

STATE BOARD OF TECHNICAL EDUCATION, BIHAR

Scheme of Teaching and Examination for Vth Semester Diploma in Computer Science & Engineering (Effective from Session 2020-2021 Batch)

THEORY

Sl. No	SUBJECTS	SUBJECT CODE	TEACHING SCHEME	EXAMINATION SCHEME							Credits
			Periods per Week	Hours of Exam	Teacher's Assessment (TA) Marks (A)	Class Test (CT) Marks (B)	End Semester Exam. (ESE) Marks (C)	Total Marks (A+B+C)	Pass Marks ESE	Pass Marks in the Subject	
1.	Mobile Computing	2018501	03	03	10	20	70	100	28	40	03
2.	Computer Hardware & Networking	2018502	03	03	10	20	70	100	28	40	03
3.	Elective-I		03	03	10	20	70	100	28	40	03
		OOP through Java (2018503A)		OOP through C++ (2018503B)			NET with 'C#' (2018503C)				
4.	Elective-II		03	03	10	20	70	100	28	40	03
		System Administration (2018504A)		Multimedia Technology (2018504B)							
5.	Open Elective / COE		02	03	10	20	70	100	28	40	02
		Project Management (2018505A)		Environmental Science (2018505B)							
	Artificial Intelligence (Basics) (2000505B)			Internet of Things (Basics) (2000505C)			Drone Technology (Basics) (2000505D)				
	3D Printing & Design (Basics) (2000505E)	Industrial Automation (Basics) (2000505F)		Electric Vehicles (Basics) (2000505G)			Robotics (Basics) (2000505H)				
Total			14				350	500			14

PRACTICAL

Sl. No	SUBJECTS	SUBJECT CODE	TEACHING SCHEME	Examination Scheme							
			Periods per Week	Hours of Exam	Practical (ESE)		Total Marks	Pass Marks in the Subject	Credits		
					Internal (PA)	External (ESE)					
6.	Computer Hardware & Networking (LAB)	2018506	02 50% Physical 50% Virtual	03	07	18	25	10	01		
7.	Elective- I (LAB)		04 50% Physical 50% Virtual	03	07	18	25	10	02		
8.	OOP through Java (2018507A)		OOP through C++ (2018507B)			NET with 'C#' (2018507C)					
9.	Elective Lab II / COE Lab		04 50% Physical 50% Virtual	03	20	30	50	20	02		
	System Administration (2018508A)		Multimedia Technology (2018508 B)			Artificial Intelligence Lab (Basics) (2000508 B)					
	Internet of Things Lab (Basics) (2000508 C)		Drone Technology Lab (Basics) (2000508D)			3D Printing & Design Lab (Basics) (2000508E)					
	Industrial Automation Lab (Basics) (2000508F)	Electric Vehicles Lab (Basics) (2000508G)		Robotics Lab (Basics) (2000508H)							
Total			10				100		05		

TERM WORK

Sl. No	SUBJECTS	SUBJECT CODE	TEACHING SCHEME	EXAMINATION SCHEME					
			Periods per Week	Marks of Internal Examiner (PA)	Marks of External Examiner (ESE)	Total Marks	Pass Marks in the Subject	Credits	
10.	Summer Internship after IV semester	2018509	4 Weeks	15	35	50	20	02	
11.	Minor Project	2018510	04	15	35	50	20	02	
12.	Term Work		02	20	30	50	20	01	
	Course under Moocs/ NPTEL / Others (2018511)	Artificial Intelligence (Basics) (TW) (2000511 B)		Internet of Things (Basics) (TW) (2000511 C)		Drone Technology (Basics) (TW) (2000511D)			
	3D Printing (Basics) (TW) (2000511E)	Industrial Automation (Basics) (TW) (2000511F)		Electric Vehicles (Basics) (TW) (2000511G)		Robotics (Basics) (TW) (2000511H)			
Total			06			150		05	
Total Periods per week of each of duration One Hour 30							Total Marks 750		24

MOBILE COMPUTING

SUBJECT CODE: 2018501	Theory			No. of period in one session: 42			Credits 03	
	No. of Periods per Week			Full Marks:				:
	L	T	P/S	ESE	:	100		
	03	-	-	T. A	:	70		
				C.T	:	20		
				:	10			

Course Learning Objective:

To impart fundamental concepts in the area of mobile computing, to provide a computer systems perspective on the converging areas of wireless networking, embedded systems, and software, and to introduce selected topics of current research interest in the field.

