

# Effective from Academic Batch: 2022-23

Programme: Master of Science (Information Technology)

Semester: II

**Course Code:** 

Course Title: Internet of Things (IOT)

**Course Group:** CORE COURSES

### **Course Objectives:**

- **1.** This subject covers the fundamentals of IoT with its architecture, protocols and Applications.
- **2.** It also covers the overview and programming of two widely used IoT platforms Arduino and Raspberry Pi.

### Teaching & Examination Scheme:

Contact hours per week			Course	Examination Marks (Maximum / Pas				sing)
Lesture Tutorial		Dractical	Credits		eory	J/V/P*		Total
Lecture	Tutorial	Practical		Internal	External	Internal	External	Total
4			4	50/20	50/20			100/40

\* J: Jury; V: Viva; P: Practical

### **Detailed Syllabus:**

Sr.	Contents	Hours
1	<b>Introduction of IOT:</b> Introduction Of IOT; Introduction-Definition & Characteristics Of IoT, Physical Design Of IoT- Things In IoT; Introduction Of IOT Reference Architecture and IOT Reference Model; IOT Application Fields ; Threads And Security Issues With IOT System	11
2	<b>IOT hardware platforms of IOT end devices:</b> Sensing devices and smart IOT end points: Sensors, sensor devices and Input devices, Actuators; Introduction of Embedded system and its role in IOT; Embedded system microcontroller architecture; Introduction IOT system educational Hardware development platforms: Arduino and Raspberry Pi; Introduction of Raspberry Pi hardware Peripherals	16
3	<b>IOT communication Protocols and information theory</b> : RF energy and theoretical range; Short range communication used in IOT: Non-IP based and IP based WPAN (Wireless personal area network) and its protocols; Long rang communication(LPWAN) used in IOT and its protocols; IOT edge to cloud protocols, Cloud service models; Introduction of Data management system for IOT	16

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 4 Domain Specific IoTs :Home Automation: Smart Lighting, Smart Appliances, Intrusion Detection, Smoke/Gas Detectors, Cities-Smart Parking, Smart Lighting, Smart Roads, Structural Health Monitoring, Surveillance, Emergency Response, Environment-Weather Monitoring, Air Pollution Monitoring, Noise Pollution Monitoring, Forest Fire Detection, River Floods Detection, Retail-Inventory Management, Smart Payments, Smart Vending Machines, Logistics-Route Generation & Scheduling, Shipment Monitoring, Remote Vehicle Diagnostics, Agriculture-Smart Irrigation, Green House Control, Industry - Machine Diagnosis & Prognosis Indoor Air Quality Monitoring, Health & Lifestyle -Health & Fitness Monitoring, Wearable Electronics IoT

#### **Reference Books:**

1	Vijay Madisetti & Arshdeep Bahga, Internet of Things (A Hands-on-Approach), 1 <sup>st</sup> Ed., VPT,
	2014
2	Cuno Pfister, Getting Started with the Internet of Things, O'Reilly Media, 2011, ISBN: 978-1-
	4493-9357-1
3	Internet of Things architecture and Design Principles, Raj Kamal, McGrawhill Education
	private limited, 2017
4	Learning Internet of Things, Peter Waher, / Packt Publishing Limited, 2015
5	Internet of Things: Technologies and Applications for a New Age of Intelligence, Vlasios
	Tsiatsis, Stamatis Karnouskos and Jan Holler, Academic Press, 2018
6	Raspberry Pi Cookbook, Simon Monk,, O'Reilly Publishing Limited, 2014
7	The Internet of Things, Olivier Hersent, David Boswarthick, Omar Elloumi, Wiley, 2018
8	Designing the Internet of Things, Adrian McEwen & Hakim Cassimally, Wiley, 2018
9	The Internet of Things, Hakima Chaouchi, Wiley, 2017

#### **Supplementary learning Material:**

1	https://www.tutorialspoint.com/internet_of_things/index.htm
2	https://www.iotworldtoday.com/
3	https://aws.amazon.com/iot/

4 https://github.com/connectIOT/iottoolkit

5 https://www.arduino.cc/

### Pedagogy:

At the start of course, the course delivery pattern, prerequisite of the subject will be discussed. The assessment and evaluation process will be broadly classified with the following 02 components viz.,:

- 1. In- Semester continuous Internal assessment and evaluation, and
- 2. End- Semester final examination

The weightage of internal assessment for theory/practical course will be 40%.

However, the remaining 60% weightage for theory/practical courses will be for End-Semester final examination, both evaluation two (02) hours duration for theory and three (03) hours for practical.

### In-Semester Continuous internal evaluation:

- 1. One Internal exam will be conducted as a part of internal theory/practical evaluation.
- 2. Assignments based on the course content will be given to the students for each unit and

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will be evaluated at regular interval evaluation.

- 3. Weekly Tests/Quizzes/Seminar/Attendance will be considered in the overall internal evaluation.
- 4. Presentation/Online Course Work/Research Paper are part of the internal evaluation

### Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %						<b>R</b> : Remembering; <b>U</b> : Understanding; <b>A</b> : Applying;
R	U	Α	Ν	Ε	С	N: Analyzing; E: Evaluating; C: Creating
10	15	25	28	17	5	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

### Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage							
CO-1	Understand the vision of IoT from a global context.	20							
CO-2	Building state of the art architecture in IoT.								
	Understand the IOT hardware platforms of IOT end devices.	30							
	Demonstrate the architecture and functioning of IoT systems including								
	the sensors and microcontrollers with their interfacing and software								
	need considering application areas.								
CO-3	Use of Devices, Gateways and Data Management in IoT. Diagnose the								
	various IoT protocols with detailing of their elements and overall <b>25</b>								
	functioning within IoT systems for efficient communication.								
	Design an IoT system to take the benefit of the Clouds for computing								
	and storage considering security issues								
CO-4	Understand the application of IoT. Application of IoT in Industrial and <b>25</b>								
	Commercial Building Automation and Real World Design Constraints.								
	Leverage the benefits of IoT technologies for automating the various								
	real-life challenges in various application areas.								
	Develop the software components of IoT system using								
	Arduino/Raspberry Pi Programming.								

