



**Dr. G. Y. Pathrikar College of
Computer Science and Information Technology**
Chhatrapati Sambhajinagar

M.Sc. Information Technology
First & Second Year
(Syllabus)

MGM University

Vision

- To ensure sustainable human development which encourages self-reliant and self-content society.
- To promote activities related to community services, social welfare and also Indian heritage and culture.
- To inculcate the culture of non-violence and truthfulness through vipassanna meditation and Gandhian Philosophy.
- To develop the culture of simple living and high thinking

Mission

- To impart state of art education and technical expertise to students and give necessary training to teachers to create self-reliant society for future.
- To encourage students to participate in Indian and International activities in sports, literature, etc. so that future generation becomes base for free and liberal society
- To educate students in areas like Management, Finance, Human relations to inculcate philosophy of simple living and high thinking value of simple economic society.
- To inculcate culture of non-violence and truthfulness through Vipassana.

To sustain activities of Indian culture (viz. classical dance, music and fine arts) through establishing institutes like Mahagami, Naturopathy, etc.

विद्यापीठ गीत

अत्त दिप भव भव प्रदिप भव,
 स्वरूप रूप भव हो
 ज्ञान सब्ब विज्ञान सब्ब भव,
 सब्ब दिप भव हो
 अत्ताहि अत्त नो नाथो,
 अत्ताहि अत्त नो गति
 अत्त मार्गपर अप्रमादसे है तुझे चलना
 सब्ब का कल्याण हो,
 वो कार्यकुशल करना
 सब्ब का उत्तम मंगल, पथप्रदर्शक हो
 अत्त दिप भव भव प्रदिप भव,
 स्वरूप रूप भव हो
 ज्ञान सब्ब विज्ञान सब्ब भव,
 सब्ब दिप भव हो
 बुद्धमं शरनं गच्छामि:
 धम्मं शरनं गच्छामि:
 संघं शरनं गच्छामि:

Dr. G. Y. Pathrikar College of Computer Science & Information Technology

MGM college of Computer Science and Information Technology was established in 2001 offering undergraduate and postgraduate degree program in Computer Science and Information Technology. College was renamed as Dr.G.Y.Pathrikar College of Computer Science and Information Technology in 2003 in memory of great educationalist, one of the founder member and Ex-Secretary MGM, Dr.G.Y.Pathrikar Sir.

It is first self-financed ISO certified institution offering program dedicated to Computer science and Information technology in Maharashtra and has achieved status of 2f/12b. Ours was the only and first college to be re-accredited as A+ grade with NAAC in the year 2017. Experienced and qualified faculty with Ph.D is strength of our college. Starting with 77 student's College has crossed total students strength of 10,000 passing out. Student are doing well in various MNCs like Infosys, Tech-Mahindra, Wipro, Capgemini, Cognizant etc. Many have their own Startups. Some of the students have completed their Masters and Ph.D. program from foreign countries like US, UK, Australia. Now we are constituent college of MGM University, Chhatrapati Sambhajanagar.

Vision

To be an academic institution in dynamic equilibrium in social, ecological and economical environment striving continuously for excellence in total quality education, research and technological service to the nation.

Mission

- To create and sustain a community of learning in which students acquire knowledge and learn to apply it professionally with due consideration for ethical, and economical issues.
- To upgrade our students in all respect with the help of latest infrastructure in the area of Computer Science and Information Technology in order to build the National Capabilities.
- To understand the culture of Non-violence, truth, peace through Gandhian Philosophy.

Programs offered at Dr. G. Y. Pathrikar College of Computer Science & Information Technology

Undergraduate Programmes	Postgraduate Programmes	PhD Programmes
B.Sc(Computer Science) Honours / Honours with Research	M.Sc(Computer Science)	Ph.D. in Computer Science and Information Technology
B.Sc(Information Technology) Honours/ Honours with Research	M.Sc(Information Technology)	
BCA(Science) Honours / Honours with Research	M.Sc(Data Science)	
B.Sc(Animation) Honours / Honours with Research	M.Sc(Animation)	
Integrated M.Sc. Data Science		
BCA(Digital Marketing) Honours		
B.Sc(Robotics) Honours		

Name of Program – M.Sc. (Information Technology)

Duration – Two Years

Eligibility -

- Any Bachelor's Degree in Science or graduate of engineering and technology of this University or any other recognized university as equivalent with minimum 50% marks (45% for reserved category) can apply.

Name of Faculty: Basic and Applied Sciences

Name of the College/Institute/Department/School: Dr. G. Y. Pathrikar College of CS & IT

Name of the Programme: M. Sc. (Information Technology)

Programme Type (UG/PG): PG

Duration: 2 Years

First Year - Semester I												
Course Category	Course Code	Course Title	Nature of Course	No. of Credits	Teaching (Contact hrs/week)		Evaluation Scheme (Marks)			Minimum Passing (Marks)		
					L	P	Internal	External	Total	Internal	External	Total
MM	MIT41MML501	Python Programming	Lecture	3	3	-	60	40	100	--	16	40
MM	MIT41MML502	Network System	Lecture	3	3	-	60	40	100	--	16	40
MM	MIT41MML503	Web Development and Java script	Lecture	3	3	-	60	40	100	-	16	40
RM	MIT41RML501	Research Methodology	Lecture	4	4	-	60	40	100	-	16	40
ME		Elective - I	Lecture	3	3	-	60	40	100	-	16	40
MM	MIT41MMP501	Practical Based on Python Programming	Practical	1	-	2	30	20	50	-	08	20
MM	MIT41MMP502	Practical Based on Network System	Practical	1	-	2	30	20	50	-	08	20
MM	MIT41MMP503	Practical Based on Web Development and Java script	Practical	1	-	2	30	20	50	-	08	20
ME		Practical Based on Elective - I	Practical	1	-	2	30	20	50	-	08	20
Total				20	16	08	420	280	700			

Note:

Nature of Course : L- Lecture, P-Practical, S-Seminar, J-Project, I-Internship, D-Dissertation,

Course Category: MM-Major Mandatory, ME-Major Elective, MI-Minor, OE-Generic / Open electives, VSC-

Vocational skill course, SEC-Skill Enhancement course, AEC-Ability Enhancement course, IKS-Indian Knowledge system, VEC-Value Education course, OJT-On Job Training / Internship / Apprenticeship, FP-Field project, CEP-Community engagement and service, CC-Co – curricular course, RM-Research methodology, RP-Research project

First Year- Semester II												
Course Category	Course Code	Course Title	Nature of Course	No. of Credits	Teaching (Contact hrs/week)		Evaluation Scheme (Marks)			Minimum Passing (Marks)		
					L	P	Internal	External	Total	Internal	External	Total
MM	MIT41MM L504	Android Application Development	Lecture	3	3	-	60	40	100	--	16	40
MM	MIT41MM L505	Network Security	Lecture	3	3	-	60	40	100	--	16	40
MM	MIT41MM L506	Java Application Development	Lecture	3	3	-	60	40	100	--	16	40
ME		Elective - II	Lecture	3	3	-	60	40	100	--	16	40
ME	MIT41MM P504	Practical Based on Android Application Development	Practical	1	-	2	30	20	50	--	08	40
MM	MIT41MM P505	Practical Based on Network Security	Practical	1	-	2	30	20	50	--	08	20
MM	MIT41MM P506	Practical Based on Java Application Development	Practical	1	-	2	30	20	50	--	08	20
ME		Practical Based on Elective - II	Practical	1	-	2	30	20	50	--	08	20
OJT	MIT41OJT J501	On Job Training / Internship	Practical	4		8	60	40	100	--	--	40
Total				20	12	16	420	280	700			

Note:

Nature of Course : L- Lecture, P-Practical, S-Seminar, J-Project, I-Internship, D-Dissertation,

Course Category: MM-Major Mandatory, ME-Major Elective, MI-Minor, OE-Generic / Open electives, VSC-Vocational skill course, SEC-Skill Enhancement course, AEC-Ability Enhancement course, IKS-Indian Knowledge system, VEC-Value Education course, OJT-On Job Training / Internship / Apprenticeship, FP-Field project, CEP-Community engagement and service, CC-Co – curricular course, RM-Research methodology, RP-Research project

Second Year- Semester III												
Course Category	Course Code	Course Title	Nature of Course	No. of Credits	Teaching (Contact hrs/week)		Evaluation Scheme (Marks)			Minimum Passing (Marks)		
					L	P	Internal	External	Total	Internal	External	Total
MM	MIT41MML601	Internet of Things (IOT)	Lecture	3	3	-	60	40	100	--	16	40
MM	MIT41MML602	Data Analytics & Visualization	Lecture	3	3	-	60	40	100	--	16	40
MM	MIT41MML603	Artificial Intelligence	Lecture	3	3	-	60	40	100	--	16	40
ME		Elective - III	Lecture	3	3	-	60	40	100	--	16	40
MM	MIT41MMP601	Practical Based on Internet of Things (IOT)	Practical	1	-	2	30	20	50	--	08	40
MM	MIT41MMP602	Practical Based on Data Analytics & Visualization	Practical	1	-	2	30	20	50	--	08	20
MM	MIT41MMP603	Practical Based on Artificial Intelligence	Practical	1	-	2	30	20	50	--	08	20
ME		Practical Based on Elective - III	Practical	1	-	2	30	20	50	--	08	20
RP	MIT41RPJ601	Research Project	Project	4		8	60	40	100	--	16	40
Total				20	12	16	420	280	700			

Note:

Nature of Course : L- Lecture, P-Practical, S-Seminar, J-Project, I-Internship, D-Dissertation,

Course Category: MM-Major Mandatory, ME-Major Elective, MI-Minor, OE-Generic / Open electives, VSC-Vocational skill course, SEC-Skill Enhancement course, AEC-Ability Enhancement course, IKS-Indian Knowledge system, VEC-Value Education course, OJT-On Job Training / Internship / Apprenticeship, FP-Field project, CEP-Community engagement and service, CC-Co – curricular course, RM-Research methodology, RP-Research project

Second Year- Semester IV												
Course Category	Course Code	Course Title	Nature of Course	No. of Credits	Teaching (Contact hrs/week)		Evaluation Scheme (Marks)			Minimum Passing (Marks)		
					L	P	Internal	External	Total	Internal	External	Total
MM	MIT41MML604	Cloud Services	Lecture	3	3	-	60	40	100	--	16	40
MM	MIT41MML605	Machine Learning	Lecture	3	3	-	60	40	100	--	16	40
MM	MIT41MML606	Quantum Computing	Lecture	2	2	-	30	20	50	--	08	20
ME		Elective - IV	Lecture	3	3	-	60	40	100	--	16	40
MM	MIT41MMP604	Practical Based on Cloud Services	Practical	1	-	2	30	20	50	--	08	40
MM	MIT41MMP605	Practical Based on Machine Learning	Practical	1	-	2	30	20	50	--	08	20
ME		Practical Based on Elective - IV	Practical	1	-	2	30	20	50	--	08	20
RP	MIT41RPJ602	Research Project	Project	6		12	120	80	200	--	32	80
Total				20	11	18	420	280	700			

Note:

Nature of Course : L- Lecture, P-Practical, S-Seminar, J-Project, I-Internship, D-Dissertation,

Course Category: MM-Major Mandatory, ME-Major Elective, MI-Minor, OE-Generic / Open electives, VSC-Vocational skill course, SEC-Skill Enhancement course, AEC-Ability Enhancement course, IKS-Indian Knowledge system, VEC-Value Education course, OJT-On Job Training / Internship / Apprenticeship, FP-Field project, CEP-Community engagement and service, CC-Co – curricular course, RM-Research methodology, RP-Research project

Elective - I

Code	Title
MIT41MEL501	Data Management Tools
MIT41MEL502	Java Script
MIT41MEL503	Sentiment Analysis
MIT41MEP501	Practical Based on Data Management Tools
MIT41MEP502	Practical Based on Java Script
MIT41MEP503	Practical Based on Sentiment Analysis

Elective – II

Code	Title
MIT41MEL504	Intellectual Property Rights
MIT41MEL505	Big Data Analytics
MIT41MEL506	Data Warehousing
MIT41MEP504	Practical Based on Intellectual Property Rights
MIT41MEP505	Practical Based on Big Data Analytics
MIT41MEP506	Practical Based on Data Warehousing

Elective – III

Code	Title
MIT41MEL601	Foundations of Data Science
MIT41MEL602	Block chain
MIT41MEL603	Business Intelligence
MIT41MEP601	Practical Based on Foundations of Data Science
MIT41MEP602	Practical Based on Block chain
MIT41MEP603	Practical Based on Business Intelligence

Elective – IV

Code	Title
MIT41MEL604	Google Analytics
MIT41MEL605	AWS DevOps
MIT41MEL606	Deep Neural Network
MIT41MEP604	Practical Based on Google Analytics
MIT41MEP605	Practical Based on AWS DevOps
MIT41MEP606	Practical Based on Deep Neural Network

Semester: FIRST

Syllabus Semester-I

Course code: MIT41MML501	Course name: Python Programming	Course category: Major Mandatory
Credits: 3	Teaching Scheme : L-3 P-0	Evolution Scheme: CA-60, ESE-40
Pre-requisites: Basics of Programming Language.		
Course Objectives: 1. Building robust applications using Python programming language's features. 2. To Understanding the usage of Python libraries.		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Understand python programs that solve simple business problems.		
CO2: Error handling in python, pandas, Jupyter, Notebook.		
CO3: Plot and data visualization.		
CO4: Missing Data Identification and understanding.		

