indexes that are too large to hold in Memory, Indexing to provide access by Multiple keys, Retrieval Using Combinations of Secondary Keys.	9	CO2, CO3
3	**Multilevel Indexing and B-Trees**: Introduction: The Invention of B-Tree, Statement of the Problem, Indexing with Binary Search Trees, Multilevel Indexing, B-trees: Example of Creating a B-Tree, B-Tree Methods Search, Insert.	9	CO4
4	**Indexed Sequential File Access and Prefix B + Trees:** Indexed Sequential Access, Maintaining a Sequence Set, Adding a Simple Index to the Sequence Set, The Content of the Index: Separators Instead of Keys, The Simple Prefix B+ Tree and its maintenance, Index Set Block Size, Internal Structure of Index Set Blocks: A Variable-order B- Tree, Loading a Simple Prefix B+ Trees, B-Trees, B+ Trees and Simple Prefix B+ Trees in Perspective.	9	CO5
5	**Hashing:** Introduction, A Simple Hashing Algorithm, Hashing Functions and Record Distribution, How much Extra Memory should be used?, Collision resolution by progressive overflow, Buckets, Making deletions, Other collision resolution techniques, Patterns of record access.	9	CO6

TEXT BOOKS:

1. Michael J. Folk, Bill Zoellick, Greg Riccardi, "File Structures-An Object Oriented Approach with C++",3rd Edition, Pearson Education, 1998.
2. K.R. Venugopal, K.G. Srinivas, P.M. Krishnaraj, "File Structures Using C++", Tata McGraw-Hill, 2008.

REFERENCE BOOKS:

1. Mary E.S. Loomis, "Data Management and File Structures", Second Edition, PHI,2012.
2. Alan L. Tharp, "File Organization and Processing", Wiley India Edition,2008.

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Taxonomy	Tests (25 marks)	Assignments (15 Marks)	Quizzes (10 Marks)
Remember	5	-	-
Understand	10	5	5
Apply	10	5	5
Analyze	-	5	-
Evaluate	-	-	-
Create	-		-

SEE- Semester End Examination (50 Marks)

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

DESIGN AND ANALYSIS OF ALGORITHMS LAB

Course Code : 20ISL56 **Credits : 2**
L: T:P : 0:0:2 **CIE Marks : 25**
Exam Hours : 3 **SEE Marks : 25**

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

CO1	Analyze algorithms in terms of space and time complexity.
CO2	Implement problems using brute force, divide and conquer and decrease and conquer techniques.
CO3	Implement problems using greedy, dynamic programming and backtracking approaches.
CO4	Use different string-matching algorithms.

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	2	-	-	-	-	-	-	2
CO2	3	3	3	2	2	-	-	-	-	-	-	2
CO3	3	3	3	2	2	-	-	-	-	-	-	2
CO4	3	3	3	2	2	-	-	-	-	-	-	2

Experiment No.	Experiment
PART-A	
1	Implement and analyze quick sort algorithm.
2	Implement and analyze merge sort algorithm
3	Implement the following graph traversal techniques using decrease and conquer approach: a. Breadth First Search method. b. Depth First Search method.
4	Implement and analyze topological sorting in a given directed graph.
5	Implement and analyze Kruskal`s algorithm and find minimum cost spanning tree of a given connected undirected graph.
6	Implement and analyze Prim`s algorithm and find minimum cost spanning tree of a given connected undirected graph.
7	Implement and analyze Dijkstra's algorithm to find the shortest path from a given source.
PART-B	
8	Implement and analyze Floyd Warshall`s algorithm to find the shortest path between all pairs of vertices in a given weighted connected graph.
9	Implement travelling salesman problem using dynamic programming.
10	Implement 0/1 Knapsack problem.
11	Implement N-Queens problem using backtracking.
12	Implement sum of subset problem using backtracking.
13	Implement and compare Simple string matching and KMP string matching algorithm.
14	Implement prefix computation algorithm by using multiple threads or processes.

For SEE Examination:

- One experiment from part A & One experiment from part B to be given
- Examination will be conducted for 50 marks and scaled down to 25 marks
- Marks Distribution: Procedure write-up – 20%
  Conduction – 60%
  Viva – Voce – 20%
- Change of the experiment is allowed only once and procedure write-up marks will be considered as '0'

CIE - Continuous Internal Evaluation (25 Marks)

Bloom's Category	Tests (25 Marks)
Remember	-
Understand	5
Apply	-
Analyze	5
Evaluate	-
Create	15

SEE – Semester End Examination (25 Marks)

Bloom's Taxonomy	Marks
Remember	-
Understand	5
Apply	-
Analyze	5
Evaluate	-
Create	15

DATA SCIENCE LAB

Course Code	**: 20ISL57**	**Credits**	**: 1.5**
L:T:P	**: 0:0:1.5**	**CIE Marks**	**: 25**
Exam Hours	**: 3**	**SEE Marks**	**: 25**

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

CO1	Understand basic operations of NumPy,pandas and Matplotlib
CO2	Implement Regression models for the sample datasets
CO3	Develop classification models and optimize the performance
CO4	Develop clustering models and apply on suitable datasets

Mapping of Course Outcomes to Program Outcomes:

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

Experiment No.	Experiment
	PART-A
1	Using pandas in python demonstrate the following operations for the sample dataset given, i) Indexing of Dataframe ii) Grouping and aggregating iii) Adding and removing attributes iv) Joining dataframes v) Filtering the data vi) Handling Missing values
2	Using pandas and Matplotlib demonstrate the following operations for the sample dataset given, i) Bar chart and Histogram ii) Comparing Distribution iii) Box plot and mention quartiles iv) Correlation using pairplot and heatmap
3	Using Numpy,pandas and Matplotlib demonstrate the following operations for the sample dataset given, i) Central tendency

	ii) Dispersion and Distribution iii) ANOVA iv) Hypothesis testing
4	Develop a program to implement Simple Linear Regression model and evaluate the model by verifying the performance
5	Develop a program to implement Multiple Linear Regression model and evaluate the model by verifying the performance
6	Develop a program to implement Logistic Regression and indicate the class label for the test dataset
PART-B	
7	Develop a program to implement Naive Bayes classifier model and analyze the model using confusion matrix
8	Develop a program to implement Decision Tree model and analyze the model using confusion matrix
9	Develop a program to implement Random Forest classifier model and analyze the model using confusion matrix
10	Develop a program to implement KNN classifier model and analyse the model using confusion matrix
11.	Develop a program to implement K Means clustering model for the given value of K, where K is number of clusters
12	Develop a program to implement Hierarchical clustering model for the given value of N, where N is number of clusters

For SEE Examination:

- One experiment from part A & One experiment from part B to be given
- Examination will be conducted for 50 marks and scaled down to 25 marks
- Marks Distribution : Procedure write-up – 20%
  Conduction – 60%
  Viva – Voce – 20%
- Change of the experiment is allowed only once and procedure write-up marks will be considered as '0'