Curriculum Revision:						
Version:	1.0					
Drafted on (Month-Year):	April-2021					
Last Reviewed on (Month-Year):	April-2022					
Next Review on (Month-Year):	April-2023					

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# Effective from Academic Batch: 2022-23

Programme:	Master of Science (Information Technology)
Semester:	II
Course Code:	
Course Title:	Application Development using Advanced .NET
Course Group:	CORE COURSES

### **Course Objectives:**

- **1.** To get familiarize with Microsoft.Net, C# and ASP.NET technologies, as well as working with State management techniques, AJAX Client Side as well as Server Side; AJAX toolkit and Hosting of web application in IIS.
- **2.** Students will learn to develop ASP.NET MVC applications using .NET Framework on server side and using AngularJS framework on client side.
- **3.** Using MVC on both server and client side allows separation of responsibilities within code which makes applications easier to maintain and also improves performance.
- **4.** To teach the basics of ASP.NET Core Basics for AngularJS web application development using ASP.NET Core framework.

### **Teaching & Examination Scheme:**

Contact hours per week			Course	se Examination Marks (Maximum / Pas				
Locturo	Tutorial Duca		Credits	The	eory	J/V/P*		Total
Lecture	Tutorial	Practical		Internal	External	Internal	External	Total
4			4	50/20	50/20			100/40

\* J: Jury; V: Viva; P: Practical

### **Detailed Syllabus:**

Sr.	Contents	Hours
1	Advanced Features of ASP.NET: Introduction to Web Architecture; Overview of	
	ASP.NET; ASP.NET State Management; Membership Functionality; Globalization	13
	and Localization; AJAX; Client Side and Server Side AJAX; AJAX Toolkit; Hosting	
	Web Application in IIS	
2	ASP.NET MVC: MVC Architectural Pattern ; URL Routing Engine ; Routing	
	Configuration ; Wiring Controller, Model, and View ; Data Access and Modeling ;	16
	TempData, ViewBag and ViewData ; Unit Testing and ASP.NET MVC	

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3	ASP.NET CORE: Introduction to ASP.NET Core ; Working with OpenID and OAuth								
	Login ; Asynchronous Programming ; Multiple Environments and Development								
	Mode ;Working with WebSockets and SignalR ; Self hosting of Web Applications ;								
	Dependency Injection ; Action Filters ; Security and Identity ; Working with SQL								
	and No-SQL Data Storage Types								
4	AngularJS with .NET: Single-page Application Framework ; Angular CLI ; Model-								
	View-Controller Architecture ; Two Way Data Binding ; Directives, Pipes,	15							
	Components, Scope Inheritance, Method Chaining, Templates, Services, Forms and								
	Validation ;Animation and Routing ; Calling API, Using Third Party API ; Web-								
	Sockets, Use of UI Frameworks Plug-ins								

- **1** Pro ASP.NET 4.5 in C# by Adam Freeman, APress, 2013
- 2 Mastering ASP.NET Core 2.0 by Ricardo Peres, Packt Publishing Limited, 2017
- **3** Professional ASP.NET MVC 5 by Jon Galloway, Wrox, 2014
- **4** Beginning ASP.NET 4.5: in C# and VB by Imar Spaanjaars, Wiley, 2014
- **5** Beginning Node.js by Basarat Syed, Apress, 2014
- **6** ASP.NET Core 2 Fundamentals by Onur Gumus and Mugilan T. S. Ragupathi, Packt Publishing Ltd, 2018
- 7 Learning ASP.NET Core MVC Programming by Mugilan T. S. Ragupathi, Packt Publishing Ltd, 2016
- 8 ASP.NET Core Essentials by Shahed Chowdhuri, Packt Publishing Ltd, 2016
- **9** Enterprise Application Architecture with .NET Core by Ganesan Senthilvel, Ovais Mehboob Ahmed Khan, Habib Ahmed Qureshi, Packt Publishing Ltd, 2017
- **10** ASP.NET Core 2 and Angular 5 by Valerio De Sanctis, Packt Publishing Ltd, 2017
- **11** ASP.NET MVC with Entity Framework and CSS by Lee Naylor, APress, 2016
- **12** Pro ASP.NET Core MVC by Adam Freeman, Springer, 2016
- **13** Node.js, MongoDB and Angular Web Development: The definitive guide to using the MEAN stack to build web applications Brad Dayley, Brendan Dayley 2<sup>nd</sup> Edition- Kindle Edition

#### **Supplementary learning Material:**

- 1 https://www.coursera.org/courses?query=angularjs
- 2 https://angularjs.org/
- 3 https://www.tutorialspoint.com/angularjs/

#### **Pedagogy:**

At the start of course, the course delivery pattern, prerequisite of the subject will be discussed. The assessment and evaluation process will be broadly classified with the following 02 components viz.,:

- 1. In- Semester continuous Internal assessment and evaluation, and
- 2. End- Semester final examination

The weightage of internal assessment for theory/practical course will be 40%.