Contents –

Unit	Content	Teaching hours
1	<p>Introduction to Python: Getting Started: Introduction to Python- an interpreted high level language, interactive mode and script mode. Variables, Expressions and Statements. Variables and Types-mutable and Immutable variable and Keywords. Operators and Operands in Python. (Arithmetic, relational and logical operators), Operator precedence, Expressions and Statements (Assignment statement) Taking input (using raw input() and input()) and displaying output - print statement, Comments in Python.</p>	10
2	<p>Conditional and Looping Construct if - else statement and nested if – else while, for, use of range function in for, Nested loops break, continue, pass statement Use of compound expression in conditional constructs.</p> <p>Functions: Built-In Function, invoking built in functions Module(Importing entire module or selected objects using from statement) Functions from math, random, time & date module.</p> <p>Composition User Define Function: Defining , invoking functions, passing parameters (default parameter values, keyword arguments) Scope of variables, void functions and functions returning values</p>	10
3	<p>String : Creating, initializing and accessing the elements, String operators: +, *, in, not in, range, slice [n:m] String built in functions & methods: len, capitalize, find, isalnum, isalpha, isdigit, lower, islower, isupper, upper, lstrip, rstrip, isspace, istitle, partition, replace, join, split, count, decode, encode, swapcase Strings constants defined in string module.</p> <p>Errors and Exceptions:</p>	10

	Syntax Errors, Exceptions, Handling Exceptions, Raising Exceptions, User-defined Exceptions, Defining Clean-up Actions(try - finally), Predefined Clean-up Actions	
4	<p>Concept of mutable list: creating, initializing and accessing the elements of list List operations (Concatenation, Repetation, Membership, list slices), List comprehensions List functions & methods: len, insert, append, extend, sort, remove, reverse, pop, Tuples, Immutable concept, creating, initializing and accessing the elements in a tuple, Tuple functions: cmp(), len(), max(), min(), tuple(),</p> <p>Sets , Concept of Sets: creating, initializing and accessing the elements of Sets operation(Membership, union, intersection, difference, and symmetric difference,</p> <p>Dictionaries: Concept of key-value pair, creating, initializing and accessing the elements in a dictionary, Traversing, appending, updating and deleting elements Dictionary functions & Methods: cmp, len, clear(), get(), has_key(), items(), keys(), update(), values()</p>	10
5	<p>Introduction to Object Oriented concepts in Python: Object Oriented concepts, Classes & Objects, Python Scopes and Namespaces Class Objects, Instance Objects, Method Objects, Class and Instances Variables, Concept of self Constructors, Inheritance</p>	5

<p>Text Books:</p> <ol style="list-style-type: none"> 1. Python Data Science Handbook Essential Tools for Working with Data Jake VanderPlas O'Reilly. 2. Introduction to Python Programming, Gowrishankar S, Veena A, CRC Press/Taylor.
<p>Reference Books:</p> <ol style="list-style-type: none"> 1. Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems AurelienGeron O'Reilly. 2. Core Python Applications Programming, Wesley J Chun, Pearson.
<p>Online Resources: 1. NPTEL / SWAYAM lectures.</p>

Course code	Course Title	Teaching Scheme		Evaluation Scheme			Credit	
		L	P	Internal	External			
					ESE	PR		
MIT41MMP501	Practical Based on Python Programming		2	30		20	50	1
L- Lecture, T-Tutorial, P-Practical, CA- Continuous Assessment, ESE- End Semester Examination, PR-Practical.								
Course Objective:	<ul style="list-style-type: none"> Building robust applications using Python programming language's features, Understanding the usage of Python libraries. 							

Course Outcome: After completion of the course the student will be able to:

Sr.No.	Course Outcome	Cognitive Level as per Bloom Taxonomy
1.	Understand python programs that solve simple business problems.	L1
2.	Error Handling in python, pandas, Jupyter, Notebook	L2
3.	Plot and data visualization	L3
4.	Missing Data Identification and understanding	L4
5.	Business Data predication tool design	L5

Detailed Syllabus:

Experiment No.	Experiment Topics	
1	Installing Python and Shell or Notebook?, Launching the IPython Shell, Launching the Jupyter Notebook	L1
2	Passing Values to and from the Shell, Shell-Related Magic Command, Errors and Debugging, Controlling Exceptions: %xmode	L1
3	Aggregations: Min, Max, and Everything in Between, Summing the Values in an Array, Minimum and Maximum, Example: What Is the Average Height of US Presidents?	L2
4	Sorting Arrays, Fast Sorting in NumPy: np.sort and np.argsort, Partial Sorts: Partitioning, Example: k-Nearest Neighbors	L2

5	Data Indexing and Selection, Data Selection in Series, Data Selection in DataFrame, Operating on Data in Pandas, Ufuncs: Index Preservation, Ufuncs: Index Alignment	L3
6	Handling Missing Data, Trade-Offs in Missing Data Conventions, Missing Data in Pandas, Operating on Null Values	L3
7	Vectorized String Operations , Introducing Pandas String Operations, Tables of Pandas String Methods, Example: Recipe Database	L4
8	General Matplotlib Tips, Importing matplotlib, Setting Styles, show() or No show()? How to Display Your Plots, Saving Figures to File	L4
9	Text and Annotation, Example: Effect of Holidays on US Births, Transforms and Text Position, Arrows and Annotation, Customizing Ticks, Major and Minor Ticks, Hiding Ticks or Labels, Reducing or Increasing the Number of Ticks	L5
10	Three-Dimensional Plotting in Matplotlib, Three-Dimensional Points and Lines, Three-Dimensional Contour Plots	L5

Books and References:

Sr. No.	Title	Author	Publishers	Edition
1	Python Data Science Handbook Essential Tools for Working with Data	Jake VanderPlas	O'Reilly	1
2	Introduction to Python Programming	Gowrishankar S, Veena A	CRC Press/Taylor	1
3	Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems	AurelienGeron	O'Reilly	1
4	Core Python Applications Programming	Wesley J Chun	Pearson	3
5	Flask Web Development: Developing Web Applications with Python	Miguel Grinberg	O'Reilly	2

Website Resources:

- 1.

Syllabus **Semester-I**

Course code: MIT41MML502	Course name: Network System	Course category: Major Mandatory
Credits: 3	Teaching Scheme : L-3 P-0	Evolution Scheme: CA-60, ESE-40
Pre-requisites: Basics of Computer Network.		
Course Objectives: 1. To build an understanding of the fundamental concepts of computer networking.		
1. To learn and understand Network Performance parameters.		
2. To Analyze Modern networks		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: To build an understanding of the fundamental concepts of computer networking.		
CO2: To learn and understand Network Performance parameters.		
CO3: To Analyze Modern networks.		

Contents –

Unit	Content	Teaching hours
1	<p>Introduction to Computer Networks</p> <ul style="list-style-type: none"> ○ Computer network, Characteristic & advantages of networking, types of network, LAN, MAN, WAN. <p>Transmission media & Network Topologies:</p> <ul style="list-style-type: none"> ○ Guided & Unguided media, Twisted pair, coaxial cable, Fiber optics, Radio. VHF and microwaves, Satellite link. <p>Network topology:</p> <ul style="list-style-type: none"> ○ Bus, star, ring, tree, mesh & hybrid topology. Advantages, disadvantages of each. <p>Introduction to Network Hardware Components:</p> <ul style="list-style-type: none"> ○ Network Connectivity Devices, Repeater, Hub, Bridges, Switch, Routers. 	10
2	<p>OSI Reference Model:</p> <ul style="list-style-type: none"> ○ The OSI reference Model, The Physical Layer, The Data Link Layer, The Network Layer, The Transport Layer, The Session Layer, Presentation Layer, Application Layer. <p>The TCP/IP Reference Model:</p> <ul style="list-style-type: none"> ○ Comparison of the OSI and TCP/IP Reference Model, Critique of the OSI Model and Protocol, A Critique of the TCP/IP Reference Model. 	10
3	<p>The Data Link Layer</p> <ul style="list-style-type: none"> ○ Data Link Layer Design Issues, Services Provided to the Network Layer, Framing, Error Control, Flow Control, Error Detection and Correction, Elementary Data Link Layer Protocols, 	10

	The Network Layer: <ul style="list-style-type: none"> ○ Network Layer Design Issues, Introduction to Routing Algorithms, The Network Layer in the Internet, The IP Protocol, IP Address, 	
4	The Transport Layer: <ul style="list-style-type: none"> ○ Transport Layer Service, Services Provided to the Upper Layer, Elementary of Transport Layer Protocol, Addressing, Connection Establishment, Connection Release. The Internet Transport Protocol: <ul style="list-style-type: none"> ○ Introduction to UDP, Remote Procedure Call, Introduction to TCP, TCP Service Model, TCP Segment Header, The Application Layer: <ul style="list-style-type: none"> ○ The Domain Name System, The DNS Name Space, Electronic Mail, The World Wide Web. 	10
5	Modern Networks <ul style="list-style-type: none"> ○ Next Generation Networks, Data Centers, Cloud Computing, Bluetooth Technology, Green Networking, GSM, GIS. 	5

Text Books:
<ol style="list-style-type: none"> 1. Computer Networks Tanenbaum A., PHI, 4th Edition. 2. Data Communications and Networking Fourauzan B. TataMcGraw-HillPublications 3rd edition.
Reference Books:
<ol style="list-style-type: none"> 1. An Engineering Approach to Computer Networking , Keshav S., PearsonEducation. 2. High Performance TCP/IP: Networking Concepts, Issues, and Solutions, Mahbub Hassan and Raj Jain, IST Edition, 2009.
Online Resources: 1. NPTEL / SWAYAM lectures.

Course code	Course Title	Teaching Scheme		Evaluation Scheme			Credit	
		L	P	Internal	External			
					ESE	PR		Total
MIT41MMP502	Practical Based on Network System		2	30		20	50	1
L- Lecture, T-Tutorial, P-Practical, CA- Continuous Assessment, ESE- End Semester Examination, PR-Practical.								
Course Objective:	<ul style="list-style-type: none"> To build an understanding of the fundamental concepts of computer networking. To learn and understand Network Performance parameters. To Analyze Modern networks. 							

Course Outcome: After completion of the course the student will be able to:

Sr.No.	Course Outcome	Cognitive Level as per Bloom Taxonomy
1.	To build an understanding of the fundamental concepts of computer networking.	L1,L2,
2.	To learn and understand Network Performance parameters.	L3,L4
3.	To Analyze Modern networks.	L4,L5

Detailed Syllabus:

Experiment No.	Experiment Topics	
1.	Study of different types of Network cables and Practically implement the cross-wired cable and straight through cable using clamping tool.	L1
2.	Install and Configure Wired and Wireless NIC and transfer files between systems in LAN and Wireless LAN	L1
3.	Install and configure Network Devices: HUB, Switch and Routers.	L2
4.	Connect the computers in Local Area Network.	L2
5.	Configure Host IP, Subnet Mask and Default Gateway in a System in LAN (TCP/IP Configuration).	L2
6.	Establish Peer to Peer network connection using two systems using Switch / Router in a LAN.	L2
7.	Configure Internet connection and use IPCONFIG, PING / Tracer and Net stat utilities to debug the network issues.	L3
8.	Transfer files between systems in LAN using FTP Configuration, install Print server in a LAN and share the printer in a network.	L3

9.	Study of basic network command and Network configuration commands	L4
10.	Configure a Network topology using packet tracer software	L5
11.	Configure a Network topology using packet tracer software.	L5

Books and References:

Sr. No.	Title	Author	Publishers	Edition
1	Computer Networks	Tanenbaum A.	PHI	4th Edition
2	Data Communications and Networking	Fourauzan B.	TataMcGraw-HillPublications	3rd edition
3	An Engineering Approach to Computer Networking	Keshav S.	PearsonEducation	
4	High Performance TCP/IP: Networking Concepts, Issues, and Solutions,	Mahbub Hassan and Raj Jain	IST Edition, 2009	
5	TCP/IP Illustrated	W. Richard Stevens, Addison-Wesley		Volume I, Volume II and Volume III

Syllabus Semester-I

Course code: MIT41MML503	Course name: Web Development and JavaScript	
Course category: Major Mandatory		
Credit: 3	Teaching Scheme : L-3 P-0	Evolution Scheme: CA-60, ESE-40
Pre-requisites: Basics of HTML.		
Course Objectives: 1. To provide the general mechanism and design of Automatic system 2.Create highly responsive interfaces that improve the user experience and provide dynamic functionality		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Know variable naming rules and JavaScript data types.		
CO2: Identify expressions and operators		
CO3: Handling Web Page		

Contents –

Unit	Content	Teaching hours
1	Introduction Introduction to HTML, First HTML Page , Paragraph Elements, Heading Elements, List Elements, Tags, Images, Entity codes, introduction to semantic makeup, Tables, Buttons, Checkboxes, Radio buttons, Common input Types, Text Area, Range	10
2	Working with CSS What is CSS? , Background color, Color Properties, Color System:RGB, Named Colors, Hexadecimal, Common text Properties. Font size, basics with pixels, Selectors, Pseudo classes and Elements, The CSS Cascade Box Model : Width and Height, Border and Padding, Margin, The display Property Responsive CSS and Flexbox, CSS Frame Work: Intro. To Boot Strap, Buttons, Typography and Utilities, Button Groups, Grid Utilities, Bootstrap and Forms	10
3	JavaScript Basics and Strings Why JavaScript Awesome? Primitives and the console, JavaScript Numbers, Increment Operator, Constant and Variables, Booleans Strings : Introduction , Indices and Length, String Methods with argument, String Template, Literals and Null	10
4	JavaScript decision making Decision Making with code, Comparison Operators, Equality, Triple Vs Double Equals, Console Alert and Prompt, IF Statement, Else-if, Else, Nesting Conditionals, Truth-y and False-y Values, Logical AND, Logical OR, Logical NOT, Switch Statement, Nested Loop, The Break Keyword	10
5	JavaScript Arrays Introduction, Array Random Access, Push & POP, Shift and Unshift, Concat, indexOf, Slice and Splice, Reference Types, Equality Testing, Multidimensional Arrays	5

Text Books: 1. Learning Web Design: A Beginner's Guide to HTML CSS, Jennifer Niederst Robbins.
Reference Books: 1. JavaScript: The Good Part, Douglas Crockford.
Online Resources: 1. NPTEL / SWAYAM lectures.

Course Code	Course Title	Teaching Scheme		Evaluation Scheme			Credit	
		L	P	Internal	External			
					ESE	PR		Total
MCS41MMP503	Practical Based on Web Development and JavaScript	--	1	30	-	20	50	1
L-Lecture, P-Practical, ESE-End Semester Examination, PR-Practical.								
Course Objective	Able to create website or web based application							

List of Practical's:-

At least two experiments should be carried out on each unit.