CIE - Continuous Internal Evaluation (25 Marks)

Bloom's Category	Tests (25 Marks)
Remember	-
Understand	5
Apply	5
Analyze	5
Evaluate	-
Create	10

SEE – Semester End Examination (25 Marks)

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

MOBILE APPLICATION DEVELOPMENT LAB

Course Code :20ISL58 **Credits : 1.5**
L:T:P : 0:0:1.5 **CIE Marks : 25**
Exam Hours : 3 **SEE Marks : 25**

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

CO1	Design and develop a Mobile App for smart phones
CO2	Design User Interface and develop activity for Android App
CO3	Design and implement Database Application and Content providers
CO4	Create Android App with SMS camera and Location based services

Mapping of Course Outcomes to Program Outcomes:

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

Experiment No.	Experiment
PART - A	
1.	Using Android SDK develop an activity which displays the below message. Hello world android app
2.	Design and implement a single screen app that displays information about a small business.eg. Restaurant, Book shop etc. . Your design must include: o Business name o Photo of business o Contact information
3.	Design and develop a Mobile App for smart phones The Easy Unit Converter using Android.
4.	Design and develop a Mobile App for smart phones Currency Converter.
5.	Design an app for Tourist spot: With three activities, Welcome page, Display attractions of tourist spot and Webpage of the tourist spot
6.	Design an android app play music in background
PART - B	
7.	Design and develop a Mobile App for smart phones The Expense Manager using Android. The application should store all the expenses in a file
8.	Design and develop Health Monitoring App using Android. The app will store the blood pressure, blood group and glucose level of patient in SQLite database
9.	Develop an android app to display Map of your college locality
10.	Develop an android app to alert SMS to one given phone number.
11.	Design and develop Health Monitoring App using Android. The app will store the 3 Internal test marks and its average of a student in SQLite database
12.	Design an app for Attendance Management System

For SEE Examination:

- One experiment from part A & One experiment from part B to be given
- Examination will be conducted for 50 marks and scaled down to 25 marks
- Marks Distribution : Procedure write-up – 20%
  Conduction – 60%
  Viva – Voce – 20%
- Change of the experiment is allowed only once and procedure write-up marks will be considered as '0'

CIE - Continuous Internal Evaluation (25 Marks)

Bloom's Category	Tests (25 Marks)
Remember	-
Understand	-
Apply	15
Analyze	5
Evaluate	-
Create	5

SEE – Semester End Examination (25 Marks)

Bloom's Taxonomy	Marks
Remember	-
Understand	-
Apply	15
Analyze	5
Evaluate	-
Create	5

MINI PROJECT

Course Code : 20ISE59 **Credits : 2**
L:T:P : 0:0:0 **CIE Marks : 25**
Exam Hours : 3 **SEE Marks : 25**

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

CO1	Analyze the Real world problem through survey of existing problems
CO2	Design the modules for solving the problems identified
CO3	Implement the design modules with suitable programming language
CO4	Test the working modules at different levels

Mapping of Course Outcomes to Program Outcomes:

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

Note :

- Mini project should be developed using the techniques learned in the course 20ISE51 - Web Internet Programming
- Every student should do individual mini project in the areas suggested by the department expert committee
- Minimum 2 reviews will be conducted by the department expert committee to know the progress of the mini project work
- In each review student should give presentation on the work carried out and show the relevant models
- A mini project report should be submitted to the department at the end of the mini project work
- Plagiarism check for the report : Similarity index of the report should not exceed more than 30%

SIXTH SEMESTER

(SYLLABUS)

SOFTWARE ENGINEERING AND PROJECT MANAGEMENT

Course Code	**: 20ISE61**	**Credits**	**: 03**
L:T:P	**: 3:0:0**	**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 understand the phases in a software project.
CO2	To understand fundamental concepts of requirements engineering and Analysis Modelling.
CO3	To understand the various software design and coding methodologies.
CO4	To learn and apply various testing and maintenance measures.
CO5	To learn and apply various project management activities.
CO6	To analyse various project management activities.

Mapping of Course Outcomes to Program Outcomes:

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

Mapping of Course Outcomes to Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	2	2
CO2	1	3
CO3	2	3
CO4	2	1
CO5	2	2
CO6	1	2

Module No.	Module Contents	Hours	COs
1	**Introduction:** Software Engineering; Software Processes: Life Cycle Models, Unified process; Agile Process Model development; Extreme Programming;	9	CO1
2	**Requirements:** Software Requirements, Feasibility study, Requirements elicitation and analysis; Requirements Specification, validation and management.	9	CO2
3	**Software Design:** Data Design, Architectural Design; Component Level Design, User Interface Design, Object Oriented Design, Software Design Notations.	9	CO3,CO4
4	**Software Coding:** Features of Software Code, Coding	9	CO5

	Guidelines, Coding Methodology, Programming Practice, Code verification Techniques, Coding Tools, Code Documentation **Software Testing:** Software Testing basics, Test Plan, Levels of Software Testing, Testing Techniques, Debugging.		
5	**Configuration Management:** Configuration Management Planning; Change management; **Project Management:** Project planning; Project scheduling; Risk management, Management activities.	9	CO6

TEXT BOOKS:

1. Roger S Pressman: Software Engineering – A Practitioner's Approach, McGraw Hill, seventh edition, 2018.
2. Ian Somerville: Software Engineering, Pearson Education, edition, 2017

REFERENCE BOOKS:

1. PankajJalote: An Integrated Approach to Software Engineering, Wiley India, 2009.
2. Hans Van Vliet: Software Engineering: Principles and Practices, Wiley India, 2018.
3. Richard Fairley: Software Engineering Concepts, McGraw Hill , 2018.

WEB RESOURCES:

1. https://www.tutorialspoint.com/software_engineering/index.htm
2. https://www.computerscience.org/careers/software-engineer/
3. https://www.javatpoint.com/software-engineering-tutorial
4. https://www.guru99.com/what-is-software-engineering.html
5. https://www.geeksforgeeks.org/software-engineering/

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Taxonomy	Tests (25 marks)	Assignments (15 Marks)	Quizzes (10 Marks)
Remember	-	-	-
Understand	5	7.5	5
Apply	5	-	-
Analyze	10	7.5	-
Evaluate	5	-	5
Create	-	-	-

SEE- Semester End Examination (50 Marks)

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

ADVANCED JAVA

Course Code	**: 20ISE62**	**Credits**	**: 03**
L:T:P	**: 3:0:0**	**CIE Marks**	**: 50**
Exam Hours	**: 3**	**SEE Marks**	**: 50**

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

CO1	Analyze the importance of event based programming in Java.
CO2	Make use of JDBC to access database through Java Programs
CO3	Apply servlet technologies to build server side applications.
CO4	Develop JSP based server side solutions.
CO5	Interpret the importance of frameworks in software development
CO6	Develop enterprise applications on Spring frameworks providing reliable solution to real world challenges.