However, the remaining 60% weightage for theory/practical courses will be for End-Semester final examination, both evaluation two (02) hours duration for theory and three (03) hours for practical.

### **In-Semester Continuous internal evaluation:**

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- 1. One Internal exam will be conducted as a part of internal theory/practical evaluation.
- 2. Assignments based on the course content will be given to the students for each unit and will be evaluated at regular interval evaluation.
- 3. Weekly Tests/Quizzes/Seminar/Attendance will be considered in the overall internal evaluation.
- 4. Presentation/Online Course Work/Research Paper are part of the internal evaluation

### Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Dist	tributio	on of T	heory M	larks i	n %	<b>R</b> : Remembering; <b>U</b> : Understanding; <b>A</b> : Applying;
R	U	Α	Ν	Ε	С	N: Analyzing; E: Evaluating; C: Creating
15	15	15	15	15	25	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

### **Course Outcomes (CO):**

Sr.	Course Outcome Statements	%weightage				
CO-1	Develop the console and GUI applications using C# ASP.Net					
	Create the dynamic web page using ASP.NET Controls which interact	15				
	with databases.					
	Manage cookies and sessions as state management techniques.					
CO-2	How to set up an ASP.NET project.					
	Project structure of ASP.NET.					
	How to create model classes for entities.	25				
	How to assign relationships between entities.					
	Building views to display data.					
	Building controllers that communicate between models and views.					
	How to create JSON Web APIs.					
CO-3	Working with ASP.NET Core Framework, Setting of ASP.NET					
	Environments and Repository Pattern in ASP.NET Core	30				
	Define MVC on server and client side					
	Create MVC and Web API applications using ASP.NET MVC on server					
	side with Unit Testing.					
CO-4	Create single page web applications using the MVC pattern of AngularJS					
	Understand the programming model provided by the AngularJS	30				
	framework					
	Define Angular controllers and directives					
	Control Angular data bindings					
	Implement Responsive Web Applications with AngularJS					

Curriculum Revision:			
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# Effective from Academic Batch: 2022-23

Programme:	Master of Science (Information Technology)
Semester:	II
Course Code:	
Course Title:	Data Science Using Python and R
Course Group:	CORE COURSES

### **Course Objectives:**

- **1.** To learn about Data Science, understand the data science areas, Data Processing, Visualization and Analytical techniques on data set.
- **2.** To develop proficiency in creating based applications using the Python Programming Language and understand to draw various kinds of data visualization techniques using matplotlib and Pandas.
- **3.** To learn creating modules and data structures like List, Tuples and Dictionaries.
- **4.** To handle exceptions and work with the built in standard libraries. To learn to Manipulate primitive data types in the R programming language using RStudio or Jupyter Notebooks.
- **5.** To understand the Control program flow with conditions and loops, write functions, perform character string operations. To learn the Construct and manipulate R data structures, including vectors, factors, lists, and data frames. To understand the data preparation using Python and R.

### **Teaching & Examination Scheme:**

Contact hours per week		Course	Course Examination Marks (Maximum / Pa			mum / Pas	sing)	
Locturo	Tutorial	Practical	Credits	The	Theory J/		/P*	Total
Lecture				Internal	External	Internal	External	TULAI
4			4	50/20	50/20			100/40

\* J: Jury; V: Viva; P: Practical

### **Detailed Syllabus:**

Sr.	Contents	Hours
1	<b>Introduction to Data Science:</b> Introduction and Methodology, Data Science Tasks, Description, Estimation, Basic ML Algorithms (Classification, Clustering, Prediction, Association), Applications of Data Science, Technologies for visualization, Data Science toolkit, Types of data	11
2	<b>Python for Data Science</b> : Python Environment Setup and Essentials, Mathematical Computing with Python (NumPy), Scientific computing with Python (Scipy), Data Manipulation with Pandas, Data Visualization in Python using matplotlib	18

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3	<b>R Programming for Data Science:</b> Basics of R programming, Essentials of R programming, Exploratory Data Analysis, Data Manipulation, Data Visualization in R	18
4	<b>Data Preparation Using Python and R:</b> The Problem Understanding Phase, Data Preparation Phase, Adding an Index Field Using R and Python, Changing Misleading Field Values, Re-expression of Categorical Data as Numeric, Standardizing the Numeric Fields, Identifying Outliers	13

1	Mark Lutz, "Learning Python", 4th Edition, O'Reilly, 2009
2	Wes McKinney, "Python for Data Analysis", O'Reilly, 2013
3	Robert I. Kabacoff, "R in Action: Data Analysis and Graphics with R", Manning, 2011
4	Field Cady, 'The Data Science Handbook ', Wiley Publication ISBN-13: 978-1119092940
5	Jake VanderPlas, 'Python Data Science Handbook ESSENTIAL TOOLS FOR WORKING WITH
	DATA', O'REILLY ISBN:978-1-491-91205-8
6	Rachel Schutt and Cathy O'Neil, Doing Data Science, O'REILLY
7	Wes McKinney,Python for Data Analysis Data Wrangling with Pandas, NumPy, and IPython,
	2nd Edition , O'REILLY

Sup	Supplementary learning Material:				
1	https://www.coursera.org/learn/python-data-analysis				
2	https://nptel.ac.in/courses/106106212				
3	https://www.kaggle.com/datasets				
4	https://www.programiz.com/python-programming				
5	https://www.coursera.org/learn/introducton-r-programming-data-science				
4 5	https://www.coursera.org/learn/introducton-r-programming-data-science				

### Pedagogy:

At the start of course, the course delivery pattern, prerequisite of the subject will be discussed. The assessment and evaluation process will be broadly classified with the following 02 components viz.,:

- 1. In- Semester continuous Internal assessment and evaluation, and
- 2. End- Semester final examination
- The weightage of internal assessment for theory/practical course will be 40%.