Syllabus**Semester-I**

Course code: MIT41RML501	Course name: Research Methodology	Course category: Research methodology
Credit: 4	Teaching Scheme : L-4 P-0	Evolution Scheme: CA-60, ESE-40
Pre-requisites: Pre-university mathematics.		
Course Objectives: 1. To understand the state-of-the-art in research methodology. 2. Survey the currently available systems.		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Demonstrate knowledge of research methodology		
CO2: Understand the Research Problem		
CO3: Understand the Research Design		
CO4: Understand Sampling Design, Measurement and Scaling Techniques		
CO5: Understand Methods of Data Collection, Processing and Analysis of Data		

Contents –

Unit	Content	Teaching hours
1	UNIT I: Introduction: Meaning of Research, Objectives of Research, Motivation in Research, Types of Research, Research Approaches, Significance of Research, Research Methods Verses Methodology, Research and Scientific Method, Importance of Knowing How Research is Done, Research Process, Criteria of Good Research, Problems Encountered by Research in India.	10
2	Unit II: Defining the Research Problem: What is Research Problem? Selecting the Problem, Necessity of Defining the Problem, Techniques Involved in Defining a Problem	10
3	Unit III: Research Design: Meaning of Research Design, Need of Research Design, Features of Good Design, Important Concepts Relating to Research Design, Different Research Design, Basic Principles of Experimental Designs.	10
4	Unit IV: Sampling Design, Measurement and Scaling Techniques: Implications of a Sample Design, Steps in Sampling Design, Criteria of Selecting a Sampling Procedure, Characteristics of a Good Sample Design. Measurement in Research, Sources of Error in Measurement, Meaning and Scaling.	10
5	Unit V: Methods of Data Collection, Processing and Analysis of Data: Collection of Primary Data, Observation Method, Interview Method, Collection of Data through Questionnaires, Collection of Data through Questionnaires Schedules, Processing Operations, Some	5

Problems in Processing, Statistics in Research, Simple Regression Analysis.

Text Books: .
1. Research Methodology Methods and Techniques, C. R. Kothari, New Age International Publishers
Reference Books:
1. Research Methodology, P. Sam Daniel, Aroma G. Sam
Online Resources:
• NPTEL / SWAYAM lectures.

Syllabus **Semester-I**

Course code: MIT41MEL50	Course name: Data Management Tools	Course category: Major Elective
Credit: 3	Teaching Scheme : L-3 P-0	Evolution Scheme: CA-60, ESE-40
Pre-requisites: Basics of Database.		
Course Objectives:. Students can design new database and modify existing ones for new or existing applications		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: To know the different issues involved in the design and implementation of a database system.		
CO2: Can use data manipulation language to query, update, and manage a database.		
CO3: Essential DBMS concepts such as: database security, integrity, concurrency, etc.		
CO4: To analyze data, choose relevant models and algorithms for respective applications.		

Contents –

Unit	Content	Teaching hours
1	<p>Unit-I: Overview of Database Concepts:</p> <ul style="list-style-type: none"> ○ Database and Need for DBMS, Characteristics of DBMS, Database Users, 3-tier architecture,(its advantages over 2-tier), Database Components: Users, facilities & Structure, Abstraction & Data Integration, <p>Entity-Relationship Data model:</p> <ul style="list-style-type: none"> ○ Entity, Entity set, Types of Entities, Attributes, Types of Attributes, Relationship, Types of Relationship, Representation of Entity, Attributes & Relationship, Keys, Types of keys Mapping Cardinality. <p>Introduction to SQL–</p> <ul style="list-style-type: none"> ○ create, insert, update, delete, drop, alter, SELECT (distinct, where, and, or, not, like, between, like, order by, group by, having etc.), inner (nested) queries, aggregate functions, numeric functions, string functions, date functions, create user/role, grant/revoke privileges, views. 	10
2	<p>Unit-II: Relational Database design:</p> <ul style="list-style-type: none"> ○ Anomalies, Types of Anomalies, Functional dependencies, Integrity Rules: Rule 1 & 2 <p>Normalization:</p> <ul style="list-style-type: none"> ○ Normal forms (1 NF, 2 NF, 3 NF, BCNF, 4 NF), Conversion From Universal to 1NF, 1NF to 2NF, 2NF to 3NF. <p>Relational Algebra:</p> <ul style="list-style-type: none"> ○ Union, Intersection, difference, Cartesian Product, Selection, Projection, Join(Inner & Outer) , Division with examples 	10
3	<p>Unit-III: Introduction: -</p>	10

	<ul style="list-style-type: none"> ○ What is data mining, DBMS Vs Data Mining, DM Techniques, Challenges, Other issues, Understanding Data, DM Applications-Case Studies, Current Trends Affecting DM, Basic Data Mining Task. Relations to Database, Statistics, Machine Learning <p>Association Rule :-</p> <ul style="list-style-type: none"> ○ What is an Association rule?, Mining, Level-wise Method, FP-Tree Method, Other Variants, A Priori Algorithm, Partition Algorithm. 	
4	<p>Unit-IV:</p> <p>Classification: -</p> <ul style="list-style-type: none"> ○ Decision Tree Algorithm, CART, PUBLIC, Pruning Classification Tree, and Decision Tree, What is a decision tree? Tree Construction Principle, Best Split, Splitting indices, Splitting Criteria <p>Web Mining:</p> <ul style="list-style-type: none"> ○ Introduction, Web Content Mining, Web Structure Mining, and Web Usage Mining. 	10
5	<p>Unit-V:</p> <p>Clustering Techniques:</p> <ul style="list-style-type: none"> ○ Clustering Paradigm, Partitioning Algorithm, Similarity and Distance Measure, Hierarchical Algorithm, Rough Set Theory and its Application to Data Mining <p>ROC Analysis:-</p> <ul style="list-style-type: none"> ○ Data Mining Trends, Big Data, Data Analytics 	5

Text Books: 1. Database System Concepts, Silberschatz, Korth and Sudarshan-.
1. Fundamental of Database Systems R. Elmasri; S. Navate; Benjamin Cummings;.
Reference Books: 1. Database Management Systems, Bipin Desai.
Online Resources: 1. NPTEL / SWAYAM lectures.

Course Code	Course Title	Teaching Scheme		Evaluation Scheme			Credit	
		L	P	Internal	External			
					ESE	PR		Total
MIT41MEP501	Practical Based on Data Management Tools		2	30		20	50	1
L-Lecture, P-Practical, ESE-End Semester Examination, PR-Practical.								
Course Objective	Able to prepare database tables							

List of Practical's:-

Experiment No.	Experiment Topics
1.	Creating database tables and using data types. • Create table, • Modify table, • Drop table
2.	Practical Based on Data Manipulation. • Adding data with Insert, • Modify data with Update, • Deleting records with Delete
3.	Practical Based on Implementing the Constraints. • NULL and NOT NULL, • Primary Key and Foreign Key Constraint • Unique, Check and Default Constraint
4.	Practical for Retrieving Data Using following clauses. • Simple select clause, • Accessing specific data with Where, Ordered by, Distinct and Group By with having clause
5.	Practical Based on Aggregate Functions. • AVG, • COUNT, • MAX, • MIN, • SUM, • CUBE
6.	Study various data mining tools
7.	Search and Download data set from UCI for data mining techniques and algorithms.
8.	Dealing with Missing data (Data cleaning method) in MS Excel
9.	Execute and analyze A-priori algorithm using data mining tool
10.	Execute and analyze information gain for decision tree using Data Mining tool
11.	Execute and analyze K-Means clustering algorithm using Orange or any tool.

Semester: Second

Syllabus**Semester-II**

Course code: MIT41MML504 Course name: Android Application Development Course category: Major Mandatory
Credits: 3 Teaching Scheme : L-3 P-0 Evolution Scheme: CA-60, ESE-40
Pre-requisites: Basics of Programming Language.
Course Objectives: 1. Describe Android platform, Architecture and features. 2.Design User Interface and develop activity for Android App
Course Outcomes: At the end of the course, the students will be able to -
CO1: To introduce Android platform and its architecture.
CO2: To learn activity creation and Android UI designing.
CO3: To be familiarized with Intent, Broadcast receivers and Internet services.

Contents –

Unit	Content	Teaching hours
1	<p>Environment Setup:</p> <ul style="list-style-type: none"> Setup Java Development Kit (JDK), Android SDK, Eclipse IDE, Android Development Tools (ADT) Plugin, Create Android Virtual Device.Architecture: Linux kernel, Libraries, Android Runtime, Application Framework. <p>Application Components:</p> <ul style="list-style-type: none"> Application Components Activities, Services, Broadcast Receivers, Content Providers, Additional Components, Create Android Application, Anatomy of Android Application, The Main Activity File, The Manifest File, The Strings File, The R File, The Layout File, Running the Application. 	10
2	<p>Resources Organizing & Accessing:</p> <ul style="list-style-type: none"> Alternative Resources, Accessing Resources <p>UI Layouts:</p> <ul style="list-style-type: none"> Android Layout Types, Relative Layout Attributes, Grid View Attributes, Sub-Activity, Layout Attributes, View Identification, UI Controls, Android UI Controls, Text View Attributes, Auto Complete Text View Attributes, Button Attributes, Image Button Attributes, Check Box Attributes, Toggle Button Attributes, Radio Button Attributes, Radio Group Attributes. 	10
3	<p>Intents and Filters:</p> <ul style="list-style-type: none"> Intent Objects, Action, Android Intent Standard Actions, Data, Category, Extras, Flags, Component Name, Types of Intents: Explicit Intents, Implicit Intents. <p>Event Handling:</p> <ul style="list-style-type: none"> Event Listeners & Event Handlers, Event Listeners Registration, Styles and Themes, Defining Styles, Using Styles, Style 	10

	Inheritance, Android Themes, Default Styles & Themes, Custom Components, Creating a Simple Custom Component.	
4	Applications and Activities: <ul style="list-style-type: none"> ○ Application Manifest, Manifest Editor, Android Application Life Cycle, Understanding Application Priority and Process States, Externalizing Resources, Fundamental Android UI Design: The Android Widget Toolbox, Layouts, Compound Controls, Custom Widgets and Controls, Android Menu System, Activity Menu, Intents, Broadcast Receivers, Adapters, and the Internet. 	10
5	Data Storage, Retrieval, and Sharing: <ul style="list-style-type: none"> ○ Creating and Saving Preferences, Retrieving Shared Preferences, Saving the Activity State, File Management Tools, Databases in Android: SQLite, Cursors and Content Values, Content Providers. Maps, Geocoding, and Location-Based Services: Location Providers, Geocoder, Map- Based Activities. 	5

Text Books:
1. Professional Andriod 4 Application Development : Retomeier, Wrox publication
Reference Books:
1. Andriod Apps for Absolute beginners, Wallace Jadson, Apress.
2. The Complete Andriod Guide, Kevin Purdy.
Online Resources: 1. NPTEL / SWAYAM lectures.

Course code	Course Title	Teaching Scheme		Evaluation Scheme				Credit
		L	P	Internal	External		Total	
					ESE	PR		
MIT41MMP504	Practical Based on Android Application Development		1	30		20	50	1

L- Lecture, T-Tutorial, P-Practical, CA- Continuous Assessment, ESE- End Semester Examination, PR- Practical.

Course Objective:	<ul style="list-style-type: none"> • Describe Android platform, Architecture and features. • Design User Interface and develop activity for Android App.
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Course Outcome: After completion of the course the student will be able to:

Sr.No.	Course Outcome	Cognitive Level as per Bloom Taxonomy
1.	To introduce Android platform and its architecture.	L1, L2
2.	To learn activity creation and Android UI designing.	L3,L4
3.	To be familiarized with Intent, Broadcast receivers and Internet services.	L4.L5

Detailed Syllabus:

Experiment No.	Experiment Topics	
01	Practical Based on Basic Java Program	L1
02	Practical Based on XML Program to understand structure	L1
03	Practical Based on UI Components	L2
04	Practical Based on UI Components	L2
05	Practical Based on Layout Structure	L3
06	Practical Based on Event Handling	L3

07	Practical Based on Intent : implicit & explicit	L4
08	Practical Based on GPS	L4
09	Practical Based on Camera & Hardware interface.	L5
10	Project: One Complete Application Development.	L5

Books and References:

Sr. No.	Title	Author	Publishers	Edition
1	Professional Andriod 4 Application Development :	Retomeier,	Wrox publication.	
2	Andriod Apps for Absolute beginners :	Wallace Jadson,	Apress.	
3	The Complete Andriod Guide	: Kevin Purdy		

Website Resources:

- 1.

Syllabus**Semester-II**

Course code: MIT41MML505	Course name: Network Security	Course category: Major Mandatory
Credits: 3	Teaching Scheme : L-3 P-0	Evolution Scheme: CA-60, ESE-40
Pre-requisites: Basics of Computer Network.		
Course Objectives: 1. To understand Cryptography Theories, Algorithms and Systems. 2. To introduce advanced networking and network security 3.To understand the concepts of Cyber Security, Ethical Hacking		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: To understand Cryptography Theories, Algorithms and Systems.		
CO2: To understand necessary Approaches and Techniques to build protection mechanisms in order to secure computer networks.		
CO3: To introduce advanced networking and network security concepts.		