Mapping of Course Outcomes to Program Outcomes:

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

Mapping of Course Outcomes to Program Specific Outcomes:

CO/PSO	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 to Event Handling:** Event-Driven Programming in Java, Swing Controls and UI elements, Event- Handling Process, The Delegation Model of Event Handling, Swing Event Classes, Event Sources, Event Listeners, Adapter Classes as Helper Classes in Event Handling.	9	CO1
2	**Working with JDBC :** Exploring web architecture models, Exploring the MVC architecture, Introducing JDBC, Exploring JDBC Drivers, Describing JDBC APIs, Exploring JDBC processes with java.sql package	9	CO2

3	**Working with servlets**: MVC Design Pattern, Http protocol, and html introduction, Exploring the features of java servlets, Exploring the servlets API, Servlets life cycle, Working with the Http servlets request and Http servlets response interfaces, Exploring request delegation and request scope, session tracking,	9	CO3
4	**Working with Java server pages:** Introducing JSP, Listing advantages of JSP over java servlets, Exploring the architecture of a JSP page, Describing the life cycle of a JSP page, Working with JSP basic tags and implicit objects, Working with the action tags in JSP	9	CO4
5	**Spring Framework**: Spring Architecture, bean life cycle, XML Configuration on Spring, Aspect-oriented Programming with Spring (AOP), Spring Model View Controller (MVC), Spring & Web Services	9	CO5, CO6

TEXT BOOKS:

1. Herbert Schildt, "JAVA the Complete Reference", 9th Edition, Tata McGraw Hill, 2017(print).
2. Jim Keogh, "J2EE-The Complete Reference", McGraw Hill, 2017.

REFERENCE BOOKS:

1. Y. Daniel Liang, "Introduction to JAVA Programming", 7th Edition, Pearson Education, 2007.
2. Stephanie Bodoff et al, "The J2EE Tutorial", 2nd Edition, Pearson Education,2004.
3. Uttam K Roy, "Advanced JAVA programming", Oxford University press, 2015.

WEB RESOURCES:

1. https://spring.io/

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Taxonomy	Tests (25 marks)	Assignments (15 Marks)	Quizzes (10 Marks)
Remember	5	-	5
Understand	5	5	5
Apply	5	5	-
Analyze	-	-	-
Evaluate	5	-	-
Create	5	5	-

SEE- Semester End Examination (50 Marks)

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

MACHINE LEARNING

Course Code	**: 20ISE63**	**Credits**	**: 03**
L:T:P	**: 3:0:0**	**CIE Marks**	**: 50**
Exam Hours	**: 3**	**SEE Marks**	**: 50**

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 and reinforcement learning.
CO2	Apply Classification concepts for solving machine learning problems
CO3	Illustrate Artificial Neural Networks(ANN's)
CO4	Implementation of association rule mining in data mining
CO5	Evaluating Mathematical Models for Machine Learning algorithms
CO6	Illustrate Convolution Neural Networks and implementation for solving machine learning problems.

Mapping of Course Outcomes to Program Outcomes:

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

Mapping of Course Outcomes to Program Specific Outcomes:

CO/PSO	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**: Introduction to Machine Learning, Supervised Learning, Unsupervised Learning and Reinforcement Learning, Goals and Challenges of machine learning, Gradient (Steepest) Descent (OR) Learning Rule , LASSO and Ridge Regression,Prescriptive Analytics : Linear Programming model building	9	CO1

2	**Decision Trees:** Chi-Square Automatic Interaction Detectors (CHAID), Classification and Regression Tree (CART), C4.5. **Support Vector Machine**: Kernel Function and Kernel SVM.	9	CO2
3	**Association Rule Mining**: Apriori, FP – Growth, **Correlations**: Basic Concepts and Methods, Pattern Mining in Multilevel, Multidimensional Space, Sequential Pattern Mining.	9	CO3
4	**Artificial Neural Networks**: Introduction, Neural Network representation, Appropriate Problems, Perceptron, Back Propagation algorithm,Introduction to deep learning	9	CO4, CO5
5	**Convolutional Neural Networks (CNN)**:Convolutional, Pooling and Soft-Max Layers, Training CNNs, activation functions, initialization, Batch Normalization.	9	CO6

TEXT BOOKS:

1. Manaranjan Pradhan, U Dinesh Kumar, "Machine Learning using Python", Wiley, First Edition, 2020.
2. Tom M. Mitchell, "Machine Learning", McGraw Hill Education, Indian Edition, 2017.
3. EthemAlpaydin, "Introduction to Machine Learning",MIT press,Second Edition, 2010.

REFERENCE BOOKS:

1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical Learning", Springer Series in Statistics, SecondEdition, 2017.
2. Dipanjan Sarkar,Raghav Bali ,Tushar Sharma, "Practical Machine Learning with Python-A Problem-Solver's Guide to Building Real-World Intelligent Systems",APress, First Edition, 2018.
3. Simon Haykin, "Neural Networks and Learning Machines", Pearson, Third Edition, 2016
4. Kevin P. Murphy , Francis Bach , "Machine Learning: A Probabilistic Perspective", Massachusets Institute of Technology,First Edition, 2012.

CIE- Continuous Internal Evaluation (50 Marks)

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

SEE- Semester End Examination (50 Marks)

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

DATA VISUALIZATION

Course Code	**: 20ISE641**	**Credits**	**: 03**
L:T:P	**: 3:0:0**	**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 structure of python programming language.
CO2	Apply MapPlotLib and Seaborn library to various datasets and infer the insights through visualizations.
CO3	Apply Visual analytics techniques using tableau for Multidimensional datasets.
CO4	Identify and explore the concept and application of interaction techniques, colour, animation and mapping and cartography in Visualization of data.
CO5	Create the Interactive data related applications using Bokeh.
CO6	To effectively design and deliver the project presentations related to visualization tools.

Mapping of Course Outcomes to Program Outcomes:

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

Mapping of Course Outcomes to Program Specific Outcomes:

CO/PSO	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 to Data Visualization, Introduction to NumPy,pandas and Basic Plotting with MatPlotLib	9	CO1
2	Exploratory Data Analysis: Waffle Charts, Word Clouds, Introduction to Folium and Map Styles, Maps with Markers, Choropleth Maps	9	CO2

3	Seaborn - Strip plot,pair grid plot, violin plots, cluster map, heat map, facet grid, KDE plot, join plot, Seaborn and Regression Plots, pair plots. Getting Started & Introduction to Data Visualization – Tableu , Exploring and Navigating Tableau, Making Data Connections, Context of Data Visualization	9	CO3
4	Visual analytics : Introduction to Table Calculations, Calculated Fields, Quick Table Calculations, Custom Table Calculations, Filters, Parameters, Introduction to Mapping, Working with Geographic Data, Shapes, Colors and Sizes, Custom Mapping Techniques, Custom Geocoding, Dual Layer Mapping	9	CO4, CO5
5	Interactive Data Visualization With Bokeh: Case Study	9	CO6