However, the remaining 60% weightage for theory/practical courses will be for End-Semester final examination, both evaluation two (02) hours duration for theory and three (03) hours for practical.

## In-Semester Continuous internal evaluation:

1. One Internal exam will be conducted as a part of internal theory/practical evaluation.

2. Assignments based on the course content will be given to the students for each unit and will be evaluated at regular interval evaluation.

3. Weekly Tests/Quizzes/Seminar/Attendance will be considered in the overall internal evaluation.

4. Presentation/Online Course Work/Research Paper are part of the internal evaluation.

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### Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %				larks i	n %	<b>R</b> : Remembering; <b>U</b> : Understanding; <b>A</b> : Applying;
R	U	Α	Ν	Ε	C	N: Analyzing; E: Evaluating; C: Creating
20	20	25	15	10	10	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

#### **Course Outcomes (CO):**

Sr.	Course Outcome Statements	%weightage		
CO-1	Describe the various areas where data science is applied. Identify the <b>20</b>			
	data types, relation between data and visualization technique for data.			
CO-2	Understand the fundamental of Python syntax and be fluent in the use of Python control flow statements. Learn methods to create and manipulate Python programs by utilizing the data structures like dictionaries, tuples, Lists and sets. Understand the Pandas and Numpy library for data science operation and plotting various Biosignal using Matplotlib.	30		
CO-3	Study and use basic fundamental concepts to solve the real world problem using R programming language. Design and implement the solution using scalar, vectors ,matrices and statistical problems in R program.	30		
<b>CO-4</b>	Understand the data preparation various phases using python and R.	20		

Cur	riculum	Revision:	
* *			

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# Effective from Academic Batch: 2022-23

Programme:	Master of Science (Information Technology)
Semester:	II
Course Code:	
Course Title:	Practical Based on Application Development using Advanced .NET
Course Group:	CORE COURSES

### **Course Objectives:**

- **1.** To get familiarize with Microsoft.Net, C# and ASP.NET technologies, as well as working with State management techniques, AJAX Client Side as well as Server Side; AJAX toolkit and Hosting of web application in IIS.
- **2.** Students will learn to develop ASP.NET MVC applications using .NET Framework on server side and using AngularJS framework on client side.
- **3.** To teach the basics of ASP.NET Core Basics for web application development using ASP.NET Core framework.

### **Teaching & Examination Scheme:**

Contact hours per week			Course	Examination Marks (Maximum / Passing)				
Lastura Tutorial			Credits	Theory		J/V/P*		Total
Lecture	Tutorial	Practical		Internal	External	Internal	External	Total
		8	4			50/20	50/20	100/40
L Lynny, V. Vivo, D. Drostical								

\* **J**: Jury; **V**: Viva; **P**: Practical

## List of Practicals / Tutorials:

1	To perform CRUD Operation with ASP.NET using ADO.NET Store Procedure database
	connectivity.
2	To implement State Management Techniques using ASP.NET C#.
3	To implement Globalization Localization in ASP.NET
4	To perform tutorial to change Bootstrap Theme for ASP.NET MVC Web application
5	To perform CRUD Operation with EmployeeDB database using ASP.NET MVC.
6	To learn how to work with Controller in ASP.NET MVC.
7	To learn how to work with Model and View in ASP.NET MVC
8	To learn how to work with Razor View Engine in ASP.NET MVC.
9	To implement Loops, conditional statements & directives in Razor MVC
10	To learn how to work with HTML helpers in ASP.NET MVC.
11	To implement ViewBag and ViewData in ASP.NET MVC.
12	To perform CRUD Operation Using - DATATABLE, MODAL, AJAX, Form Validation in Asp.net
	MVC

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13	To Setup web application on GitHub repository.
14	To learn how to work with MVC pattern in ASP.NET Core MVC.
15	To learn Razor ViewEngine in ASP.NET Core MVC.
16	To perform CRUD Operation with any database using ASP.NET Core MVC

<b>1</b>   Pro ASP.NET 4.5 in C# by Adam Freeman, APress, 2
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- 2 Mastering ASP.NET Core 2.0 by Ricardo Peres, Packt Publishing Limited, 2017
- **3** Professional ASP.NET MVC 5 by Jon Galloway, Wrox, 2014
- **4** Beginning ASP.NET 4.5: in C# and VB by Imar Spaanjaars, Wiley, 2014
- **5** Beginning Node.js by Basarat Syed, Apress, 2014
- **6** ASP.NET Core 2 Fundamentals by Onur Gumus and Mugilan T. S. Ragupathi, Packt Publishing Ltd, 2018
- Learning ASP.NET Core MVC Programming by Mugilan T. S. Ragupathi, Packt Publishing Ltd, 2016
- 8 ASP.NET Core Essentials by Shahed Chowdhuri, Packt Publishing Ltd, 2016
- **9** Enterprise Application Architecture with .NET Core by Ganesan Senthilvel, Ovais Mehboob Ahmed Khan, Habib Ahmed Qureshi, Packt Publishing Ltd, 2017
- **10** ASP.NET Core 2 and Angular 5 by Valerio De Sanctis, Packt Publishing Ltd, 2017
- **11** ASP.NET MVC with Entity Framework and CSS by Lee Naylor, APress, 2016
- **12** Pro ASP.NET Core MVC by Adam Freeman, Springer, 2016
- **13** Node.js, MongoDB and Angular Web Development: The definitive guide to using the MEAN stack to build web applications Brad Dayley and Brendan Dayley-Second Edition- Kindle Edition