Contents –

Unit	Content	Teaching hours
1	UNIT I Foundations of Network Security <ul style="list-style-type: none"> ○ CIA, Risks, Breaches, Threats, Attacks, Exploits. Introduction to the Concepts of Security: The need for security, Security Approaches, Principles of Security. Network Security Terminologies, Network Security and Data Availability, Threats and Risks. Attacks – <ul style="list-style-type: none"> ○ Passive and Active, Security Services, Confidentiality, Authentication, Non- Repudiation, Integrity, Access Control, Availability, Model for Internetwork Security. 	10
2	UNIT II Classical Encryption Technique: <ul style="list-style-type: none"> ○ Introduction to Cryptographic Techniques: Plain Text and Cipher Text. Substitution Techniques, Caesar cipher, monoalphabetic cipher, Playfair cipher, Transposition Techniques, Encryption and Decryption, Steganography, Key Range and Key Size, Possible Types of Attacks. Cryptography and Cryptanalysis <ul style="list-style-type: none"> ○ Introduction to Cryptography, Symmetric key Cryptography, Asymmetric key Cryptography, Message Authentication, Digital Signatures, Applications of Cryptography. 	10
3	UNIT III Ethical Hacking: <ul style="list-style-type: none"> ○ Introduction, What is hacking, Hackers, types of hackers, why hackers hack? Prevention from hacker, steps performed by hackers, working of ethical hacker 	10

	<ul style="list-style-type: none"> ○ Email Hacking:- How email works? Email service protocol's, Email Security, email spoofing, Methods to send fake Emails, email spamming, phishing, prevention from phishing, email tracing 	
4	UNIT IV Trojans & Malware <ul style="list-style-type: none"> ○ Explanation of Malware, Types of Malware: Rootkits, Robots, Adware's, Spywares, Ransom wares, Zombies, keystroke loggers. ○ Trojans:- Introduction, types of Trojans, components of Trojan, mode of Transmission for Trojans, detection and Removal, Counter measures. ○ Virus & Worms, Proxy & Packet Filtering, Denial of Service, Sniffer, Social Engineering, ○ Overview of Firewalls- Types of Firewalls, User Management, 	10
5	UNIT V Penetration Testing <ul style="list-style-type: none"> ○ What is Penetration Testing, Types of Penetration Testing, Black Box, Grey Box, White Box, External Penetration Testing. ● Introduction, Setting the Stage, Introduction to Kali and Backtrack Linux: Tools. Lots of Tools, Working with Your Attack Machine: Starting the Engine, The Use and Creation of a Hacking Lab, Phases of a Penetration Test 	5

Text Books: 1 Network Security Essentials, William Stallings, Prentice-Hall..
Reference Books: 1. Fundamentals of Computer Security Technology, Edward Amoroso, Prentice-Hall. 2. Cryptography: Theory and Practice, Douglas R. Stinson, CRC Press.
Online Resources: 1. NPTEL / SWAYAM lectures.

Course code	Course Title	Teaching Scheme		Evaluation Scheme				Credit
		L	P	Internal	External		Total	
					ESE	PR		
MIT41MMP505	Practical Based on Network Security		2	30		20	50	1

L- Lecture, T-Tutorial, P-Practical, CA- Continuous Assessment, ESE- End Semester Examination, PR- Practical.

Course Objective:	<ul style="list-style-type: none"> • To understand Cryptography Theories, Algorithms and Systems. • To introduce advanced networking and network security concepts. • To understand the concepts of Cyber Security, Ethical Hacking
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Course Outcome: After completion of the course the student will be able to:

Sr.No.	Course Outcome	Cognitive Level as per Bloom Taxonomy
1.	To understand Cryptography Theories, Algorithms and Systems.	L1,L2
2.	To understand necessary Approaches and Techniques to build protection mechanisms in order to secure computer networks.	L3,L4
3.	To introduce advanced networking and network security concepts.	L5

Detailed Syllabus:

Experiment No.	Experiment Topics	
01	Introduction to Virtual Box and Installation of Windows Operating System.	L1
02	Demonstrate Windows based Networking Commands.	L1
03	Introduction to Virtual Box and Installation of Linux Operating System.	L1
04	Demonstrate Linux based Networking Commands.	L1
05	Implement the Caesar Cipher Technique.	L2
06	Introduction to Kali Linux.	L2
07	Implement the transposition Technique.	L3

08	Demonstrate the use of Software Firewall	L3
09	Demonstrate Steganography with example.	L4
10	Demonstration of Firewall.	L5

Books and References:

Sr. No.	Title	Author	Publishers	Edition
1	Network Security Essentials	William Stallings	Prentice-Hall.	
2	Fundamentals of Computer Security Technology	Edward Amoroso	Prentice-Hall.	
3	Cryptography: Theory and Practice	Douglas R. Stinson	CRC Press	

Website Resources:

- 1.

Syllabus**Semester-II**

Course code: MIT41MML506 Course name: Java Application Development		
Course category: Major Mandatory		
Credits: 3	Teaching Scheme : L-3 P-0	Evolution Scheme: CA-60, ESE-40
Pre-requisites: Basics of Programing Language.		
Course Objectives: 1. Develop error-free Java programs		
2.Learn how to write, test, and debug advanced-level of OOP using Java		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Students will design and implement programs in the Java programming language that make strong use of classes and objects.		
CO2: Develop component-based Java Program		
CO3: Update and retrieve the data from the databases		

Contents –

Unit	Content	Teaching hours
1	<p>Unit I:</p> <p>Introduction to Java:</p> <ul style="list-style-type: none"> ○ Overview of Java Environment, History of java, Features of java, ○ Java Class and Object, writing a Java Program, Obtaining the Java Environment, Setting up Java Environment, ○ Creating a Class that Can Run as a Program, Using the Java Documentation <p>Java Basics:</p> <ul style="list-style-type: none"> ○ Basic Java Syntax, Identifier, Rules for Declaring Identifier, Identifier Coding guidelines, ○ Java Keywords, Java Literals, Data Types, Variables, Operators, Creating and Using Methods <p>Java Objects:</p> <ul style="list-style-type: none"> ○ Objects, Object-Oriented Languages, Object-Oriented Programs, ○ Encapsulation, Creating and Using an Instance of an Object, References, ○ Defining a Class, Constructors, Method Overloading, ○ The this Keyword, static Elements, Garbage Collection, Java Packages, Dealing with Keyboard Input 	10
2	<p>Unit II:</p> <p>Flow Control Structures:</p> <ul style="list-style-type: none"> ○ Controlling Program Flow, Boolean-Valued Expressions, Complex Boolean Expressions, ○ Simple Branching, Two Mutually Exclusive Branches, Nested if... else Statements, ○ The switch Statement, Comparing Objects, ○ Conditional Expression, while and do. .while Loops, for Loops, 	10

	<ul style="list-style-type: none"> ○ Additional Loop Control: break and continue, ○ Classpath, Code Libraries, and Jar files 	
	<p>Arrays and Vectors:</p> <ul style="list-style-type: none"> ● Arrays, Array Variables, Copying Arrays, Arrays of Objects, Enhanced for Loops, Multi-Dimensional Arrays, Multidimensional Arrays in Memory, Typecasting with Arrays of Primitives, Vectors 	
3	<p>Unit III: Inheritance:</p> <ul style="list-style-type: none"> ● Inheritance, Polymorphism, creating a Derived Class, Typecasting with Object References, Other Inheritance-Related, Keywords, and Methods Inherited from Object. <p>Packages and Interfaces:</p> <ul style="list-style-type: none"> ○ Packages, Interfaces, Implementing Interfaces, Interfaces and Inheritance, Interfaces and Event ○ Handling, Interfaces and Pluggable Components. <p>Exception handling and Multithreading:</p> <ul style="list-style-type: none"> ○ Exceptions, syntax of exception handling code, multiple catch statements, throw: throwing own exceptions, throws and finally, ○ Introduction to multithreading, creating threads by extending the Thread class and by implementing Runnable interface, implementing the run() method, Life cycle of a thread, Thread methods and thread priority. 	10
4	<p>Unit-IV</p> <p>Event Handling:</p> <ul style="list-style-type: none"> ○ Two Event Handling Mechanisms, The Delegation Event Model, Event Classes, Sources of Events, Event Listener Interfaces, Using the Delegation Event Model, Adapter Classes, Inner Classes. <p>Working with Windows Graphics:</p> <ul style="list-style-type: none"> ○ AWT Classes, Window Fundamentals, Working with Frame, Windows, Creating a Frame Window in an Applet, Creating a WindowedProgram, Displaying Information within a Window, Working with Graphics, color, Fonts, Setting the Paint Mode, Managing Text Output Using FontMetrics. <p>AWT Controls, Layout, Menus:</p> <ul style="list-style-type: none"> ○ Control Fundamentals, Labels, Using Buttons, Applying Check Boxes, CheckboxGroup, Choice Controls, Using Lists, Managing Scroll Bars, Using a TextField, Using a TextArea, Layout Managers, Menu Bars and Menus, Dialog Boxes, FileDialog, Handling Events by Extending AWT Components. 	10
5	<p>Java Database Connectivity (JDBC):</p> <ul style="list-style-type: none"> ○ Design of JDBC, JDBC configuration, Executing SQL Statement, QueryExecution, Scrollable and updatable resultsets, row sets, metadata, Transaction Processing. 	5

Text Books: 1. Java 2 Complete Reference by Herbert Schildt, Sixth Edition.
1.
Reference Books: 1. Core Java Vol 1:, Sun Press.
2. Java: The Complete Reference, Herbert Schildt, McGraw-Hill.
Online Resources: 1. NPTEL / SWAYAM lectures.

Course code	Course Title	Teaching Scheme		Evaluation Scheme				Credit
		L	P	Internal	External		Total	
					ESE	PR		
MIT41MMP506	Practical Based on Java Application Development		2	30		20	50	1

L- Lecture, T-Tutorial, P-Practical, CA- Continuous Assessment, ESE- End Semester Examination, PR- Practical.

Course Objective:

- Develop error-free Java programs
- Learn how to write, test, and debug advanced-level of OOP using Java

Course Outcome: After completion of the course the student will be able to:

Sr.No.	Course Outcome	Cognitive Level as per Bloom Taxonomy
1.	Students will design and implement programs in the Java programming language that make strong use of classes and objects.	L1,L2,L3,L4
2.	Develop component-based Java Program	L2,L3,L4,L5
3.	Update and retrieve the data from the databases	L5

Detailed Syllabus:

Experiment No.	Experiment Topics	
01	Write Java Program for Creating a Thread	L1
02	Write Java Program to Creating Multiple Threads using <code>isAlive()</code> and <code>join()</code>	L1
03	Write Java Program for <code>values()</code> and <code>valueOf()</code>	L2
04	Write Java Program for AnnotatedElement Interface	L2
05	Write Java Program for Generic Class with Two Type Parameters	L3
06	Write Java Program for Creating a Generic Method	L4
07	Write Java Program for String Conversion and <code>toString()</code>	L4
08	Write Java Program to Data Conversion Using <code>valueOf()</code>	L4
09	Write Java Program to Create Table	L5
10	Write Java Program to Delete Table	L5
11	Design and develop webpages using html, java and database connectivity.	L6

Books and References:

Sr. No.	Title	Author	Publishers	Edition
1.	Java 2 Complete Reference by	Herbert Schieldt		Sixth Edition
2.	Core Java Vol 1:		Sun Press	
3.	Java: The Complete Reference	Herbert Schildt	McGraw-Hill	10
4.	Advance Java	Gajendra Gupta	Laxmi Publication	
5.	Java 2 Complete Reference by	Herbert Schieldt		Sixth Edition

Syllabus**Semester-II**

Course code: MIT41MEL504 Course name: Intellectual Property Right
Course category: Major Mandatory
Credits: 3 Teaching Scheme : L-3 P-0 Evolution Scheme: CA-60, ESE-40
Pre-requisites: Basic knowledge of documentation and law.
Course Objectives: 1. To make patent copyright, trademark application process known
Course Outcomes: At the end of the course, the students will be able to -
CO1: Understand Indian Patent Law
CO2: To understand Patent Data basis and Patent Information System
CO3: To Understand Preparation of Patent Documents

Contents –

Unit	Content	Teaching hours
1	<p>Unit I</p> <p>Indian Patent Law: Concept of Patent, Product / Process Patents & Terminology, The Patents Act, Amendments to the Patents Act, Patent Rules, Patentable Subject Matter and Patentability Criteria, Duration of Patents - Law and Policy Consideration, Elements of Patentability - Novelty and Non Obviousness, Procedure for Filing of Patent Application and Types of Applications, Procedure for Opposition, Revocation of Patents, Ownership and Maintenance of Patents, Assignment and Licensing of Patents, Assignments of Patents, Working of Patents- Compulsory Licensing, Revocation of Patents by the Controller for Non-Working, Procedure in Respect of Compulsory License, International Applications, Patent Agent- Qualification and Registration Procedure.</p>	10
2	<p>Unit II</p> <p>Patent Data basis and Patent Information System: Patent Offices in India, Patent Information, What is Patent Information, Reasons for Using Patent Information, Patent Search & Patent Databases, Databases on CD-Rom, On-line Databases, Various Types of Searches using Patent Documentation, Pre-Application Searches (PAS), State-of-the-Art Searches, Novelty Searches, Patentability or Validity Searches, Name Searches , Technological Activity Searches, Infringement Searches, Patent Family Searches, Legal Status Searches.</p>	10
3	<p>Unit III</p> <p>Preparation of Patent Documents: Lab Notebooks/Log Books/Record Books, Methods of Invention Disclosure, Provisional Specification, Complete Specification, Patent Application and its Contents, Contents of Patent Application, Writing of Patent Document, Preparing Patent Applications, Obtaining Invention Disclosures from Inventors, Identifying Patentable Inventions, Understanding the Invention, Typical Parts of the Patent Application,</p>	10

	Claims, Detailed Description or Specification, Detailed Description or Specification, Detailed Description or Specification, Abstract, Summary.	
4	Unit IV Process of Examination of Patent Application: Publication of Patent Application, Request for Examination, Request for Examination, Allocation of Application to examiner for examination, Examination of Patent Application: Regulatory Regime, Formal examination, Substantive Examination, Understanding the invention, Sufficiency of Disclosure: Technical or Specialized Terms, Scope of Claims, Scope of Claims, Scope of Claims, Single Inventive Concept, Patentability Criterion novelty, inventive step, industrial applicability, Prior Public Use, Prior Claiming, Industrial Applicability, Re-Issue and Re-Examination.	10
5	Unit V Patent Infringement: What Amounts to Patent Infringement, Types of Patent Infringement, Damages and Accounts for Profits. Trade Mark: Registration of Trade Marks, Registration Procedure. Copyright: Nature of Copyright Protection, Copyright Pertaining to Software, Term of Copyright, Registration of Copyright. Industrial Designs: What is a Design? Application and Registration of Design, Priority Document, Representation Sheet. Geographical Indications, Lay-Out Designs of Integrated Circuits, The Protection of Plant Varieties and Farmers Rights.	5

Text Books: 1. Intellectual property property property rights- rights-laws and practice, The institute of company secretaries of india, Module 3 elective paper 9.3.