TEXT BOOKS:

1. David Baldwin, “Mastering Tableau: Smart Business Intelligence techniques to get maximum insights from your data” , Packt Publications,2016
2. Kevin Jolly ,”Hands-On Data Visualization with Bokeh: Interactive web plotting for Python using Bokeh” , Packt Publications,2015
3. Srinivasa Rao Poladi , “Matplotlib 3.0 Cookbook: Over 150 recipes to create highly detailed interactive visualizations using Python” , Packt Publications,2017

REFERENCE BOOKS:

1. EfraimTurban , Jay E. Aronson , Ting-Peng Liang, “Decision Support Systems & Intelligent Systems”, 9th edition, Prentice Hall, 2016.
2. Data, data everywhere, “Special report on managing information, Economist”, February 27th, 2016.
3. Liberatore and Luo, “The Analytics Movement, Interfaces, Articles in Advance”

CIE- Continuous Internal Evaluation (50 Marks)

Bloom’s Taxonomy	Tests (25 marks)	Assignments (15 Marks)	Quizzes (10 Marks)
Remember	5	-	-
Understand	10	-	5
Apply	10	10	5
Analyze	-	-	-
Evaluate	-	-	-
Create	-	5	-

SEE- Semester End Examination (50 Marks)

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

SYSTEM MODELING AND SIMULATION

Course Code : 20ISE642 **Credits : 03**
L: T: P : 3:0:0 **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 simulation needs, and to implement and test a variety of simulation models
CO2	Conceptualize real world situations related to systems development decisions
CO3	Discuss the simulation methods and select the suitable technique on the problems.
CO4	Generate and test random number variates and apply them to develop simulation models
CO5	Create a model prediction based upon new input and validate the output data.
CO6	Test validity of the model for various case studies like inventory, traffic flow networks, etc.

Mapping of Course Outcomes to Program Outcomes:

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

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

Mapping of CO v/s PSO:

COs	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:** Simulation, Advantages and disadvantages, Areas of Application, System environment, components of a system, Model of a system, types of models, steps in a simulation study, Simulation of Queuing systems and Simulation of Inventory System,	**9**	CO1
2.	**General Principles:** Concepts in discrete - event simulation, event scheduling/ Time advance algorithm, simulation using event scheduling. **Statistical Models in Simulation** : Review of terminology and concepts, Useful statistical models, Discrete distributions. Continuous distributions, Poisson process.	**9**	CO2 CO3
3.	**Queuing Theory:** Arrival pattern distributions, servicing times, queuing disciplines, Steady-state behavior of M/G/1 queue. **Random Numbers:** Properties, Generations methods, Tests for Random number- Frequency test, Runs test, Autocorrelation test.	**9**	CO4
4.	**Input Modeling:** Data Collection; Identifying the distribution with data; Parameter estimation; Goodness of Fit Tests; Fitting a non-stationary Poisson process; Selecting input models without data; Multivariate and Time-Series input models.	**9**	CO4 CO5
5.	**Output Analysis** – Types of Simulations with Respect to Output Analysis, Output analysis of terminating simulation, Output analysis of steady state simulations.	**9**	CO5 CO6

Text Books:

1. Jerry Banks, John S. Carson II, Barry L. Nelson, David M. Nicol: " Discrete-Event System Simulation ", 5th Edition, Pearson Education, 2010.

Reference Books:

1. Lawrence M. Leemis, Stephen K. Park: " Discrete – Event Simulation: A First Course ", Pearson Education, 2006.
2. Averill M. Law: " Simulation Modeling and Analysis ", 4th Edition, Tata McGraw-Hill, 2007.
3. Geoffrey Gordon, " System Simulation ", Prentice Hall publication, 2nd Edition, 1978, ISBN: 81-203-0140-4.

CIE -Continuous Internal Evaluation (50 Marks)

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

SEE –Semester End Examination (50 Marks)

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

OBJECT ORIENTED MODELING & DESIGN

Course Code : 20ISE643 **Credits : 03**
L:T:P : 3:0:0 **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	Construct use case models, sequence models and activity models from the requirements specified for a particular problem.
CO4	Construct domain model using system conception.
CO5	Understand Reverse Engineering concepts.
CO6	Understand, analyze 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	No. of Hours	COs
1.	**INTRODUCTION, MODELING CONCEPTS AND CLASS MODELLING** : 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; Aggregation.	**9**	CO1, CO2
2.	**USECASE MODELLING AND DETAILED REQUIREMENTS:** Overview; Detailed object oriented Requirements	**9**	CO1, CO3

	definitions; System Processes-A use case/Scenario view; Identifying Input and outputs-The System sequence diagram; Identifying Object Behaviour-The state chart Diagram; Integrated Object-oriented Models.		
3.	**PROCESS OVERVIEW, SYSTEM CONCEPTION AND DOMAIN ANALYSIS**: Process Overview: Development stages; Development life Cycle; System Conception: Devising a system concept; elaborating a concept; preparing a problem statement. Domain Analysis: Overview of analysis; Domain Class model: Domain state model; Domain interaction model; Iterating the analysis.	**9**	CO1, CO4
4.	**ARCHITECTURAL MODELING** : Component, Deployment, Component diagrams and Deployment diagrams. Case Study : The Unified Library application. Legacy Systems: Reverse engineering; Building the class models; Building the state model; Reverse engineering tips; Wrapping; Maintenance.	**9**	CO5
5.	**DESIGN PATTERNS**: What is a pattern and what makes a pattern? Pattern categories; Pattern description. Communication Patterns: Forwarder-Receiver; Client-Dispatcher-Server. Management Patterns: View handler	**9**	CO6

TEXT BOOKS:

1. Michael Blaha, James Rumbaugh, "Object-Oriented Modeling and Design with UML", Pearson Education ,2nd Edition, 2007.
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.

REFERENCES:

1. Grady Booch et al, "Object-Oriented Analysis and Design with Applications", Pearson Education ,3rd Edition, 2007.
2. Brahma Dathan, Sarnath Ramnath, "Object-Oriented Analysis, Design, and Implementation", Universities Press, 2009.
3. D Jeya Mala, S Geetha , "Object-Oriented Modeling and Design with UML", McGraw-Hill Education (India) Private Limited,2013.

CIE - Continuous Internal Evaluation (50 Marks)

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

SEE – Semester End Examination (50 Marks)

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

COMPILER DESIGN

Course Code : 20ISE644 **Credits : 03**
L:T:P : 3:0:0 **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 concepts and application of Compiler Design
CO2	Apply their basic knowledge Data Structure to design Symbol Table, Lexical Analyzer
CO3	Understand and Implement a Parser-Top Down and Bottom Up Design
CO4	Understand strength of Grammar and Programming Language
CO5	Understand various Code optimization Techniques and Error Recovery mechanisms.
CO6	Comprehend and manipulate the different concepts in Compiler Design.