Sup	Supplementary learning Material:					
1	http://www.w3schools.com/angular/default.asp [Tutorial link for AngularJS]					
2	http://www.tutorialspoint.com/angularjs/ [Tutorial link for AngularJS]					
3	https://www.tutorialspoint.com/angularjs/angularjs_tutorial.pdf [E-book for AngularJS]					

### **Pedagogy:**

At the start of course, the course delivery pattern, prerequisite of the subject will be discussed. The assessment and evaluation process will be broadly classified with the following 02 components viz.,:

- 1. In-Semester continuous Internal assessment and evaluation, and
- 2. End- Semester final examination

The weightage of internal assessment for theory/practical course will be 40%.

However, the remaining 60% weightage for theory/practical courses will be for End-Semester final examination, both evaluation two (02) hours duration for theory and three (03) hours for practical.

## In-Semester Continuous internal evaluation:

- 1. One Internal exam will be conducted as a part of internal theory/practical evaluation.
- 2. Assignments based on the course content will be given to the students for each unit and will be evaluated at regular interval evaluation.
- 3. Weekly Tests/Quizzes/Seminar/Attendance will be considered in the overall internal evaluation.

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- 4. Presentation/Online Course Work/Research Paper are part of the internal evaluation
- 5. The course includes a laboratory, where students have an opportunity to build lab index for the concepts being taught in lectures/lab demonstrations.

#### Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %			larks i	n %	<b>R</b> : Remembering; <b>U</b> : Understanding; <b>A</b> : Applying;	
R	U	Α	Ν	Ε	С	N: Analyzing; E: Evaluating; C: Creating
5	5	10	10	20	50	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

#### **Course Outcomes (CO):**

Sr.	Course Outcome Statements	%weightage
CO-1	Upon successful completion of the course, the students will:	
	Be able to develop the console and GUI applications using C# ASP.Net	15
	Be able to create the dynamic web page using ASP.NET Controls which	
	interact with databases.	
	Be able to manage cookies and sessions as state management	
	techniques.	
CO-2	Be able to design responsive web page for different devices. (Desktops,	
	tablets, and phones).	
	Create web application using the MVVM pattern with JavaScript	30
	Framework. Also, able to maintain the two way data binding between	
	model and view.	
CO-3	Be able to work with ASP.NET Core Framework, Setting of ASP.NET	
	Be able to create MVC and Web API applications using ASP.NET Core	30
	framework on server side with Unit Testing.	
CO-4	Be familiar with JavaScript Framework (AngularJS and NodeJS) and its	
	applications.	25
	Be able to create a single page application using AngularJS.	
	Be able to create responsive web page with database using AngularJS	

Curriculum Revision:			
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## Effective from Academic Batch: 2022-23

Programme:	Master of Science (Information Technology)
Semester:	II
Course Code:	
Course Title:	Practical Based on Data Science Using Python And
Course Group:	CORE COURSES

### **Course Objectives:**

**1.** Understand the Python and R Programming Language. Exposure on solving of data science problems.

R

- **2.** To understand to draw various kinds of data visualization techniques using matplotlib and Pandas. To study and employ different datatypes, operators, and control statements. To learn creating modules and data structures like List, Tuples and Dictionaries.
- **3.** To handle exceptions and work with the built in standard libraries. To learn to Manipulate primitive data types in the R programming language using RStudio or Jupyter Notebooks.
- **4.** To understand the Control program flow with conditions and loops, write functions, perform character string operations. To learn the Construct and manipulate R data structures, including vectors, factors, lists, and data frames.

#### **Teaching & Examination Scheme:**

Contact hours per week			Course	Exam	Examination Marks (Maximum / Passi				
Locturo	Tutorial	Practical	Credits	Theory		J/V/P*		Total	
Lecture				Internal	External	Internal	External	Total	
		8	4	50/20	50/20			100/40	

\* J: Jury; V: Viva; P: Practical

### List of Practicals / Tutorials:

1	Develop basic python programs.
2	Develop programs to understand the control structures of python
3	Develop programs to learn different types of structures (list, dictionary, tuples) in python.
4	Develop programs to learn concept of functions scoping, recursion and list mutability
5	To implement a program to demonstrate different number datatypes in python.
6	To implement a program to perform different arithematic operations on numbers in
	python.
7	To implement mathematical Computing with Python using Numpy.
8	To implement Scientific Computing with Python using Scipy.
9	To implement Data Manipulation in Python using Pandas.
10	To implement Data Visualization in Python using matplotlib.