COURSE OUTCOMES (COs)

Please Use Bloom's Taxonomy as possible: - {Remember, Understand, Apply, Analyse, Evaluate, Create}

1. Will be able to develop and deploy basic mobile applications.

CONTENTS: Theory		Hrs.
<u>UNIT – 01</u>	A brief history of Mobile, Types of mobile phone generations. The Mobile Ecosystem, Types of Mobile. Mobile Information Architecture, Android Versions, Features of Android, Android Architecture. Installing Android SDK Tools, Configuring Android in Eclipse IDE. "Android Development Tools (ADT), Creating Android Virtual Devices (AVD)".	[8]
<u>UNIT – 02</u>	Creating first android application. " Anatomy of android application, Deploying Android app on USB connected Android device." Android application components, Activity life cycle. Understanding activities, Exploring Intent objects, Intent Types, Linking activities using intents.	[8]
<u>UNIT – 03</u>	Fragments life cycle, Interaction between fragments. "Understanding the components of a screen (Layouts), Adapting to display orientation." Action Bar, Views (UI Widgets)-Button, Toast, Toggle Button, Check Box, Radio Button, Spinner, Web View, Edit Text, Date Picker, Time Picker, List View, Progress Bar. Analog and Digital clock, Handling UI events, List fragment, Dialog fragment.	[10]
<u>UNIT – 04</u>	Menus-Option, Context, Popup, Images-Image View, Image Switcher. Alert Dialog, Alarm manager. SMS, E-mail, Media Player, using camera, recording video, Handling Telephony Manager.	[6]
<u>UNIT – 05</u>	"Storing the data persistently-Data Storage Options: preferences, Internal Storage, External Storage, Content Provider." The SQLite database, Connecting with SQLite database and operations-Insert, Delete, Update, Fetch. Publishing android applications, Deploying APK files.	[10]

COMPUTER HARDWARE & NETWORKING

SUBJECT CODE: 2018502	Theory			No. of period in one session: 42			Credits 03	
	No. of Periods per Week			Full Marks:				100
	L	T	P/S	ESE	:	70		
	03	-	-	T. A	:	10		
				C.T	:	20		

Course Learning Objective:

This course will allow students to develop background knowledge as well as core expertise in computer hardware and networking, which is one of the fastest growing technologies in our culture today. It forms an integral part of the modern Information Technology. Starting from Intranet in small offices to the global Internet, principles of data communication and networking play an important role.

Course Outcomes:

At the end of the course, the students will be able to know:

- Evolution of computer hardware and networking up to the internet
- Principles of computer hardware, channel characteristics, signaling, modulation and encoding
- Various transmission media, their comparative study, fiber optics and wireless communication in details
- Categories and topologies of networks
- OSI model vis-à-vis TCP/IP architecture
- Multiplexing, channel error detection and correction, data link protocols
- Ethernet and token ring, X.25 ATM, BISDN
- Details of IP operations in the INTERNET and associated routing principles
- Operation of optical networks, satellite networks and wireless mobile systems
- Strategies for securing network application using cryptography
- Emerging technologies such as SONET, FDDI, mobile telephony etc.

CONTENTS: Theory		Hrs.
<u>UNIT-01</u>	<p><u>PC Components and System Board:</u> -</p> <p>Hardware used for I/P, O/P & inside computer case, system board components used for communication among devices, Software - 3 types of Software, ROM BIOS, OS, application software, Functions of BIOS, The boot process, POST and important beep codes, Know about different connectors, Types of system boards, The CPU & the chipset – CPU form factor, CPU slots and sockets, Different types of RAM, Buses – ISA, MCA, EISA, USB, Firewire, AGP,PCI, Setting the CPU & Bus speeds, CMOS setup and data protection.</p>	[08]
<u>UNIT – 02</u>	<p><u>Managing Storage devices:-</u></p> <p>Know about Semiconductor Memories – RAM, ROM on System Board, Main Memory – SIMMs, DIMMs, Other RAM Technologies, Hard drives – hard drive technology – IDE, EIDE, SCSI, SATA, Hard drive partitions, Trouble-shooting hard drives & data recovery, Optimizing Hard drive – disk clean-up, disk fragmentation. Disk backup.</p>	[06]

<u>UNIT – 03</u>	<p><u>Troubleshooting Fundamentals:-</u> Troubleshooting tools – Bootable rescue disk, diagnostic software, virus detection software, Anti-Static tools, Trouble-shooting guidelines – Power system, system board, OS & hard drive, Optical drives, keyboard, Monitor and printer problems, Surge protection & battery backup, Stand by UPS, Inline UPS, Line-interactive UPS, and intelligent UPS.</p>	[06]
<u>UNIT – 04</u>	<p><u>Introduction to Networks and LAN components:-</u> Understand the Overview of Networking, State the Need for Networking, Classification of Networks –LAN,MAN,WAN, List the Hardware and Software Components, Various Network Communication Standards, OSI Reference Model, TCP/IP Reference Model, Know about LAN Cables and Connectors, wireless network adapter, Know about Coaxial Cables, Twisted-Pair Cables, Optical Fiber Cables, and Connectors, Explain LAN Devices, Repeaters, Hubs, Switches, Network Interface Cards (NICs), Routers, Modem, Overview of Network Topologies.</p>	[12]
<u>UNIT – 05</u>	<p><u>Network Addressing and Management:-</u> Introduction to Network Addressing, Components of IP Address, IP Address Classes, IP Subnetting, Classify the two types of Internet Protocol addressing IPv4 and IPv6 and state the need for IPv6, explain classful addressing and classless addressing in IPv4, State the need for protocols in computer networks, Hyper Text Transfer Protocol (HTTP), File Transfer Protocol (FTP), Simple Mail Transfer Protocol (SMTP), Telnet.</p>	[10]