Mapping of Course Outcomes to Program Outcomes:

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

Mapping of CO v/s PSO:

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

Module No.	Module Contents	Hours	COs
1	Introduction: Overview of the Translation Process, Difference between interpreter, assembler and compiler, Overview and use of linker and loader, Analysis of the Source Program, Language processors; Pass and phase, Bootstrapping, The structure of a Compiler, The science of building a Compiler; Types	9	CO1, CO6
2	Lexical Analysis: The Role of Lexical Analyzer; Input Buffering; Specifications of Tokens; Recognition of Tokens, A Language for Specifying Lexical Analyzers, Finite Automata From a Regular Expression, Design of a Lexical Analyzer Generator, Optimization of DFA.	9	CO2, CO6
3	Syntax Analysis: Introduction; Context-free Grammars; Writing a Grammar. Top-down Parsing :Recursive descent parsing, Non-recursive predictive parsing, LL(1) grammars, Bottom-up Parsing, Operator-Precedence Parsing, LR Parsers, Using Ambiguous Grammars, Parser Generators.	9	CO3, CO6
4	Syntax Directed Translation: Syntax-Directed Definitions, Construction of Syntax Trees, Bottom-Up Evaluation of S-Attributed Definitions, L-Attributed Definitions, syntax directed definitions and translation schemes	9	CO4, CO6
5	Code Generation: Principal Sources of Optimization-DAG-Optimization of Basic Blocks-Global Data Flow Analysis-Efficient Data Flow Algorithms-Issues in Design of a Code Generator - The Target Language, Addresses in the Target Code,A Simple Code Generator Algorithm.	9	C05, CO6

TEXT BOOKS:

1. Aho, Lam, Sethi, and Ullman , “Compilers: Principles, Techniques and Tools” Pearson, 2nd Edition, 2014
2. Steven S Muchnick, “Advanced Compiler Design and Implementation”, Morgan Kaufmann Publishers,1998.

REFERENCES:

1. Allen I. Holub,”Compiler Design in C”, Prentice-Hall/Pearson, 2nd Edition.

CIE - Continuous Internal Evaluation (50 Marks)

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

SEE – Semester End Examination (50 Marks)

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

OPERATIONS RESEARCH

Course Code: 20ISE645 **Credits : 03**
L: T: P : 3:0:0 **CIE Marks : 50**
Exam Hours: 3 **SEE Marks : 50**

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

CO1	Realize the importance of Operations Research and explain the basic concepts.
CO2	Construct and Solve Linear Programming Problems for its optimal solutions by graphical method.
CO3	Apply the concept of Simplex method and its extensions to Solve Linear Programming Problems for its optimal solutions.
CO4	Solve specialized linear programming problems like assignment problems using various OR methods.
CO5	Solve the problem of transporting the products from origins to destinations with least transportation cost.
CO6	Analyze network technique namely PERT/CPM and optimal project duration and cost.

Mapping of Course Outcomes to Program Outcomes

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

Module No	Module Contents	Hours	COs
1	**INTRODUCTION & LINEAR MODEL-I :** Definition and Historical development of OR, Nature and Meaning of OR, Characteristics of OR, Phases of OR, Scope of OR. Introduction to Linear Model, Formulation of LPP problem, Graphical Solution, Slack and Surplus variables, standard form of LPP	9	CO1, CO2
2	**LINEAR MODEL-II:** Computational procedure of simplex method, Degeneracy problem, method to resolve degeneracy. Special cases: Alternative optimum solution, unbounded solution, Big-M method, Concept of duality	9	CO3

3	**ASSIGNMENT MODEL:** Introduction, Mathematical formulation of assignment problem, Hungarian method to solve assignment problems, unbalanced assignment problems, maximal assignment problem, restriction on assignments, travelling salesman problem, crew scheduling problem.	9	CO4
4	**TRANSPORTATION MODEL:** Introduction, Mathematical formulation of transportation problem, definitions, initial basic feasible solution, moving towards optimality, unbalanced transportation problem, degeneracy in transportation problem.	9	CO5
5	**NETWORK ANALYSIS:** Introduction to Project management, basic steps in PERT / CPM techniques, network diagram representations and rules, Time estimates and Critical Path in Network Analysis, Optimum duration and Minimum duration cost, Project Evaluation and Review Technique (PERT), Applications	9	CO6

TEXT Books:

1. S. D. Sharma, "OPERATIONS RESEARCH – Theory, Methods & Applications", , Seventeenth Review Edition 2014, Reprint 2015, Kedarnath Ram Nath Publisher

REFERENCE Books:

1. Frederick S Hillier, Gerald J Lieberman, Bodhibrata Nag and Preetam Basu "Introduction to OPERATIONS RESEARCH ", , Ninth Edition, Tenth Reprint , 2015, TATA McGraw Hill

2. Hamdy Taha, " Operations Research: An Introduction", Pearson Education Inc. (2009),

Continuous Internal Evaluation (50 Marks)

Bloom's Category	Tests (25Marks)	Assignments (15 Marks)	Quizzes (10 Marks)
Remember	5	-	-
Understand	5	7.5	5
Apply	5	-	5
Analyze	5	7.5	-
Evaluate	5	-	-
Create	-	-	-

SEE- Semester End Examination (50 Marks)

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

USER INTERFACE DESIGN

Course Code	**: 20ISE651**	**Credits**	**: 03**
L:T:P	**: 3:0:0**	**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	Study the characteristics and components of windows.
CO5	Design a usable and compelling user-interface given a set of requirements and available technologies.
CO6	Perform various testing methods on UI.

Mapping of Course Outcomes to Program Outcomes:

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

Mapping of Course Outcomes to Program Specific Outcomes:

CO/PSO	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	**The User Interface-Introduction**: Overview, The importance of user interface, Defining the user interface, The importance of Good design, The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics, Principles of user interface design.	9	CO1, CO2

2	**The User Interface Design process**: Obstacles, Usability, Human characteristics in Design, Human Interaction speeds, Iterative design practices, Design rules, maximum usability, Principles, Standards and guidelines, design patterns, Programming Tools, Windowing systems, Interaction tool kit, User Interface management system. **Evaluating Interface Designs:** Expert Reviews, Usability Testing and Labs, Acceptance Tests, Evaluation During Active Use.	9	CO2, CO3
3	**Windows:** Characteristics, Components of window, Window presentation styles, Types of window, Window management, Organizing window functions, Window operations, Web systems, Characteristics of device based controls.	9	CO4
4	**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	CO5
5	**Information Search and Visualization:** Introduction, Search in Textual Documents and Database Querying, Multimedia Document Searches, Information Visualization. **Screen based controls**: Operable control, Text control, Selection control, Custom control, Presentation control, Windows Tests-prototypes, kinds of tests.	9	CO5, CO6

TEXT BOOKS:

1. Ben Shneiderman,"Designing the User Interface: Strategies for Effective Human-Computer Interaction", Pearson Education, 5th Edition 2017
2. Wilbent. O. Galitz "The Essential Guide to User Interface Design", Wiley& Sons, Third Edition 2007.
3. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale "Human Computer Interaction", Prentice Hall, 3rd Edition, 2004.