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11	Perform following operations on a CSV file
	a. Create a data frame from csv file, dictionary, List of tuples
	b. Operations on Data Frame Shape, head, tail
	c. Retrieving rows / columns from data frame
	d. Finding maximum and minimum values
	e. Displaying statistical information
	f. Performing queries
	g. Handling missing data
12	R AS CALCULATOR APPLICATION
	a. Using with and without R objects on console
	b. Using mathematical functions on console
	c. Write an R script, to create R objects for calculator application and save in a specified
	location in disk.
13	DESCRIPTIVE STATISTICS IN R
	a.Write an R script to find basic descriptive statistics using summary, str, quartile function
	on mtcars& cars datasets.
	b.Write an R script to find subset of dataset by using subset (), aggregate () functions
14	READING AND WRITING DIFFERENT TYPES OF DATASETS
	a. Reading different types of data sets (.txt, .csv) from web and disk and writing in file in
	specific disk location.
15	Perform a following Data Visualization :
	a. R Pie Charts
	b. R Bar Charts
	c. R Boxplot
	d. R Histogram
	e. R Line Graphs
	f. R Scatterplots
16	Perform a following Vector operations :
	a. Combining vectors
	b. Arithmetic operations
	c. Logical Index vector
	d. Numeric Index
	e. Duplicate Index
	f. Range Indexes
	g. Out-of-order Indexes
	h. Named vectors members

1	Mark Lutz, "Learning Python", 4th Edition, O'Reilly, 2009
2	Wes McKinney, "Python for Data Analysis", O'Reilly, 2013
3	Robert I. Kabacoff, "R in Action: Data Analysis and Graphics with R", Manning, 2011
4	Field Cady, 'The Data Science Handbook ', Wiley Publication ISBN-13: 978-1119092940
5	Jake VanderPlas, 'Python Data Science Handbook ESSENTIAL TOOLS FOR WORKING WITH
	DATA', O'REILLY ISBN:978-1-491-91205-8
6	Rachel Schutt and Cathy O'Neil, Doing Data Science, O'REILLY

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7 Wes McKinney,Python for Data Analysis Data Wrangling with Pandas, NumPy, and IPython, 2nd Edition, O'REILLY

Sup	plementary learning Material:
1	https://www.coursera.org/learn/python-data-analysis
2	https://nptel.ac.in/courses/106106212
3	https://www.kaggle.com/datasets
4	https://www.programiz.com/python-programming
5	https://www.coursera.org/learn/introducton-r-programming-data-science

### Pedagogy:

At the start of course, the course delivery pattern, prerequisite of the subject will be discussed. The assessment and evaluation process will be broadly classified with the following 02 components viz.,:

- 1. In- Semester continuous Internal assessment and evaluation, and
- 2. End- Semester final examination

The weightage of internal assessment for theory/practical course will be 40%.

However, the remaining 60% weightage for theory/practical courses will be for End-Semester final examination, both evaluation two (02) hours duration for theory and three (03) hours for practical.

### **In-Semester Continuous internal evaluation:**

- 1. One Internal exam will be conducted as a part of internal theory/practical evaluation.
- 2. Assignments based on the course content will be given to the students for each unit and will be evaluated at regular interval evaluation.

3. Weekly Tests/Quizzes/Seminar/Attendance will be considered in the overall internal evaluation.

- 4. Presentation/Online Course Work/Research Paper are part of the internal evaluation.
- 5. The course includes a laboratory, where students have an opportunity to build a lab index for the concepts being taught in lectures/lab demonstrations.

### Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Dist	tributio	on of T	heory M	larks i	n %	<b>R</b> : Remembering; <b>U</b> : Understanding; <b>A</b> : Applying;
R U A N E C				Ε	С	N: Analyzing; E: Evaluating; C: Creating
10	20	15	20	10	25	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

### **Course Outcomes (CO):**

51.	Course Outcome Statements	%weightage
<b>CO-1</b> W	Vrite, test, and debug simple Python programs. Implement the core	25
py co by	ython programming concepts like loops, if statement and other oncept to create python program. Develop Python programs step-wise y defining functions and calling them	

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CO-2	Use Python lists, tuples, dictionaries for representing compound data. Understand Mathematical computing with NumPy, Scientific computing with Scipy, Data Manipulation with Pandas, Data Visualization using matplotlib.	25
CO-3	Understand the installation of R Programming Environment. Study and use basic fundamental concepts to solve the real world problem using R programming language. Utilize and R Data types for developing programs.	25
CO-4	Make use of different R Data Structures. Analyze the datasets using R programming capabilities. Understand the data preparation various phases using python and R.	25

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# Effective from Academic Batch: 2022-23

Programme:	Master of Science (Information Technology)
Semester:	II
Course Code:	
Course Title:	Comprehensive Viva-Voce
_	

**Course Group:** CORE COURSES

### **Course Objectives:**

The comprehensive viva – voce examination should be based on the theoretical knowledge, skills and the practices in which students have undergone in the period of four courses of theory of the semester. The viva shall normally cover the subjects taught in all the semesters of M.Sc. IT Programme.

# **Teaching & Examination Scheme:**

Contact hours per week			Course	Examination Marks (Maximum / Pas				sing)
Locturo	Tutorial	Practical	Credits	Theory		J/V/P*		Total
Lecture	Tutorial			Internal	External	Internal	External	Total
			1				50/20	50/20

\* J: Jury; V: Viva; P: Practical

## **Course Outcomes (CO):**

Sr.	Course Outcome Statements	%weightage
CO-1	It is overall oral examination of all four theory papers as mentioned	40
	above.	
CO-2	Expert shall evaluate and examine the knowledge acquired in the	30
	semesters to solve the problems, applications, skills and techniques.	
CO-3	Students should be able to give lucid explanation of questions asked by	30
	the experts of the different topics learnt by themselves during the	
	semester.	

Curriculum Revision:				
Version:	1.0			
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# Effective from Academic Batch: 2022-23

Programme: Master of Science (Information Technology)

Semester: II

Course Code:

**Course Title:** Cloud Computing

**Course Group:** ELECTIVE COURSE

### **Course Objectives:**

This course will provide an opportunity to study the new area of cloud computing, its infrastructure, architecture and services and provide an insight into the various delivery models and service providers.