2. A textbook of intellectual property rights. Chintakunta, Ramakrishna & Meka, Geethavani, 2022.

Reference Books: 1. Intellectual property rights, Niraj Panday, K D, PHI learning Pvt ltd, 2014.

2.

Online Resources: 1. NPTEL / SWAYAM lectures.

Course Code	Course Title	Teaching Scheme		Evaluation Scheme			Credit	
		L	P	Internal	External			
					ESE	PR		Total
MCS41MEP505	Practical Based on Intellectual Property Rights	--	1	30	--	20	50	1

L-Lecture, P-Practical, ESE-End Semester Examination, PR-Practical.

List of Practicals:

At least two experiments should be carried out on each unit.

Semester: Third

Syllabus

Semester-III

Course code: MIT41MML601	Course name: Internet of Things	Course category: Major Mandatory
Credits: 3	Teaching Scheme: L-3 P-0	Evolution Scheme: CA-60, ESE-40
Pre-requisites: Basic understanding of Microcontroller and Microprocessors.		
Course Objectives: To understand the state of art of Internet of Things		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Describe the fundamentals of Internet of Things.		
CO2: Understand the state of art design principles and internet principles of IoT.		
CO3: Extend the understanding of sensors, sensor technology, actuators and RFID in IoT.		
CO4: Develop a better understanding of data acquisition, storage, cloud computing platforms, privacy, and security and vulnerability solutions in IoT.		
CO5: Extend the understanding of real time application of IoT		

Contents –

Unit	Content	Teaching hours
1	Overview of Internet of Things- IoT definition and vision, Characteristics of IoT, IoT conceptual framework, IoT architectural view, Technology behind IoT, Sources of IoT, M2M communication, Wearable smart watch, an example of IoT, Smart home, an example of IoT, Smart cities, an application of IoT.	10
2	Design Principles and Internet Connectivity Principles- Fundamentals of design principles, Communication technologies IoT/M2M systems, layers and designs standardization, Data Enrichment, Data Consolidation and Device Management at Gateway, Ease of designing and affordability, Web communication protocol for connected devices, Message communication protocol for connected devices, Web Connectivity for Connected-Devices, Network using Gateway, SOAP, REST, HTTP, RESTful and WebSockets Internet –based communication, IP addressing in IoT	10
3	Sensors, Participatory Sensing, RFIDs, and Wireless Sensor Networks- Sensor technology, Analog sensors, Digital sensors, Participatory Sensing, Industrial IoI, Automotive IoT, Actuators, Sensor data communication protocols, Radio Frequency identification Technology (RFID), Wireless Sensor Network (WSN) concept, WSN architecture.	10
4	Data Acquisition, Organization, Storage and Computing as Cloud Platforms- Data acquisition , storage and organization, Cloud computing paradigm for data collection and storage and computing, IoT Cloud-based services and models , IoT Privacy, Security and Vulnerabilities Solutions- Defining basic terms associated to privacy & security in IoT, Vulnerabilities, security requirements and threat analysis, Use cases and misuse cases, IoT security tomography and layered attacker model, Identity management, and establishment, Access control and secure message communication, Security models, Profiles and protocols for IoT,	10
5	Applications- Connected RFIDs Supply Chain Monitoring Project, Customer monitoring in IoT Applications/Services Project, Connected car and its applications and services: Tesla an example, IoT applications for smart homes,	05

	cities, environment monitoring and agriculture., Case study: smart city streetlight control and monitoring,	
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Text Books:
2. IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things, David Hanes, CISCO Press.
3. Internet of Things, Architecture and Design Principles, Raj Kamal, McGraw Hill, Education (India) Private Limited.
Reference Books:
3. Internet of Things, A Hands on Approach, Arshdeep Bagha, Vijay Madiseti Universities Press Private Limited.
4.INTERNET OF THINGS Architecture and Design Principles, Raj Kamal, McGraw Hill Education (India) Private Limited

Syllabus

Semester III

Course code: MIT41MMP601

Course name: Practical based on Internet of Things

Course category: Major Mandatory

Credits: 1	Teaching Scheme: L-0 P-2	Evolution Scheme: CA-30, ESE-20
Pre-requisites: Basic understanding of Microcontroller and Microprocessors.		
Course Objectives: To understand the state of art Internet of Things		
Course Outcomes: At the end of the course, the students will be able to –		
CO1: Understand the working of Microcontroller chips.		
CO2: Extend the understanding of sensors with their implementation in real.		
CO3: Describe the role of cloud storage, Amazon Web Services and communication APIs.		

List of Practical:

Sr. No.	Title of the Experiment	Practical hours
1	To study of Arduino Uno Microcontrollers and Arduino IDE	2
2	To demonstrate blinking of LED using Arduino Uno	2
3	To demonstrate sensing the available networks using Arduino	2
4	To demonstrate the use of ultrasonic sensor integrating with Arduino board	2
5	To demonstrate the use of ultrasonic sensor integrating with Arduino board	2
6	To demonstrate the use of vibration sensor integrating with Arduino board	2
7	To establish the connection with the available Wi-Fi using Arduino and wifi module	2
8	Demonstrate the touch sensor using Arduino board Demonstrate the use of temperature and humidity sensor integrating with Arduino board	2
9	Demonstrate the working of LDR sensor integrating with Arduino board	2
10	Study on Amazon web Services for IoT Study on Cloud Storage models & Communication APIs	2
11	Project	10

Text Books:

1. Internet of Things, Architecture and Design Principles, Raj Kamal, McGraw Hill, Education (India) Private Limited.

2. IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things, David Hanes, CISCO Press.

Reference Books:

3. Internet of Things, A Hands on Approach, Arshdeep Bagha, Vijay Madiseti Universities Press Private Limited.

4. INTERNET OF THINGS Architecture and Design Principles, Raj Kamal, McGraw Hill Education (India) Private Limited

Syllabus Semester-III

Course code: MIT41MML602	Course name: Data Analytics & Visualization	
Course category: Major Mandatory		
Credits: 3	Teaching Scheme: L-3 P-0	Evolution Scheme: CA-60, ESE-40
Pre-requisites: Basic knowledge of algorithms & data structures.		
Course Objectives:		
1. Understanding concepts and techniques of Data Analytics.		
2. Getting knowledge of Data Visualization methods.		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Understand data analytics.		
CO2: Identify missing data and understanding computational tools		
CO3: Design the Business Data predication tool		
CO4: Learn Interacting with Databases		
CO5: Learn various Machine Learning Models and algorithms		

Contents –

Unit	Content	Teaching hours
1	Introduction to Python: Python Data Analysis, Libraries, Data analysis and processing, Python libraries in data analysis, NumPy Arrays and Vectorized Computation, Array functions, Data processing using arrays, Linear algebra with NumPy, NumPy random numbers.	10
2	Data Analysis with Pandas: An overview of the Pandas package, The Pandas data structure, The basic functionality, Indexing and selecting data, Computational tools, Working with missing data, Advanced uses of Pandas for data analysis	10
3	Data Visualization: The matplotlib API primer, Exploring plot types, Legends and annotations, Plotting functions with Pandas, Additional Python data visualization tools Time Series, Time series primer, Working with date and time objects, Resampling time series, Downsampling time series data, Upsampling time series data, Time zone handling, Timedeltas, Time series plotting.	10
4	Interacting with Databases: Interacting with data in text format, Interacting with data in binary format, Interacting with data in MongoDB, Interacting with data in Redis, Data Analysis Application Examples, Data munging, Data aggregation, Grouping data,	10
5	Random sampling and the central limit theorem Hypothesis testing, Chi-square test, Correlation, Linear regression, Clustering,	5

Text Books:

1. Python Data analytics and Visualization. Pakt 2017

Reference Books:

2. Python Data Science Handbook Essential Tools for Working with Data, Jake VanderPlas, O'Reilly, 2017

3. Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data, Devid Detrich, Wiley.

Syllabus

Semester-III

Course code: MIT41MMP602	Course name: Practical Based on Data Analytics & Visualization	
Course category: Major Mandatory		
Credits: 1	Teaching Scheme: L-0 P-2	Evolution Scheme: CA-30, ESE-20
Pre-requisites: Basic knowledge of algorithms & data structures.		
Course Objectives: Getting knowledge of Data Visualization methods.		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Design the Business Data predication tool		
CO2: Learn Interacting with Databases		
CO3: Learn various Machine Learning Models and algorithms		

List of Practical-

Sr. No.	Title of the Experiment	Practical hours
1	Exploratory Data Analysis (EDA) <ul style="list-style-type: none"> • Load a dataset using pandas. • Perform summary statistics (mean, median, standard deviation, etc.). • Visualize distributions of numerical variables using histograms and box plots. • Visualize relationships between variables using scatter plots and correlation matrices. 	2
2	Data Cleaning and Preprocessing <ul style="list-style-type: none"> • Handle missing values using techniques such as imputation or removal. • Detect and handle outliers using z-score or IQR methods. • Normalize numerical features using Min-Max scaling or Standardization. • Encode categorical variables using techniques like one-hot encoding or label encoding. 	2
3	Linear Regression Analysis <ul style="list-style-type: none"> • Split the dataset into training and testing sets. • Fit a linear regression model to predict a target variable. • Evaluate the model's performance using metrics like RMSE or R-squared. • Visualize the regression line and actual vs. predicted values. 	2
4	Classification with Logistic Regression <ul style="list-style-type: none"> • Load a classification dataset (e.g., Iris dataset) using scikit-learn. • Split the dataset into features and target variables. 	2
5	<ul style="list-style-type: none"> • Train a logistic regression model to classify the data. • Evaluate the model's performance using metrics like accuracy, precision, and recall. • Visualize the decision boundary and class predictions. 	2
6	Clustering with K-Means <ul style="list-style-type: none"> • Generate synthetic data for clustering using make_blobs from scikit-learn. • Apply K-Means clustering algorithm to the data. • Visualize the clustered data points and centroids. • Evaluate clustering performance using metrics like silhouette score or inertia. 	2
7	Principal Component Analysis (PCA) <ul style="list-style-type: none"> • Load a dataset with high-dimensional features. • Apply PCA to reduce the dimensionality of the data. • Visualize the explained variance ratio for each principal component. • Plot the data in the reduced dimensional space. 	2
8	Time Series Analysis	2

	<ul style="list-style-type: none"> • Load a time series dataset (e.g., stock prices) using pandas. • Perform time series decomposition (trend, seasonality, and noise). • Visualize the components of the time series using line plots or decomposition plots. • Apply smoothing techniques like moving averages or exponential smoothing. 	
9	Text Mining <ul style="list-style-type: none"> • Load a dataset of text reviews or tweets. • Preprocess text data (tokenization, stopword removal, stemming/ lemmatization). 	2
10	Sentiment Analysis <ul style="list-style-type: none"> • Apply sentiment analysis to classify text into positive, negative, or neutral sentiments. • Visualize sentiment distributions using bar plots or word clouds. 	2
11	Project	10

Text Books:

1. Python Data analytics and Visualization. Pakt 2017

Reference Books:

1. Python Data Science Handbook Essential Tools for Working with Data, Jake VanderPlas, O'Reilly, 2017

2. Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data, Devid Detrich, Wiley.

Syllabus Semester-III

Course code: MIT41MML603	Course name: Artificial Intelligence	
Course category: Major Mandatory		
Credits: 3	Teaching Scheme: L-3 P-0	Evolution Scheme: CA-60, ESE-40
Pre-requisites: Basic knowledge of algorithms & data structures.		
Course Objectives:		
1. Understand basic principles, techniques, and applications of Artificial Intelligence.		
2. Problem solving, inference, perception, knowledge representation, and learning		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Understand the history of artificial intelligence (AI) and its foundations.		
CO2: Learn Various Heuristic Search algorithms.		
CO3: Solve searching problems.		
CO4: Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.		
CO5: Demonstrate awareness and a fundamental understanding of various applications of AI		

Contents –

Unit	Content	Teaching hours
1	Introduction to Artificial Intelligence- Definition and scope of Artificial Intelligence, Historical perspective and evolution of AI, Applications of AI in various domains, Ethical considerations and societal impact of AI.	10
2	Problem Solving and Search Algorithms- Problem-solving methods in AI, Search algorithms (depth-first search, breadth-first search, A* algorithm), Heuristic search and optimization techniques.	10
3	Knowledge Representation and Reasoning- Basics of knowledge representation, Propositional and first-order logic, Semantic networks, frames, and ontologies, reasoning mechanisms (deduction, abduction, induction).	10
4	Natural Language Processing and Computer Vision- Natural Language Processing (NLP) fundamentals, Text processing, sentiment analysis, and language models.	10
5	Computer Vision- Computer Vision basics, Image processing, object detection, and image classification, Applications of NLP and Computer Vision in AI systems.	5

Text Books:

1. Artificial Intelligence: A Modern Approach by Stuart Russell and Peter Norvig.
2. Artificial Intelligence: Foundations of Computational Agents by David L. Poole and Alan K. Mackworth

Reference Books:

3. Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein
4. Artificial Intelligence, Kelvin Knight, Elaine Rich and B. Nair. Tata Mc Graw Hill, 2010.

Syllabus **Semester-III**

Course code: MIT41MMP603	Course name: Practical Based on Artificial Intelligence
Course category: Major Mandatory	
Credits: 1	Teaching Scheme: L-0 P-2
Evolution Scheme: CA-30, ESE-20	
Pre-requisites: Basic knowledge of algorithms & data structures.	
Course Objectives:	
1. Problem solving, inference, perception, knowledge representation, and learning	
Course Outcomes: At the end of the course, the students will be able to -	
CO1: Learn Various Heuristic Search algorithms.	
CO2: Solve various searching problems.	
CO3: Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.	