REFERENCE BOOKS:

1. Alan Cooper, "The Essential Of User Interface Design", Wiley – Dream Tech Ltd., 2012.
2. Jonathan Lazar Jinjuan Heidi Feng, Harry Hochheiser, "Research Methods in Human Computer Interaction", Wiley, 2010.
3. Ben Shneiderman, "Design the User Interface",Pearson Education, 5th Edition

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Taxonomy	Tests (25 marks)	Assignments (15 Marks)	Quizzes (10 Marks)
Remember	5	-	-
Understand	5	-	5
Apply	5	7.5	5
Analyze	5	7.5	-
Evaluate	5	-	-
Create	-	-	-

SEE- Semester End Examination (50 Marks)

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

VIRTUAL REALITY

Course Code : 20ISE652 **Credits : 03**
L:T:P : 3:0:0 **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 fundamentals of Virtual Reality Systems.
CO2	Summarize the hardware and software of the Virtual Reality.
CO3	Analyze the applications of Virtual Reality.
CO4	Illustrate technology, underlying principles, its potential and limits.
CO5	To learn about the criteria for defining useful applications.
CO6	Explain process of creating virtual environments.

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	2	2	1	2	1	0	1	1	0
CO2	2	2	1	1	1	1	1	0	2	0	1	0
CO3	2	3	1	2	1	2	1	2	1	1	0	1
CO4	2	2	1	2	1	2	1	0	0	0	1	0
CO5	2	2	1	2	1	2	1	0	0	0	1	0
CO6	2	3	1	2	1	2	1	2	1	1	0	1

Mapping of Course Outcomes to Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	1	2
CO2	2	2
CO3	2	1
CO4	1	1
CO5	2	1
CO6	1	2

Module No.	Module Contents	Hours	COs
1	Introduction: The three I's of virtual reality, commercial VR technology and the five classic components of a VR system. Input Devices: Three dimensional position trackers, navigation and manipulation, interfaces and gesture interfaces.	9	CO1
2	Output Devices: Graphics displays, sound displays & haptic feedback.	9	CO2
3	Modeling : Geometric modeling, kinematics modeling, physical modeling, behavior modeling, model management.	9	CO3
4	Human Factors: Methodology and terminology, user performance studies, VR health and safety issues.	9	CO4, CO5
5	Applications: Medical, Military, Robotics applications.	9	CO6

TEXT BOOKS:

1. Samuel Greengard, Steven Jay Cohen, "Virtual Reality", Gilden Media, First Edition, 2019.
2. Gregory C. Burdea& Philippe Coiffet, "Virtual Reality Technology", Second Edition, John Wiley & Sons, 2006

REFERENCE BOOKS:

1. Jason Jerald, "The VR Book: Human-Centred Design for Virtual Reality", ACM Books, First Edition, 2015.
2. Tony Parisi, "Learning Virtual Reality", O'Reilly, First Edition, 2015.

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Tests	Assignments	Quizzes
Marks (out of 50)	**25**	**15**	**10**
Remember	5	5	-
Understand	5	5	5
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	-

C# & .NET

Course Code : 20ISE653 **Credits : 03**
L:T:P : 3:0:0 **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 technologies of the .NET framework
CO2	Understand the basic and object oriented concepts in C#.
CO3	Model the real world entities as classes and objects using C# object oriented programming concepts.
CO4	Apply exception handling and gain efficient testing, debugging skills C#.
CO5	Applying interfaces and Events in C# programming.
CO6	Develop Windows applications based on C# programming libraries and .NET framework.

Mapping of Course Outcomes to Program Outcomes:

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

Mapping of Course Outcomes to Program Specific Outcomes:

CO/PSO	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 to .Net:** The C# Environment: .NET Framework – An Overview, Components of .NET , Common Language Specification (CLS), Common Language Runtime (CLR), Microsoft Intermediate Language ("MSIL" or "IL"), The Common Type System (CTS), .NET Framework Base Classes, Web Services, Web Forms, and Windows Forms, The .Net Languages.	9	CO1
2	**An Overview of C#:** Object Oriented Concepts, C# Program – Execution, Sample Programs, Command Line Arguments, Programming Examples, Multiple Main Methods. Literals, Variables and Data Types: Keywords, Identifiers, Literals, Variables, Data Types, Boxing and Unboxing. operators and expressions, branching and looping	9	CO2,CO3
3	**Structures and Enumerations:** Structures- Defining a Structure, Assigning Values to Members , Copying Structures , Structures with Methods , Nested Structures , Classes Vs Structures, Guidelines to use Structures; Enumerations- Enumerator Initialization, Enumerator Base Types, Enumerator Type Conversion. Classes and Objects: Classes, Constructors & Destructors, Member Initialization, 'this' Reference Variable, Nesting of Classes, Members, Properties.	9	CO3
4	**Exception Handling:** Exceptions – An Overview, Exception Handling Syntax, Multiple Catch Statements, The Exception Hierarchy, General Catch Handler, Using 'Finally', Nested Try Blocks, User Defined Exceptions, Operators – Checked and Unchecked.	9	CO4
5	**Interfaces, Delegates and Events:** Defining Interfaces, Extending Interfaces, Implementing Interfaces, Explicit Interface Implementation, Abstract Classes and Interfaces, Delegates, Multicast Delegates, Events. Developing Windows Applications, Developing Web Applications.	9	CO5,CO6

TEXT BOOKS:

1. Herbert Schildt, "The Complete Reference: C# 4.0", Tata Mc Graw Hill, 2012. 2. Christian Nagel et al. "Professional C# 2012 with .NET 4.5", Wiley India, 2012.
2. Mark J. Price," C# 8.0 and .NET Core 3.0" – Modern Cross-Platform Development, Fourth Edition ,Expert Insight,2019.

REFERENCE BOOKS:

1. Andrew Troelsen , "Pro C# 2010 and the .NET 4 Platform, Fifth edition, A Press, 2010.
2. Ian Griffiths, Matthew Adams, Jesse Liberty, "Programming C# 4.0", Sixth Edition, O"Reilly, 2010.