### **Teaching & Examination Scheme:**

Contact hours per week			Course	Examination Marks (Maximum / Pas				sing)
Locturo	Tutorial	Practical	Credits	Theory		J/V/P*		Total
Lecture				Internal	External	Internal	External	IUtal
4			4	50/20	50/20			100/40

\* J: Jury; V: Viva; P: Practical

### **Detailed Syllabus:**

Sr.	Contents	Hours
1	Introduction to Cloud Computing; Characteristics of Cloud Computing; Cloud	
	Service Models - Infrastructure as a Service, Platform as a Service, Software as a	
	Service and Anything as a Service; Cloud Deployment Models - Private Cloud,	15
	Community Cloud, Public Cloud and Hybrid Cloud ; Difference Between Traditional	
	Commuting and Cloud Computing ; Virtualization; Need of Virtualization; Types of	
	Virtualization ; Virtualization in Cloud Computing	
2	Cloud Infrastructure and Architectures; Cloud Computing Stack ; Composability ;	
	Infrastructure ; Platforms ; Virtual Applications ; Communication Protocols ;	
	Applications; Cloud Data Center Architecture 2.3 Conceptual View of Networking in	15
	Cloud Computing; Cloud Data Storage (Overview of SAN, DFS, etc.) ; Computing	
	Cluster in Cloud ;Service Level Agreement and Cloud Pricing Model ; Cloud Security	
	Concepts; Industrial Platforms and New Developments: Amazon Web Services,	
	Google App Engine, Microsoft Azure	

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3	Service Offerings by Cloud Providers; Introduction to Amazon Cloud Services ;EC2 – Elastic Cloud Compute ;Elastic Container Service ; Elastic Kubernetes Service ; Lambda – Serverless Computing ; VPC – Virtual Private Cloud ; S3 – Simple Storage Service ; EBS – Elastic Block Storage ; RDS – Relational Database Service ; ; Introduction to Microsoft Azure ; Service Fabric ; AKS – Azure Kubernetes Service ; Container Instances ; Azure SQL ; Azure DevOps ;Security Center ; Azure IoT Hub ; Traffic Manager ; Cognitive Services ; Introduction to Google Cloud Services ; Google App Engine ; Google Compute Engine ; Google Kubernetes Engine ; Cloud ; Cloud SQL	15
4	Cloud Delivery Model Considerations: Cloud Delivery Models: The Cloud Provider Perspective, Cloud Delivery Models: The Cloud Consumer Perspective, Cost Metrics and Pricing Models: Business Cost Metrics, Cloud Usage Cost Metrics, Cost Management Considerations, Service Quality Metrics and SLAs: Service Quality Metrics, SLA Guidelines	15

1	Cloud Computing and Virtualization by Dac-Nhuong Le, Raghvendra Kumar, Gia Nhu					
	Nguyen, Jyotir Moy Chatterjee, WILEY, 2018					
2	Cloud Computing : A Practical Approach by Anthony Velte, Toby Velte, Robert Elsenpeter, Mc					
	Graw Hill, 2017					
3	Cloud Computing – Black Book by Kailash Jayaswal, Jagannath kallakurchi, Donald Houde,					
	Deven Shah, Dreamtech Press, 2014					
4	Architecting The Cloud by Michael Kavis, WILEY, 2014					
5	Learning AWS by Aurobindo Sarkar, Amit Shah, Packt Publication, 2015					
6	Google Cloud Platform Cookbook by LegorieRajan, Packt Publication, 2018					
7	Building Your Next Big Thing with Google Cloud Platform by S.P.T. Krishnan, Jose L. Ugia					
	Gonzalez, Apress, 2015					
8	Microsoft Azure Fundamentals by Jim Cheshire, Pearson, 2019					

#### **Supplementary learning Material:**

- 1 https://www.coursera.org/learn/introduction-to-cloud
- 2 https://onlinecourses.nptel.ac.in/noc22\_cs20/preview
- 3 https://www.tutorialspoint.com/cloud\_computing/index.htm

#### Pedagogy:

At the start of course, the course delivery pattern, prerequisite of the subject will be discussed. The assessment and evaluation process will be broadly classified with the following 02 components viz.,:

- 1. In-Semester continuous Internal assessment and evaluation, and
- 2. End- Semester final examination

The weightage of internal assessment for theory/practical course will be 40%.

However, the remaining 60% weightage for theory/practical courses will be for End-Semester final examination, both evaluation two (02) hours duration for theory and three (03) hours for practical.

### In-Semester Continuous internal evaluation:

1. One Internal exam will be conducted as a part of internal theory/practical evaluation.

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- 2. Assignments based on the course content will be given to the students for each unit and will be evaluated at regular interval evaluation.
- 3. Weekly Tests/Quizzes/Seminar/Attendance will be considered in the overall internal evaluation.
- 4. Presentation/Online Course Work/Research Paper are part of the internal evaluation

### Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Dist	tributio	on of T	heory M	larks i	n %	<b>R</b> : Remembering; <b>U</b> : Understanding; <b>A</b> : Applying;
R	U	Α	Ν	Е	С	N: Analyzing; E: Evaluating; C: Creating
10	20	25	28	17	0	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

### **Course Outcomes (CO):**

Sr.	Course Outcome Statements	%weightage
CO-1	Students will learn basics of cloud computing, types of cloud computing	25
	difference between traditional and cloud computing.	
CO-2	The students will be familiar with various cloud infrastructures,	25
	architectures and services.	
CO-3	They will get the knowledge of various services offering by cloud providers.	25
<b>CO-4</b>	Students will get various business aspects of cloud delivery models	25
	considerations.	