List of Practical-

Sr. No.	Title of the Experiment	Practical hours
01	AI in the Real World: Research and present case studies where AI is actively used in industry or research.	2
02	Ethical Dilemmas Scenario Analysis: Assign scenarios where students need to analyze and discuss the ethical implications of AI applications.	2
03	Search Algorithm Implementation: Code and implement search algorithms such as depth-first search, breadth-first search, and A* for solving specific problems.	2
04	Heuristic Search Practice: Design and solve problems using heuristic search algorithms, experimenting with different heuristic functions.	2
05	Logic Puzzle Solving: Present logic puzzles and have students represent and solve them using propositional and first-order logic.	2
06	Semantic Network Construction: Task students with constructing semantic networks to represent relationships in various scenarios.	2
07	Supervised Learning Project: Develop a supervised learning model for a classification task using a dataset relevant to their interests.	2
08	Neural Network Implementation: Guide students in building a basic neural network using a library like TensorFlow or PyTorch.	2
09	NLP Text Processing Project: Apply NLP techniques like tokenization, named entity recognition, and sentiment analysis on a dataset of text documents.	2
10	Computer Vision Image Recognition Task: Can students build a computer vision model for image classification using pre-trained models or creating their own with CNNs.	2
11	Project	10

Text Books:

1. Artificial Intelligence: A Modern Approach by Stuart Russell and Peter Norvig.
2. Artificial Intelligence: Foundations of Computational Agents by David L. Poole and Alan K. Mackworth

Reference Books:

3. Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein
4. Artificial Intelligence, Kelvin Knight, Elaine Rich and B. Nair. Tata Mc Graw Hill, 2010.

Syllabus Semester-III

Course code: MIT41MEL601	Course name: Foundation of Data Science	Course category: Elective
Credits: 3	Teaching Scheme: L-3 P-0	Evolution Scheme: CA-60, ESE-40
Pre-requisites: Basics of Data Structure.		
Course Objectives:		
1. Understand and Learn the lifecycle and phases of data science and work comfortably with data science projects		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Develop fundamental knowledge of concepts underlying data science		
CO2: Develop practical data analysis skills, which can be applied to practical problems		
CO3: Learn R Programming.		
CO4: Explain how math and information sciences can contribute to building better algorithms and software		
CO5: Develop applied experience with data science software, programming, applications and processes		

Contents –

Unit	Content	Teaching hours
1	<p>Introduction to Data Science: Definition and applications, Skills needed basic steps in Data Science, Benefits and uses of data science and big data.</p> <p>Facets of Data: Structured data, unstructured data, Natural Language, Machine generated data; Graph based or network data, Audio, Image and Video, Streaming data</p> <p>Data Science Process: Overview of data science process. Basics of retrieving data, data cleansing, transforming data, data modeling.</p>	10
2	<p>Steps for Data Science Process: Setting the research goal, Retrieving data, Cleansing, Integrating and transforming data. Exploratory data analysis, Build the model, Presentation and automation.</p> <p>Sentiment analysis and its applications: Definition, types of sentiments, applications, case study. Uses of Text mining.</p>	10
3	<p>Data with R Studio: Using an integrated development environment, installing R studio, Creating R Script, History, overview. Data types variable, operators, and string. Syntax of R objects.</p> <p>R functions: Statistical functions, Built in functions, User defined functions.</p>	10
4	<p>Objects in R Language: Creating and manipulation of R Objects Vector, List, Matrices, Arrays, Factors, Data frames</p> <p>Data Interfaces: CSV file, Excel file, Text file</p>	10

	Charts and Graphs: Pie chart, Bar chart, Boxplot, Histogram, Advanced visualization techniques.	
5	Machine learning: Concept, application, Supervised and Unsupervised Learning, Supervised learning via Support Vector Learning,	5

Text Books:

1. Introduction to Data Science, Jeffrey S.Saltz,Jeffrey M.Stanton, Ebook, SAGE Publications.

Reference Books:

2. Foundation of Data Science, Avrim Blum, John Hopcroft, and Ravindran Kannan
3. Foundations of Data Science, Dr. Ms. Manisha Bharambe,Dr. Mrs. Harsha Patil, Nirali Prakashan

Syllabus **Semester-III**

Course code: MIT41MEP601	Course name: Practical Based on Foundations of Data Science	
Course category: Elective		
Credits: 1	Teaching Scheme: L-0 P-2	Evolution Scheme: CA-30, ESE-20
Pre-requisites: Basics of Data Structure.		
Course Objectives:		
1. Understand and Learn the lifecycle and phases of data science and work comfortably with data science projects		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Develop practical data analysis skills, which can be applied to practical problems		
CO2: Learn R Programming.		
CO3: Develop applied experience with data science software, programming, applications and processes		

List of Practical-

Sr. No.	Title of the Experiment	Practical hours
1	To create records in excel using different data types.	2
2	To create student mark details by applying at least any ten statistical functions.	2
3	To Visualize data using graphs and charts	2
4	Use Data Frame using R Programming	2
5	show the results using statistical functions such as mean, mod, median, etc.,	2
6	Write a Program in R to Write data to CSV file.	2
7	Read and analyze data from CSV file.	2
8	Read data from notepad file and apply some preprocessing on data.	2
9	Read data from Excel file	2
10	To demonstrate Visualization Techniques.	2
11	Project	10

Text Books:

1. Introduction to Data Science, Jeffrey S. Saltz, Jeffrey M. Stanton, Ebook, SAGE Publications.

Reference Books:

2. Foundation of Data Science, Avrim Blum, John Hopcroft, and Ravindran Kannan
3. Foundations of Data Science, Dr. Ms. Manisha Bharambe, Dr. Mrs. Harsha Patil, Nirali Prakashan

Syllabus Semester-III

Course code: MIT41MEL602	Course name: Block Chain	Course category: Elective
Credits: 3	Teaching Scheme: L-3 P-0	Evolution Scheme: CA-60, ESE-40
Pre-requisites: Good programming Skill and domain knowledge of Networking & routing.		
Course Objectives:		
1. Be able to explain what is blockchain		
2. Be able to explain why we need blockchain. What is the real world problem(s) that blockchain is trying to solve		
3. Understand and describe how blockchain works		
4. Understand underlying technology of transactions, blocks, proof-of-work, and consensus building		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Describe blockchain technology and its key concepts		
CO2: Explain Bitcoin transaction processes		
CO3: Work with Ethereum deployment tools		
CO4: Deploy a business network using Hyperledger Composer		
CO5: Develop and deploy smart contracts on Ethereum test network		

Contents –

Unit	Content	Teaching hours
1	Introduction to Blockchain Backstory of Blockchain, What is Blockchain?, Centralized vs. Decentralized Systems, Layers of Blockchain, Why is Blockchain Important?, Blockchain Uses and Use Cases, How Blockchain Works?, Laying the Blockchain Foundation, Cryptography, Game Theory, Computer Science Engineering, Properties of Blockchain Solutions, Blockchain Transactions, Distributed Consensus Mechanisms, Blockchain Applications, Scaling Blockchain	10
2	Bitcoin Mechanics and Optimizations How Bitcoin Works: The History of Money, Dawn of Bitcoin, The Bitcoin Blockchain, The Bitcoin Network, Bitcoin Scripts, Full Nodes vs. SPVs, Bitcoin Wallets	10
3	Smart Contracts How Ethereum Works, Bitcoin to Ethereum, Enter the Ethereum Blockchain, Ethereum Smart Contracts, Ethereum Virtual Machine and Code Execution, Ethereum Ecosystem	10
4	Scaling Blockchain Decentralized Applications, Blockchain Application Development, Interacting with the Bitcoin Blockchain, Interacting Programmatically with Ethereum—Sending Transactions, Interacting Programmatically with Ethereum—Creating a Smart Contract, Interacting Programmatically with Ethereum—Executing Smart, Contract Functions, Blockchain Concepts Revisited, Public vs. Private Blockchains, Decentralized Application Architecture	10
5	Enterprise Blockchain Building an EthereumDApp: The DApp, Setting Up a Private Ethereum Network, Creating the Smart Contract, Deploying the Smart Contract, Client Application	5

Text Books:

1. Beginning Blockchain A Beginner's Guide to Building Blockchain Solutions, Bikramaditya Singhal, Gautam Dhameja, Priyansu Sekhar Panda, A press, ISBN-13 (pbk): 978-1-4842-3443-3.

Reference Books:

2. Bitcoin and Crypto currency Technologies, Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder.
3. Mastering Blockchain, Imran Bashir, Second Edition-Fully revised and updated

Syllabus

Semester-III

Course code: MIT41MEP602	Course name: Practical Based on Block chain	
Course category: Elective		
Credits: 1	Teaching Scheme: L-0 P-2	Evolution Scheme: CA-30, ESE-20
Pre-requisites: Good programming Skill and domain knowledge of Networking & routing.		
Course Objectives:		
<ol style="list-style-type: none"> 1. How does blockchain exist in the public domain (decentralized, distributed) yet maintain transparency, privacy, anonymity, security, immutability, history 2. Why people value a 'digital' currency, how it can be protected against scam, fraud, hacking and devaluation 		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Work with Ethereum deployment tools		
CO2: Deploy a business network using Hyperledger Composer		
CO3: Develop and deploy smart contracts on Ethereum test network		

List of Practical-

Sr. No.	Title of the Experiment	Practical hours
1	Explore various popular blockchain applications. Create a list of those applications and the industries/businesses they are impacting	2
2	Explore the bitcoin blockchain on blockchain.info	2
3	Use an online service to generate hashes for content	2
4	Build a transaction and then hash it. Generate public and private keys. Digitally sign a transaction	2
5	Explore the bitcoin blockchain on blockchain.info for block generation. Explore how long it takes a block to be confirmed.	2
6	Use an online service to illustrate how consensus is built in a distributed system with no central authority.	2
7	What is the computing power needed to mine and generate bitcoin? Explore if miner pools are dominating bitcoin mining. Compare incentives from mining activity vs transaction fees.	2
8	Install a bitcoin wallet. Generate and secure your private key. Send a small transaction amount (to be monetized by instructor) to another user. Track the transaction through blockchain. Verify the confirmation and commitment of the transaction to the bitcoin blockchain.	2
9	Pick three industries. Research the application of blockchain in those industries. Describe how blockchain could be successful in those industries.	2

10	Develop and deploy smart contracts on Ethereum test network	2
11	Deploy a business network using Hyperledger Composer	2
12	Project	10

Text Books:

1. Beginning Blockchain A Beginner's Guide to Building Blockchain Solutions, Bikramaditya Singhal, Gautam Dhameja, Priyansu Sekhar Panda, A press, ISBN-13 (pbk): 978-1-4842-3443-3.

Reference Books:

2. Bitcoin and Crypto currency Technologies, Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder.
3. Mastering Blockchain, Imran Bashir, Second Edition-Fully revised and updated

Syllabus **Semester-III**

Course code: MIT41MEL603	Course name: Business Intelligence	Course category: Elective
Credits: 3	Teaching Scheme: L-3 P-0	Evolution Scheme: CA-60, ESE-40
Pre-requisites: Data warehousing and Data Mining, ERP		
Course Objectives:		
1. To become familiar with the ethics and basics of Business Intelligence and Decision Support Systems		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Become familiar with the role of mathematical models, Business intelligence architectures, representation of the decision-making process, and evolution of information systems		
CO2: Define development of a model, representation of input data, data mining process, analysis methodologies, data validation, data transformation, data reduction.		
CO3: Acquire knowledge of current BI practices and trends in the global industry.		
CO4: Acquire knowledge of core BI methodology and its strong relationship with data warehousing.		
CO5: Enhance the skills to execute Data-driven decision making through BI, through the use of specific charts and designing interactive dashboards and stories		

Contents-

Unit	Content	Teaching hours
1	Business intelligence- Effective and timely decisions, Data, information and knowledge, The role of mathematical models, Business intelligence architectures, Ethics and business intelligence Decision support systems- Definition of system, Representation of the decision-making process, Evolution of information systems, Definition of decision support system, Development of a decision support system.	10
2	Mathematical models for decision making- Structure of mathematical models, Development of a model, Classes of models. Data mining- Definition of data mining, Representation of input data , Data mining process, Analysis methodologies, Data preparation: Data validation, Data transformation, Data reduction	10
3	Classification- Classification problems, Evaluation of classification models, Bayesian methods, Logistic regression, Neural networks, Support vector machines. Clustering- Clustering methods, Partition methods, Hierarchical methods, Evaluation of clustering models.	10
4	Business intelligence applications- Marketing models: Relational marketing, Sales force management. Logistic and production models- Supply chain optimization, Optimization models for logistics planning, Revenue management systems. Data envelopment analysis- Efficiency measures, Efficient frontier, The CCR model, Identification of good operating practices.	10
5	Knowledge Management- Introduction to Knowledge Management, Organizational Learning and Transformation, Knowledge Management Activities, Approaches to Knowledge Management, Information Technology (IT) In Knowledge Management, Knowledge Management Systems Implementation, and Roles of People in Knowledge Management. Artificial Intelligence and Expert Systems- Concepts and Definitions of Artificial Intelligence, Artificial Intelligence Versus Natural Intelligence, Basic Concepts of Expert	5

Systems, Applications of Expert Systems, Structure of Expert Systems, Knowledge Engineering, Development of Expert Systems	
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Text Books:

1. Business Intelligence: Data Mining and Optimization for Decision Making, Carlo Verzellis, Wiley, 1st

Reference Books:

2. Decision support and Business Intelligence Systems, Efraim Turban, Ramesh Sharda, Dursun Delen, Pearson.
3. Successful Business Intelligence, Unlock the value of BI and Big Data, Cindi Howson, , Mc Graw Hill Publication, Second Edition

Syllabus **Semester-III**

Course code: MIT41MEP603	Course name: Practical Based on Business Intelligence	
Course category: Elective		
Credits: 1	Teaching Scheme: L-0 P-2	Evolution Scheme: CA-30, ESE-20
Pre-requisites: Data warehousing and Data Mining, ERP		
Course Objectives:		
1. To become familiar with the ethics and basics of Business Intelligence and Decision Support System		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Define development of a model, representation of input data, data mining process, analysis methodologies, data validation, data transformation, data reduction.		
CO2: Capable the BI practices and trends in the global industry.		
CO3: Enhance the skills to execute Data-driven decision making through BI, through the use of specific charts and designing interactive dashboards and stories		

List of Practical-

Sr. No.	Title of the Experiment	Practical hours
1	Import the legacy data from different sources such as (Excel , SqlServer, Oracle etc.) and load in the target system. (You can download sample database such as Adventureworks, Northwind, foodmart etc.)	2
2	Perform the Extraction Transformation and Loading (ETL) process to construct the database in the Sqlserver.	2
3	Create the Data staging area for the selected database.	2
4	Create the cube with suitable dimension and fact tables based on ROLAP, MOLAP and HOLAP model.	2
5	Create the ETL map and setup the schedule for execution.	2
6	Execute the MDX queries to extract the data from the datawarehouse.	2
7	Import the datawarehouse data in Microsoft Excel and create the Pivot table and Pivot Chart	2
8	Import the cube in Microsoft Excel and create the Pivot table and Pivot Chart to perform data analysis	2
9	Apply the what – if Analysis for data visualization. Design and generate necessary reports based on the data warehouse data.	2
10	Perform the data classification using classification algorithm.	2
11	Perform the data clustering using clustering algorithm. Perform the Linear regression on the given data warehouse data.	2
12	Project	10

Text Books:

1. Business Intelligence: Data Mining and Optimization for Decision Making, Carlo Vercellis, Wiley, 1st

Reference Books:

2. Decision support and Business Intelligence Systems, Efraim Turban, Ramesh Sharda, Dursun Delen, Pearson.
3. Successful Business Intelligence, Unlock the value of BI and Big Data, Cindi Howson, , Mc Graw Hill Publication, Second Edition

Semester: Fourth

Syllabus

Semester-IV

Course code: MIT41MML604	Course name: Cloud Services	Course category: Major Mandatory
Credits: 3	Teaching Scheme: L-3 P-0	Evolution Scheme: CA-60, ESE-40
Pre-requisites: Basics of Computer Networks.		
Course Objectives: Identify the technical foundations of cloud systems architectures.		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Develop basic understanding of cloud computing, its services (through tools) and deployments models.		
CO2: Understand the fundamental principles of distributed computing.		
CO3: Design and implement cloud applications.		
CO4: Discuss the role of virtualization in the cloud		
CO5: Compare and contrast Web based client-server models and cloud models and their associated models of computation.		