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Taxonomy	Tests (25 marks)	Assignments (15 Marks)	Quizzes (10 Marks)
Remember	5	-	-
Understand	10	-	5
Apply	5	10	5
Analyze	-	-	-
Evaluate	-	-	-
Create	5	5	-

SEE- Semester End Examination (50 Marks)

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

COMPUTER GRAPHICS USING OPENGL

Course Code : 20ISE654 **Credits : 03**
L:T:P : 3:0:0 **CIE Marks : 50**
Exam Hours : 3 **SEE Marks : 50**

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

CO1	Interpret the fundamental principles of computer graphics
CO2	Illustrate primitives and attributes for designing graphics
CO3	Analyze the two-dimensional graphics and their transformations
CO4	Analyze the three-dimensional graphics and their transformations
CO5	Implement illumination and color models using OpenGL
CO6	Design a Computer Animation with 2D and 3D effects

Mapping of Course Outcomes to Program Outcomes:

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

Mapping of Course Outcomes to Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	3	-
CO2	3	-
CO3	3	-
CO4	3	-
CO5	3	-
CO6	3	-

Module No.	Module Contents	Hours	COs
1	**Introduction to Computer Graphics and OpenGL:** Input Devices,Hard-Copy Devices,Graphics Networks, Graphics on the Internet, Coordinate Representations,Graphics Functions,Software Standards **OpenGL:**Related Libraries, Header Files, Display-Window Management Using GLUT, A Complete OpenGL Program	9	CO1
2	**Attributes of Graphics Primitives:**OpenGL State Variables, Color and Grayscale, OpenGL Color Functions, Point Attributes, OpenGL Point-Attribute Functions,Line Attributes, OpenGL Line-Attribute Functions, Curve Attributes	9	CO2
3	**Two-Dimensional Geometric Transformations:**Basic GeometricTransformations, Matrix Representations andHomogeneous Coordinates, CompositeTransformations, , Raster Methods for GeometricTransformations,OpenGL Raster Transformations, OpenGL Functions forGeometricTransformations	9	CO3
4	**Three-Dimensional Geometric Transformations:**Translation, Rotation, Scaling, Composite Transformations,Affine Transformations, OpenGL Geometric-TransformationFunctions, OpenGL Geometric- TransformationProgramming Examples	9	CO4, CO5
5	**Computer Animation:**Design of Animation Sequences, Traditional Animation Techniques, General Computer-AnimationFunctions, Computer-Animation Languages, Key-Frame Systems, Motion Specifications,Character Animation, Periodic Motions, OpenGL Animation Procedures	9	CO6

TEXT BOOKS:

1. Hearn Baker Carithers, "Computer Graphics with OpenGL", Pearson New International Edition,2014
2. J. D. Foley, A. Van Dam, S. K. Feiner and J. F. Hughes, "Computer Graphics – Principles and Practice", Second Edition in C, Pearson Education, 2003
3. F. S. Hill Jr., "Computer Graphics using OpenGL", Pearson Education, 2003.

REFERENCE BOOKS:

1. Xiang, Plastock,"Computer Graphics" , sham's outline series, 2nd edition, TMG,Jan 2015.
2. Kelvin Sung, Peter Shirley, stevenBaer ,"Interactive Computer Graphics, concepts and Applications", 1st Edition ,Cengage Learning,2010.
3. M MRaikar&Shreedhara K S ,"Computer Graphics using OpenGL",1st Edition,Cengage publication,2019.

WEB RESOURCES:

1. Welcome to OpenGL:https://learnopengl.com/
2. Basic OpenGL:http://www.opengl-tutorial.org/beginners-tutorials/
3. An Introduction on OpenGL with 2D Graphics : https://www3.ntu.edu.sg/home/ehchua/programming/opengl/cg_introduction.html
4. Getting started with OpenGL https://www.geeksforgeeks.org/getting-started-with opengl/

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Taxonomy	Tests (25 marks)	Assignments (15 Marks)	Quizzes (10 Marks)
Remember	5	-	5
Understand	10	-	5
Apply	5	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	-

SOFT COMPUTING

Course Code : 20ISE655 | **Credits : 03**
L:T:P : 3:0:0 | **CIE Marks : 50**
Exam Hours : 3 | **SEE Marks : 50**

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

CO1	Learn about soft computing techniques and their applications.
CO2	Understand Neural Networks, architecture, functions and various algorithms involved.
CO3	Comprehend the fuzzy logic and the concept of fuzziness involved in various systems and fuzzy set theory.
CO4	Understand appropriate learning rules for each of the architectures and learn several neural network paradigms and its applications.
CO5	Apply Neural networks for Real world problems.
CO6	Analyze the genetic algorithms and their applications.

Mapping of Course Outcomes to Program Outcomes:

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

Mapping of Course Outcomes to Program Specific Outcomes:

CO/PSO	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:** What is Soft Computing? Difference between Hard and Soft computing, Requirement of Soft computing, Major Areas of Soft Computing, Applications of Soft Computing.	9	CO1
2	**Neural Network:** Structure and Function of a single neuron: Biological neuron, artificial neuron, definition of ANN, Taxonomy of neural net, Difference b/w ANN and human brain, characteristic and applications of ANN, single layer network.	9	CO2

3	**Fuzzy Systems:** Fuzzy Set theory, Fuzzy versus Crisp set, Fuzzy Relation, Fuzzification, Minmax Composition, Defuzzification Method, Fuzzy Logic, Fuzzy Rule based systems, Predicate logic, Fuzzy Decision Making, Fuzzy Control Systems, Fuzzy Classification.	9	CO3
4	**Types of learning**: supervised and unsupervised learning laws. Learnig Laws : Hebb's rule, Delta rule, Widrow - Hoff (The Least-Mean-Square) learning rule, correlation learning rule, instar and outstar learning rules	9	CO4
5	**Genetic algorithm:** Fundamental, basic concepts, working principle, encoding, fitness function, reproduction, Genetic modeling: Inheritance operator, cross over, inversion & deletion, mutation operator, Bitwise operator ,Generational Cycle, Convergence of GA, Applications & advances in GA, Differences & similarities between GA & other traditional methods.	9	CO5,CO6

TEXT BOOKS:

1. S.N. Sivanandam & S.N. Deepa, "Principles of Soft Computing", Wiley Publications, 2nd Edition, 2011.
2. Saroj Kaushik,Suntia Tiwari,"Soft Computing Fundamentals ,Techniques and Applications",1st Edition,Mc Graw Hill,2018.
3. S.Rajasekaran, G. A.Vijayalakshami ,"Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications" , PHI,2011.

REFERENCE BOOKS:

1. N.K.Bose, Ping Liang, "Neural Network fundamental with Graph, Algorithms & Applications" , TMH, 1st Edition, 1998.
2. Bart Kosko," Neural Network & Fuzzy System" , PHI Publication, 1st Edition, 2009.
3. Rich E, Knight K," Artificial Intelligence" , TMH, 3rd Edition, 2012.
4. George J Klir, Bo Yuan, "Fuzzy sets & Fuzzy Logic,Theory & Applications", PHI Publication, 1st Edition, 2009.
5. Martin T Hagen, "Neural Network Design" , Nelson Candad, 2nd Edition, 2008

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Taxonomy	Tests (25 marks)	Assignments (15 Marks)	Quizzes (10 Marks)
Remember	10	-	-
Understand	10		5
Apply	5	5	5
Analyze	-	5	-
Evaluate	-	5	-
Create	-	-	-

SEE- Semester End Examination (50 Marks)

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

ADVANCED JAVA LAB

Course Code : 20ISL66 **Credits : 1.5**
L:T:P : 0:0:1.5 **CIE Marks : 25**
Exam Hours : 3 **SEE Marks : 25**

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

CO1	Apply event handling mechanism in Java based GUI programming.
CO2	Illustrate database access and details for managing information using the JDBC API.
CO3	Describe how Servlets and JSP fit into Java-based web application architecture.
CO4	Demonstrate the usage of frameworks Spring in J2EE based application development.