Curriculum Revision:	
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# Effective from Academic Batch: 2022-23

Programme: Master of Science (Information Technology)

Semester: II

**Course Code:** 

Course Title: Digital Image Processing

**Course Group:** ELECTIVE COURSE

### **Course Objectives:**

- **1.** To understand the basic principles and methods of digital image processing.
- **2.** To be able to formulate solutions to general image processing problems and have a comprehensive background in image filtering.
- **3.** To get exposed to simple image enhancement techniques in Spatial and Frequency domain.
- 4. To learn concepts of degradation function and restoration techniques.
- **5.** To study the image segmentation and representation techniques and Understand the morphological image processing.

### **Teaching & Examination Scheme:**

Contact hours per week			Course	Examination Marks (Maximum / Pas				sing)
Locturo	Tutorial	Practical	Credits	Theory		J/V/P*		Total
Lecture	Tutorial			Internal	External	Internal	External	IULAI
4			4	50/20	50/20			100/40

\* J: Jury; V: Viva; P: Practical

### **Detailed Syllabus:**

Sr.	Contents	Hours						
1	Digital Image Fundamentals: Digital Image Processing, Origins of Digital Image							
	Processing, Fields using Digital Image Processing, Fundamental Steps in Digital							
	Image Processing, Components of an Image Processing System, Understanding							
	Pixel, Overview of Coordinate System, Accessing and Manipulating Pixels, Elements							
	of Visual Perception, Light and the Electromagnetic Spectrum, Overview of Image							
	Sensing and Acquisition, Image Sampling and Quantization, Basic Relationship							
	between Pixels, Introduction to Mathematical Tools used in Digital Image							
	Processing-Array Operations, Matrix Operations, Image representation - Gray							
	scale and Color images							

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2	Image enhancement	17					
	Spatial domain: Basics of Intensity Transformation and Spatial Filtering, Basic						
	Intensity Transformation Functions, Histogram Processing, Fundamentals of						
	Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters						
	Filtering in the Frequency Domain: Preliminary Concepts, Extension to functions						
	of two variables, Image Smoothing, Image Sharpening, Homomorphic filtering						
3	Image Restoration and Reconstruction: Reasons for image degradation, Model of	14					
	image degradation/restoration process, Noise probability density functions, Image						
	restoration using spatial filtering (Mean filters, Order statistic filters and adaptive						
	filters), Inverse Filtering, MMSE (Wiener) Filtering, Noise Models, Noise Reduction						
4	Image Segmentation	17					
	Edge based segmentation, Region based segmentation, Region split and merge						
	techniques, Region growing by pixel aggregation, optimal thresholding						
	Morphological Image Processing: Erosion, Dilation, Opening, Closing, Basic						
	Morphological Algorithms: hole filling, connected components, thinning, skeletons						

1	Digital Image Processing by Rafael C. Gonzalez and Richard E. Woods, Pearson Education,
	Third Edition
2	Fundamentals of Digital Image Processing: Practical Approach with examples in MATLAB by
	Chris Solomon and Toby Breckon, Wiley-Blackwell
3	Digital Image Processing by S Sridhar, Oxford University Press
4	"Digital Image Processing using MATLAB", Rafael C Gonzalez, Richard E Woods, Steven
	Eddins, Tata McGraw-Hill Publications
5	"Digital Image Processing", William K. Pratt, Wiley Publications

### Supplementary learning Material:

	FF
1	https://nptel.ac.in/courses/117105079
2	https://www.tutorialspoint.com/dip/index.htm
3	https://www.javatpoint.com/digital-image-processing-tutorial
4	https://www.coursera.org/specializations/image-processing

### Pedagogy:

At the start of course, the course delivery pattern, prerequisite of the subject will be discussed. The assessment and evaluation process will be broadly classified with the following 02 components viz.,:

- 1. In- Semester continuous Internal assessment and evaluation, and
- 2. End- Semester final examination

The weightage of internal assessment for theory/practical course will be 40%.

However, the remaining 60% weightage for theory/practical courses will be for End-Semester final examination, both evaluation two (02) hours duration for theory and three (03) hours for practical.

### **In-Semester Continuous internal evaluation:**

1. One Internal exam will be conducted as a part of internal theory/practical evaluation.

2. Assignments based on the course content will be given to the students for each unit and will be evaluated at regular interval evaluation.

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3. Weekly Tests/Quizzes/Seminar/Attendance will be considered in the overall internal evaluation.

4. Presentation/Online Course Work/Research Paper are part of the internal evaluation.

### Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %						<b>R</b> : Remembering; <b>U</b> : Understanding; <b>A</b> : Applying;
R	U	Α	Ν	Ε	С	N: Analyzing; E: Evaluating; C: Creating
10	20	30	20	10	10	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

#### **Course Outcomes (CO):**

Sr.	Course Outcome Statements	%weightage
CO-1	Understand the Digital Image Fundamentals. Relate to the digital image	20
	processing primitives and the different types of images and their	
	application areas.	
CO-2	Understand the basic image enhancement techniques in spatial &	30
	frequency domains. Operate on images using the techniques of	
	smoothing, sharpening and enhancement. Filter given image using	
	frequency domain filtering technique	
CO-3	Understand the various kind of noise present in the image and how to	20
	restore the noisy image.	
<b>CO-4</b>	Understand the basic concept of morphological operations, image	30
	segmentation, and representation techniques.	

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