Contents-

Unit	Content	Teaching hours
1	Introduction to Cloud Computing Cloud Computing (NIST Model) Introduction to Cloud Computing, History of Cloud Computing, Cloud service providers Properties, Characteristics & Disadvantages Pros and Cons of Cloud Computing, Benefits of Cloud Computing, Cloud computing vs. Cluster computing vs. Grid computing Role of Open Standards.	10
2	Cloud Computing Architecture:- Cloud computing stack,Comparison with traditional computing architecture (client/server), Services provided at various levels, How Cloud Computing Works, Role of Networks in Cloud computing, protocols used, Role of Web services,Service Models (XaaS), Infrastructure as a Service(IaaS), Platform as a Service(PaaS),Software as a Service(SaaS), Deployment Models:- Public cloud, Private cloud, Hybrid cloud, Community cloud	10
3	Infrastructure as a Service(IaaS):- Introduction to IaaS, IaaS definition, Introduction to virtualization, Different approaches to virtualization, Hypervisors, Machine Image, Virtual Machine(VM): Resource Virtualization, Server, Storage Network, Virtual Machine(resource) provisioning and manageability, storage as a service, Data storage in cloud computing (storage as a service), Examples:- Amazon EC2, Renting, EC2 Compute Unit, Platform and Storage, pricing, customers Eucalyptus	10
4	Platform as a Service(PaaS):- Introduction to PaaS,What is PaaS, Service Oriented Architecture (SOA),Cloud Platform and Management,Computation, Storage Examples:- Google App Engine , Microsoft Azure, Sales Force.com's Force.com platform	10
5	Software as a Service(PaaS):- Introduction to SaaS, Web services, Web 2.0, Web OS, Case Study on SaaS ,Cloud Security , Infrastructure Security, Network level security, Host level security, Application level security, Data security and Storage Data privacy and security Issues, Jurisdictional issues raised by Data location ,Identity & Access Management , Access Control, Trust, Reputation, Risk. Authentication in cloud computing, Client access in cloud, Cloud contracting Model, Commercial and business considerations,	5

	Case Study on Open Source & Commercial Clouds :-Eucalyptus, Microsoft Azure, Amazon EC2	
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Text Books:

1. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010

Reference Books:

2. Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wile, 2011

3. Cloud Computing, Sandeep Bhowmik, Cambridge University Press, Edition 2017

Syllabus **Semester-IV**

Course code: MIT41MMP604	Course name: Practical Based on Cloud Services	
Course category: Major Mandatory		
Credits: 1	Teaching Scheme: L-0 P-2	Evolution Scheme: CA-30, ESE-20
Pre-requisites: Basic knowledge of Computer Networks.		
Course Objectives: At the end of the course, the students will be able to -		
CO1: Design and implement cloud applications.		
CO2: Discuss the role of virtualization in the cloud		
CO3: Compare and contrast Web based client-server models and cloud models and their associated models of computation.		

List of Practical-

Sr. No.	Title of the Experiment	Practical hours
1	Creating a Virtual Machine (VM) on AWS: Learn how to launch a virtual machine on Amazon EC2.	2
2	Explore different instance types and configurations. Understand security groups and key pairs.	2
3	Setting up a Web App on Azure: Deploy a simple web application on Microsoft Azure's App Service.	2
4	Configure custom domains and SSL certificates. Explore scaling options based on demand.	2
5	Object Storage on Google Cloud: Create a bucket in Google Cloud Storage.	2
6	Upload and download objects (files) to and from the bucket. Implement access controls and versioning.	2
7	Load Balancing on AWS: Set up a load balancer using Amazon ELB (Elastic Load Balancing).	2
8	Distribute traffic across multiple EC2 instances. Monitor and scale the load balancer.	2
9	Database Management on Azure: Deploy a database using Azure SQL Database or Cosmos DB.	2
10	Configure security and access controls. Perform basic database operations.	2
11	Project	10

Text Books: 1. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010

Reference Books: 1. Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wiley, 2011
Cloud Computing, Sandeep Bhowmik, Cambridge University Press, Edition 2017

Syllabus **Semester-IV**

Course code: MIT41MML605	Course name: Machine Learning	Course category: Major Mandatory
Credits: 3	Teaching Scheme: L-3 P-0	Evolution Scheme: CA-60, ESE-40
Pre-requisites: Basic Knowledge of Mathematics & Image Processing.		
Course Objectives:		
<ol style="list-style-type: none"> 1. Understanding concepts and techniques of Machine Learning. 2. Getting knowledge of regression methods. 3. Learn classification & clustering methods 		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Become familiar with Dimensionality reduction Techniques.		
CO2: Build Simple Linear Regression Model		
CO3: Analyze Classification Techniques.		
CO4: Analyze the data clustering		
CO5: Identify machine learning techniques suitable for a given problem		

Contents –

Unit	Content	Teaching hours
1	Introduction to Machine Learning- Introduction to Analytics and Machine Learning, What is Machine Learning, Types of Machine Learning, Applications of Machine Learning, Issues in Machine Learning, Why Machine Learning?, Framework for Developing Machine Learning Models, State-of-the-Art Languages / Tools In Machine Learning. Descriptive Analytics- Working with DataFrames in Python, Handling Missing Values, Exploration of Data using Visualization: Drawing Plots, Bar Chart, Histogram, Distribution or Density Plot, Box Plot, Comparing Distributions, Scatter Plot, Pair Plot, Correlation and Heatmap.	10
2	Linear Regression- Simple Linear Regression, Steps in Building a Regression Model, Building Simple Linear Regression Model, Model Diagnostics, Multiple Linear Regression.	10
3	Classification- Classification Overview, Binary Logistic Regression, Credit Classification, Gain Chart and Lift Chart, Classification Tree (Decision Tree Learning)	10
4	Clustering- Overview, How Does Clustering Work?, K-Means Clustering, Creating Product Segments Using Clustering, Hierarchical Clustering.	10
5	Advances in Machine Learning- Gradient Descent Algorithm, Scikit-Learn Library for Machine Learning, K-Nearest Neighbors (KNN) Algorithm, Random Forest.	5

Text Books:

1. Machine Learning using Python, Manaranjan Pradhan, U Dinesh Kumar, Wiley
2. Machine Learning, Author: Saikat Dutt, S. Chandramouli, Amit K.Das, Pearson Pub.

Reference Books:

1. Machine Learning with Python, By Abhishek Vijayvargia, BPB Publications
2. Machine Learning, By Mitchell Tom, McGraw Hill Pub.

Syllabus **Semester-IV**

Course code: MIT41MMP605	Course name: Practical Based on Machine Learning	
Course category: Major Mandatory		
Credits: 1	Teaching Scheme: L-0 P-2	Evolution Scheme: CA-30, ESE-20
Pre-requisites: Basic Knowledge of Mathematics & Image Processing.		
Course Objectives:		
1. Getting knowledge of regression methods.		
2. Learn classification & clustering methods		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Build Simple Linear Regression Model		
CO2: Perform Classification Techniques.		
CO3: Perform the data clustering		

List of Practical-

Sr. No.	Title of the Experiment	Practical hours
01	Introduction to Machine Learning- Research and list three real-world applications of machine learning. Identify and describe the types of machine learning algorithms (supervised, unsupervised, and reinforcement learning). Discuss the ethical issues associated with machine learning applications.	2
02	Feature Engineering: Explore feature engineering techniques such as scaling, normalization, one-hot encoding, and feature selection. Apply these techniques to improve model performance on a given dataset.	
03	Descriptive Analytics: Use a dataset (e.g., from Kaggle or UCI Machine Learning Repository) and load it into a Pandas DataFrame in Python. Handle missing values in the dataset using appropriate techniques. Create visualizations such as bar charts, histograms, and scatter plots to explore the dataset.	2
04	Linear Regression: Implement simple linear regression using a dataset of your choice. Evaluate the performance of the regression model using metrics like Mean Squared Error (MSE) or R-squared. Extend to multiple linear regression by incorporating additional features and analyze the results.	2
05	Multiple Linear Regression Extend the previous exercise to multiple linear regression by incorporating additional features into the model. Perform feature selection and assess the impact on model performance.	2
06	Binary Logistic Regression Apply binary logistic regression to a dataset for classification tasks. Train the model to predict binary outcomes, evaluate its performance using metrics like accuracy, precision, recall, and ROC curves.	2
07	Classification: Apply binary logistic regression to a dataset for classification. Evaluate the model using precision, recall, and F1-score. Implement a decision tree classifier for a different dataset (e.g., the famous Iris dataset).	2
08	Clustering:	2

	Use the K-Means algorithm to cluster a dataset. Visualize the clusters on a scatter plot. Apply hierarchical clustering to the same dataset and compare the results.	
09	Advances in Machine Learning: Implement the gradient descent algorithm from scratch for a simple linear regression problem. Utilize the Scikit-Learn library to build a machine learning model (e.g., linear regression or classification) on a dataset. Apply the K-Nearest Neighbors (KNN) algorithm to a dataset and evaluate its performance.	2
10	Decision Tree Learning: Implement a decision tree classifier using Python's scikit-learn library. Train the model on a dataset, visualize the decision tree, and interpret the results.	2
11	Project	10

Text Books:

1. Machine Learning using Python, Manaranjan Pradhan, U Dinesh Kumar, Wiley
2. Machine Learning, Author: Saikat Dutt, S. Chandramouli, Amit K.Das, Pearson Pub.

Reference Books:

1. Machine Learning with Python, By Abhishek Vijayvargia, BPB Publications
2. Machine Learning, By Mitchell Tom, McGraw Hill Pub.

Syllabus **Semester-IV**

Course code: MIT41MML606	Course name: Quantum Computing	
Course category: Major Mandatory		
Credits: 3	Teaching Scheme: L-3 P-0	Evolution Scheme: CA-60, ESE-40
Pre-requisites: Basic knowledge of Mathematics, Data Structures and Algorithm.		
Course Objectives: To understand basics of quantum computing		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Understand basic concepts of quantum computing		
CO2: Learn Various Quantum Algorithms.		
CO3: Illustrate building blocks of quantum computing through architecture and programming models		
CO4: Implement Quantum Applications and Future Trends.		

Contents –

Unit	Content	Teaching hours
1	Introduction to Quantum Mechanics- Overview of Classical vs. Quantum Computing, Understanding classical bits vs. quantum bits (qubits), Brief history and motivation for quantum computing Quantum Mechanics Basics- Principles of superposition and entanglement, Quantum gates and circuits, Dirac notation and quantum state vectors Quantum Measurement and Probability- Measurement in quantum systems, Quantum probability and interference, Bloch sphere representation	6
2	Quantum Algorithms- Quantum Parallelism and Superposition, Quantum parallelism and its implications, Building quantum parallel algorithms Quantum Fourier Transform and Shor's Algorithm- Introduction to Quantum Fourier Transform, Shor's Algorithm for integer factorization, Implications for cryptography	8
3	Quantum Programming- Quantum Programming Languages, Overview of Qiskit and Cirq, Basic quantum programming constructs, Writing simple quantum algorithms Quantum Error Correction- Basics of quantum error correction, Introduction to quantum error correction codes (e.g., Shor code, Steane code)	8
4	Quantum Applications and Future Trends- Quantum Machine Learning, Quantum algorithms for machine learning, Quantum-enhanced classical machine learning Quantum Cryptography- Quantum key distribution, Post-quantum cryptography Emerging Trends and Future Directions- Quantum computing in industry, potential impact on various sectors, Ethical considerations and societal implications	8

Text Books:

1. Micheal A. Nielsen. & Issac L. Chiang, "Quantum Computation and Quantum Information", Cambridge University Press, Fint South Asian edition, 2002.
2. "Quantum Computing: A Gentle Introduction" by Eleanor G. Rieffel and Wolfgang H. Polak

Reference Books:

3. "Quantum Computing for Computer Scientists" by Noson S. Yanofsky and Mirco A. Mannucci
4. David McMahon, —Quantum Computing Explained, Wiley, 2008...