Mapping of Course Outcomes to Program Outcomes:

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

Experiment No.	Experiment
	PART-A
1	Design and create swing based program to display the coordinates of a mouse pointer in a label component.
2	Design and demonstrate loading of file in a Swing Component.

3	Design and develop a swing based application to count the number of times a specific button is clicked by the user, apply event handling mechanism.
4	Design, Develop and Implement a JDBC program using statement object to display the student information to the console. Assume suitable columns and rows for the Student table and JDBC drivers.
5	Design, Develop and Implement a menu driven JDBC based program using Prepared statement object to perform CRUD operations: insert a row into the student table, delete, update and display the updated data. Assume suitable columns for the Student table and JDBC drivers.
6	Design, Develop and Implement a JDBC based program using callable statement to execute a stored SQL procedure to display the USN of all students from student table. Assume suitable columns and rows for the Student table and JDBC drivers.
PART-B	
7	Write a servlet to show all the parameters sent to the servlet via either GET or POST. Note: consider all types of form fields.
8	Design and develop a user login page and authenticate the user in a JSP page using database. Assume user name and password to be the column of the USER database. Establish connectivity using JDBC drivers.
9	Create a HTML Page, which asks the user to enter a number in a textbox. On clicking the submit button, it places the request to a Servlet. The Servlet generates all Prime numbers which are less than the given number and adds them to an ArrayList and forwards the control to a JSP page. The JSP page iterates through the ArrayList and prints them in a tabular format. Apply RequestDispatcher methods to achieve the same.
10	Design a registration form with Student Name, USN, favourite Course elements. Apply usebean tag in JSP to receive and send the data to Student Java Bean and reply with successful registration and display the registered data.
11.	Demonstrate the concept of dependency injection in spring framework using a suitable web based application.
12	Design and develop a program to demonstrate the MVC pattern using spring framework. Implement the Model view Controller components to interact with spring framework.

For SEE Examination:

- One experiment from part A & One experiment from part B to be given
- Examination will be conducted for 50 marks and scaled down to 25 marks
- Marks Distribution : Procedure write-up – 20%
  Conduction – 60%
  Viva – Voce – 20%
- Change of the experiment is allowed only once and procedure write-up marks will be considered as ‘0’

CIE - Continuous Internal Evaluation (25 Marks)

Bloom's Category	Tests (25 Marks)
Remember	-
Understand	5
Apply	15
Analyze	5
Evaluate	-
Create	-

SEE – Semester End Examination (25 Marks)

Bloom's Taxonomy	Marks
Remember	-
Understand	5
Apply	5
Analyze	-
Evaluate	-
Create	15

MACHINE LEARNING LAB

Course Code : 20ISL67 | **Credits : 1.5**
L:T:P : 0:0:1.5 | **CIE Marks : 25**
Exam Hours : 3 | **SEE Marks : 25**

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

CO1	Demonstrate Supervised, Unsupervised Learning algorithms.
CO2	Implement Concept Learning, Supervised Learning Algorithms.
CO3	Model the Association Rule Mining algorithms with real world problems.
CO4	Illustrate Artificial Neural Networks and Convolutional Neural Networks to solve machine learning problems.

Mapping of Course Outcomes to Program Outcomes:

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

Experiment No.	Experiment
	PART-A
1	Implement and demonstrate the Pricipal Component Analysis for dimentionality reduction. Read the training data set from a .CSV file.
2	For a given set of training data examples stored in a .CSV file, implement and demonstrate the Document classifier using Naiive Bayes.
3	Develop a program to demonstrate the working of the decision tree based CHAID algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
4	Develop a program to demonstrate the working of the decision tree based CART algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
5	Develop a program to demonstrate the working of the decision tree based C4.5 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample
6	Develop a program to construct Support Vector Machine considering a Sample Dataset.

PART-B	
7	Implement and demonstrate the Association Rule Mining
8	Implement and demonstrate the Association Rule Mining using Apriori Algorithm.
9	Implement and demonstrate the Association Rule Mining using FP-Growth Algorithm.
10	Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.
11.	Build a Convolutional Neural Networks and test the same using appropriate data sets.
12	Implement Q learning algorithm.

For SEE Examination:

- One experiment from part A & One experiment from part B to be given
- Examination will be conducted for 50 marks and scaled down to 25 marks
- Marks Distribution: Procedure write-up – 20%
  Conduction – 60%
  Viva – Voce – 20%
- Change of the experiment is allowed only once and procedure write-up marks will be considered as '0'

CIE - Continuous Internal Evaluation (25 Marks

Bloom's Category	Tests (25 Marks)
Remember	-
Understand	5
Apply	15
Analyze	5
Evaluate	-
Create	-

SEE – Semester End Examination (25 Marks)

Bloom's Taxonomy	Marks
Remember	-
Understand	5
Apply	15
Analyze	5
Evaluate	-
Create	-

MINI PROJECT

Course Code	**: 20ISE68**	**Credits**	**: 2**
L:T:P	**:0:0:0**	**CIE Marks**	**: 25**
Exam Hours	**: 3**	**SEE Marks**	**: 25**

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

CO1	Analyze the Real world problem through survey of existing problems.
CO2	Design the modules for solving the problems identified.
CO3	Implement the design modules with suitable programming language.
CO4	Test the working modules at different levels.

Mapping of Course Outcomes to Program Outcomes:

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

Note :

- Every student should do individual mini project in the areas suggested by the department expert committee
- Minimum 2 reviews will be conducted by the department expert committee to know the progress of the mini project work
- In each review student should give presentation on the work carried out and show the relevant models
- A mini project report should be submitted to the department at the end of the mini project work
- Plagiarism check for the report : Similarity index of the report should not exceed more than 30%

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.

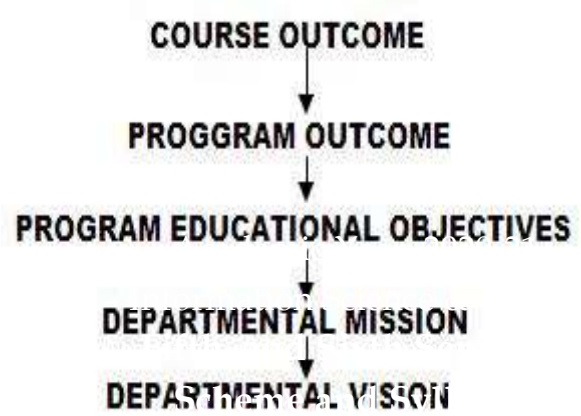
There are three educational Outcomes as defined by the National Board of Accreditation:

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.