Syllabus

Semester-IV

Course code: MIT41MEL604	Course name: Google Analytics	Course category: Major Elective
Credits: 3	Teaching Scheme: L-3 P-0	Evolution Scheme: CA-60, ESE-40
Pre-requisites: Basic knowledge of Data Analysis.		
Course Objectives:		
<ol style="list-style-type: none"> 1. Configuration of Google Analytics 2. Understand different types of insights you can generate using reports available in Google Analytics to support improvement decisions 		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Determine basic navigation of Google Analytics Interface.		
CO2: Identify the benefits of a customer-centric approach to website design and optimization		
CO3: Navigate the Google Analytics interface and reports, and set up dashboards and shortcuts.		
CO4: Determine site content in GA, filtering data techniques		
CO5: Keep Track of Your Configuration Changes		

Contents –

Unit	Content	Teaching hours
1	<p>Introducing Web Analytics- Defining Web Analytics, Quantitative and Qualitative Data, The Continuous Improvement Process, Measuring Outcomes, What Google Analytics Contributes, How Google Analytics Fits in the Analytics Ecosystem</p> <p>Creating an Implementation Plan- Gather Business Requirements, Analyze and Document Website Architecture, Create an Account and Configure Your Profile, Configure the Tracking Code and Tag Pages, Tag Marketing Campaigns, Create Additional User Accounts and Configure Reporting Features, Perform Optional Configuration Steps.</p>	10
2	<p>How Google Analytics Works- Data Collection and Processing, Reports, About the Tracking Code, The Mobile Tracking Code, App Tracking, The (Very) Old Tracking Code: urchin.js, Understanding Page views.</p> <p>Tracking Visitor Clicks, Outbound Links, and Non-HTML Files- About the Tracking Cookies Designing Blogs for Google Analytics</p>	10
3	<p>Google Analytics Accounts and Profiles- Google Analytics Accounts, Creating a Google Analytics Account, Creating Additional Profiles, Access Levels, All About Profiles, Basic Profile Settings, Profile Name, Website URL, Time Zone, Default Page, Exclude URL Query Parameters, E-Commerce Settings, Tracking On-Site Search, Applying Cost Data.</p> <p>Filters- Filter Fields, Filter Patterns, Filter Type, Include/Exclude Filters, Search and Replace Filters, Lowercase/Uppercase Filters, Advanced Profile Filters, Predefined Filters.</p>	10
4	<p>Tracking Conversions with Goals and Funnels- Goals, Time on Site, Pages per Visit, URL Destinations, Additional Goal Settings, Tracking Defined Processes with Funnels.</p>	10
5	<p>Must-Have Profiles- Profile Roles, Raw Data Profile, Master Profile, Test Profile, Access-Based Profiles, Using Profiles to Segment Data, Exclude Internal Traffic,</p>	5

Include Valid Traffic, Force Request URI to Lowercase, Force Campaign Parameters to Lowercase, Keeping Track of Your Configuration Changes.

Text Books:

1. Google Analytics, Justin Cutroni, O'Reilly.
2. Introduction to Google Analytics: A Guide for Absolute Beginners, Todd Kelsey, A Press.

Reference Books:

3. Google Analytics, Jerri L. Ledford, Joe Teixeira, and Mary E. Tyler, Google Analytics
4. Advanced Web Metrics with Google Analytics, Brian Clifton, Second Edition

Syllabus **Semester-IV**

Course code: MIT41MEP604	Course name: Practical Based on Google Analytics	
Course category: Major Elective		
Credits: 1	Teaching Scheme: L-0 P-2	Evolution Scheme: CA-30, ESE-20
Pre-requisites: Basic knowledge of Data Analysis.		
Course Objectives:		
<ol style="list-style-type: none"> 1. Configuration of Google Analytics 2. Understand different types of insights you can generate using reports available in Google Analytics to support improvement decisions 		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Identify the benefits of a customer-centric approach to website design and optimization		
CO2: Navigate the Google Analytics interface and reports, and set up dashboards and shortcuts.		
CO3: Determine site content in GA, filtering data techniques		

List of Practical-

Sr. No.	Title of the Experiment	Practical hours
1	Create Google Analytics Account	2
2	Configure Google Analytics Account	2
3	Create Web blogs	2
4	Create Google Analytics Tracking Code and insert in Blog	2
5	Creating an Implementation Plan of Business case	2
6	Configure Google Analytics Accounts and Profiles	2
7	Create Administrator and User Profiles	2
8	Create Filters in Google Analytics	2
9	Create Tracking Conversions with Goals	2
10	Create Tracking Conversions with Funnels	2
11	Project	10

Text Books:
1. Google Analytics, Justin Cutroni, O'Reilly.
2. Introduction to Google Analytics: A Guide for Absolute Beginners, Todd Kelsey, A Press.
Reference Books:
1. Google Analytics, Jerri L. Ledford, Joe Teixeira, and Mary E. Tyler, Google Analytics

Syllabus **Semester-IV**

Course code: MIT41MEL605	Course name: AWS DevOps	Course category: Elective
Credits: 3	Teaching Scheme: L-3 P-0	Evolution Scheme: CA-60, ESE-40
Pre-requisites: Basic understanding of cloud computing concepts, basic knowledge of Linux administration, knowledge of programming languages and fundamentals of networking		
Course Objectives:		
<ol style="list-style-type: none"> 1. Understand key AWS services and best practices for cloud infrastructure, networks and applications 2. Learn how to implement continuous integration and deployment on AWS using CodeBuild and other strategies 3. Gain knowledge of infrastructure as code concepts and tools like Terraform, CloudFormation and Ansible on AWS 4. Learn how to monitor, observe and secure AWS environments with DevSecOps tools like CloudTrail, X-Ray and Security Hub 5. Differentiate between monolithic and microservices architectures and gain introduction to Kubernetes clusters 		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Demonstrate understanding of AWS infrastructure, network and application best practices for cloud solutions.		
CO2: Demonstrate understanding of CI/CD pipelines on AWS using CodeBuild demonstrating knowledge of continuous practices.		
CO3: Implement CI/CD pipelines on AWS using CodeBuild demonstrating knowledge of continuous practices.		
CO4: Demonstrate understanding of developing infrastructure as code for AWS environments using tools like Terraform, CloudFormation and Ansible.		
CO5: Demonstrate understanding of secure and monitor AWS environments using various DevSecOps services and features.		

Contents –

Unit	Content	Teaching hours
1	What Is DevOps- Understanding the Business Need for DevOps, Recognizing the Business, Value of DevOps, Enhanced customer experience, Increased capacity to innovate, Faster time to value, How DevOps Works, Develop and test against production-like systems, Deploy with repeatable, reliable processes, Monitor and validate operational quality, Amplify feedback loops	10
2	Looking at DevOps Capabilities- Paths to DevOps Adoption, Steer, Develop/Test, Collaborative development, Continuous testing, Deploy, Operate, Continuous monitoring, Continuous customer feedback and optimization	10
3	Adopting DevOps- Where to Begin, Identifying business objectives, Identifying bottlenecks in the delivery pipeline, People in DevOps, DevOps culture, DevOps team, Process in DevOps, DevOps as a business process, Change management process, DevOps techniques, Technology in DevOps, Infrastructure as code, Delivery pipeline, Deployment automation and release management	10
4	How Cloud Accelerates DevOps- Using Cloud as an Enabler for DevOps, Full-Stack Deployments, Choosing a Cloud Service Model for DevOps, Understanding What a Hybrid Cloud.	10

5	DevOps to Solve New Challenges- Mobile Applications, ALM Processes, Scaling Agile, Multiple-Tier Applications, DevOps in the Enterprise, Supply Chains, The Internet of Things	5
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Text Books: 1. A Complete Guide to DevOps with AWSDeploy, Osama Mustafa, Apress

Online Resources:

1. NPTEL Course on Cloud Computing:

<https://archive.nptel.ac.in/courses/106/105/106105167/>

2. Mastering AWS DevOps - For AWS Engineers Course:

<https://www.udemy.com/course/mastering-aws-devops-for-cloud-engineers/>

Syllabus

Semester-IV

Course code: MIT41MEP605	Course name: Practical Based on AWS DevOps	
Course category: Major Elective		
Credits: 1	Teaching Scheme: L-0 P-2	Evolution Scheme: CA-30, ESE-20
Pre-requisites: Basics of Cloud Computing		
Course Objectives: Learn how these tools are used in software development operations		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Understand the Fundamentals of DevOps		
CO2: Learn DevOps Capabilities		
CO3: Adopt DevOps resources and infrastructures		
CO4: Implement the DevOps Works with real time Application		
CO5: Develop Multiple-Tier Applications		

List of Practical –

Sr. No.	Title of the Experiment	Practical hours
1	Install and Configure DevOps platforms(GitLab, GitHub, Bitbucket)	2
2	Exploring Git Commands through Collaborative Coding.	2
3	Implement GitHub Operations	2
4	Implement BitBucket Operations	2
5	Demonstrate Maven Build Life Cycle	2
6	Applying CI/CD Pipelines to Web Development Using Jenkins, Git, and Local HTTP Server.	2
7	Create the GitHub Account to demonstrate CI/CD pipeline using Cloud Platform.	2
8	Applying CI/CD Pipelines to Web Development Using Jenkins, Git, using Docker Containers	2
9	Exploring Containerization and Application Deployment with Docker	2
10	Demonstrate Container Orchestration using Kubernetes.	2
11	Project	10

Text Books:

1. DevOps By by Sanjeev Sharma and Bernie Coyne 2nd IBM Limited Edition

Reference Books:

2. Effective DevOps By Jennifer Davis and Ryn Daniels O'Reilly
3. Neural Network Design, Martin T. Hagan, Howard B. Demuth, Mark Hudson Beale, Orlando De Jesús

Syllabus **Semester-IV**

Course code: MIT41MEL606	Course name: Deep Neural Network	
Course category: Major Elective		
Credits: 3	Teaching Scheme: L-3 P-0	Evolution Scheme: CA-60, ESE-40
Pre-requisites: Basic of probability theory, linear algebra and calculus.		
Course Objectives: To understand principles, algorithms, and applications of Neural Network		
Course Outcomes: At the end of the course, the students will be able to –		
CO1: Describe the basics of ANN and comparison with Human brain		
CO2: Describe the geometry of binary threshold neuron and associated terms.		
CO3: Extend understanding of perceptron and least mean square terminology.		
CO4: Understand back propagation algorithms and multilayer neural network.		
CO5: Describe support vector machines and radial basis functions with their applications in solving problems.		

Detailed Syllabus

Unit	Content	Teaching hours
1	Introduction to Neural Network- The nature of computation in the human brain, Human brain and biological neuron, Inner secret of the Neuron: Microtubules, Inspiration for Neural Network, Classical AI and Neural Network, Basic architecture of Neural Network, Properties of Neural Network, Neuron signal functions, Mathematical Preliminaries, Feed forward architecture of Neural Network	10
2	Geometry of Binary Threshold Neuron- Feed backward architecture of Neural Network, Pattern recognition and data classification, Convex sets, convex hull and linear separability, Space of Boolean functions, Binary neuron as pattern dichotomizers, Non-linear separability problems, Capacity of simple threshold logic neuron, Revisiting the XOR problem, Multilayer Networks, Finding out how many hidden nodes are sufficient.	10
3	Perceptrons and LMS- Learning and Memory, Long term memory, Behavioral approach to learning, Learning algorithms, Error correction and Gradient Descent rules, Learning Objective for TLNs, Pattern space and Weight space, Perceptron learning algorithm, Perceptron convergence theorem, Alpha-Least Mean Square learning, MSE error surface and its geometry, LMS: approximate Gradient Descent.	10
4	Back propagation and Beyond- Multilayer network architecture, Back propagation learning algorithm, Hand-worked example, MATLAB simulation examples, Practical considerations in implementing the BP algorithm, Structure growing algorithms, Fast relatives of Back propagation, Universal function approximation and Neural networks, applications of Feed forward neural networks, Reinforcement learning in brief.	10
5	Support Vector Machines and Radial Basis Function- Learning from Examples, Statistical Learning Theory, Support Vector Machines, SVM application to Image Classification, Radial Basis Function, Regularization theory, Generalized RBF Networks.	05

Text Book:

1. Neural Network , A Classroom Approach, Satish Kumar, McGraw Hill Education (India) Pvt. Ltd, Second Edition

Reference Book :

2. Neural Network and Deep Learning, Charu C. Aggrawal, Springer
3. Neural Network Design, Martin T. Hagan, Howard B. Demuth, Mark Hudson Beale, Orlando De Jesús

Syllabus **Semester-IV**

Course code: MIT41MEP606	Course name: Practical Based on Deep Neural Network
Course category: Elective	
Credits: 1	Teaching Scheme: L-0 P-2
Evolution Scheme: CA-30, ESE-20	
Pre-requisites: Basic of probability theory, linear algebra and calculus.	
Course Objectives: To understand principles, algorithms, and applications of Neural Network	
Course Outcomes: At the end of the course, the students will be able to –	
CO1: Install and use Neural Network libraries in Python.	
CO2: Develop binary classifier and implement back propagation and feed-forward model in python.	
CO3: Extend understanding of hand written digit recognition and image classification with the help of available dataset.	

List of Practical-

Sr. No.	Title of the Experiment	Practical hours
1	Study the basics of Neural Network libraries (Tensor Flow, Keras, Pytorch) in Python	2
2	Learn mathematical preliminaries for Neural Network	2
3	Implementing different activation function to train Neural Network	2
4	Design single layer Neural Network in Python	2
5	Develop a back-propagation model in Python	2
6	Implementing feed-forward model in Python	2
7	Implementation of binary classifier in Python	2
8	Demonstrate linear separability with Iris dataset.	2
9	Development of a multilayer Neural Network Implementation of Gradient Descent algorithm in Python	2
10	Illustrate the handwritten digit recognition through MINST dataset. Illustrate small image classification through CIFAR10 dataset.	2
11	Project	10

Text Book:

1. Neural Network , A Classroom Approach, Satish Kumar, McGraw Hill Education (India) Pvt. Ltd, Second Edition

Reference Book :

2. Neural Network and Deep Learning, Charu C. Aggrawal, Springer
3. Neural Network Design, Martin T. Hagan, Howard B. Demuth, Mark Hudson Beale, Orlando De Jesús

Online Resources:

1. NPTEL / SWAYAM courses
2. <https://nthu-datalab.github.io>