OBJECT ORIENTED PROGRAMMING THROUGH C++

SUBJECT CODE: 2018503B	Theory			No. of period in one session: 42			Credits
	No. of Periods per Week			Full Marks:	:	100	03
	L	T	P/S	ESE	:	70	
	03	-	-	T. A	:	10	
				C.T	:	20	

Course Learning Objective

The learning objectives of this course are:

- To understand how C++ improves C with object-oriented features.
- To learn how to write inline functions for efficiency and performance.
- To learn the syntax and semantics of the C++ programming language.
- To learn how to design C++ classes for code reuse.
- To learn how to implement copy constructors and class member functions.
- To understand the concept of data abstraction and encapsulation.
- To learn how to overload functions and operators in C++.
- To learn how containment and inheritance promote code reuse in C++.
- To learn how inheritance and virtual functions implement dynamic binding with polymorphism.
- To learn how to design and implement generic classes with C++ templates.
- To learn how to use exception handling in C++ programs.

CONTENTS: Theory		Hrs.
<u>UNIT – 01</u>	<p><u>Principles of Object Oriented Programming:</u> - Procedure Oriented Programming (POP) Verses Object Oriented Programming (OOP). Basic Concepts of Object-Oriented Programming, Object Oriented languages, Applications of OOP. C versus C++ , Structure of C++ Program, Simple C++ Program. Tokens, Keywords, Variables, Constants, Basic Data Types, User Defined Data Types, Type Casting, Operators, Expressions. Control Structures: Decision making statements & Loops. Scope resolution Operator, Memory Management Operators. Arrays, Strings & Structures in C++.</p>	[08]
<u>UNIT – 02</u>	<p><u>Classes and Objects :-</u> Class & Object: Introduction, specifying a Class, Access Specifier Class, Defining Member Function, Creating Objects, Memory allocation for Objects. Static data members, Static Member Functions, Friend Function. Array of Objects, Object as function Arguments. Concepts of constructors, Type of constructors Multiple constructors in a class, Constructors with Default Arguments. Destructors.</p>	[10]
<u>UNIT – 03</u>	<p><u>Extending Classes using Inheritance:</u> - Introduction to Inheritance, Defying a derived class, Visibility Modes and Effects. Types of Inheritance: Single, Multilevel, Multiple, Hierarchical, Hybrid. Virtual Base Class, Abstract Class, Constructors in Derived Class.</p>	[08]

<p><u>UNIT – 04</u></p>	<p><u>Pointers and Polymorphism in C++ :-</u></p> <p>Concepts of Pointer: Pointer Declaration, Pointer Operator, Address Operator, Pointer Arithmetic.</p> <p>Pointer to Objects: Pointer to Object, this pointer, Pointer to derived class.</p> <p>Introduction to Polymorphism: Function Overloading, Operator overloading, Overloading of Unary & Binary Operator, Rules for Operator Overloading.</p> <p>Run time Polymorphism: Virtual functions, Rules for virtual function, Pure virtual functions.</p>	<p>[10]</p>
<p><u>UNIT – 05</u></p>	<p><u>File Operations: -</u></p> <p>C++ stream Classes, Classes for File stream operations, Opening files, Closing Files, reading from and writing to files. Detection of End of file, File Modes.</p>	<p>[6]</p>

MULTIMEDIA TECHNOLOGY

SUBJECT CODE: 2018504B	Theory			No. of period in one session: 50			Credits
	No. of Periods per Week			Full Marks:	:	100	03
	L	T	P/S	ESE	:	70	
	03	-	-	T. A	:	20	
				C.T	:	10	

Course Learning Objective:

- To identify a range of concepts, techniques and tools for creating and editing the interactive multimedia applications.
- To identify the current and future issues related to multimedia technology.
- To identify both theoretical and practical aspects in designing multimedia systems surrounding the emergence of multimedia technologies using contemporary hardware and software technologies.

CONTENTS: Theory		Hrs
<u>UNIT – 01</u>	<p><u>INTRODUCTION TO COMPUTER GRAPHICS AND MULTIMEDIA:-</u></p> <p>Introduction to multimedia. concepts of animation and simulation. various applications of multimedia in education, research and development, business and games, training, entertainment.</p>	[8]
<u>UNIT – 02</u>	<p><u>MULTIMEDIA SYSTEM AND ITS APPLICATIONS:-</u></p> <p>Sound and Video cards. compression techniques. Memory & Storage devices. Input devices, Output hardware, Communication device. Introduction of Multimedia authoring tools & its types.</p>	[8]
<u>UNIT – 03</u>	<p><u>MULTIMEDIA SOFTWARE:-</u></p> <p>Features of any one of authoring tools such as Macro-media/ Adobe Photoshop/3-D studio/ Paint-Shop Pro/ Animator Pro/ Director and Harvard graphics.</p>	[8]
<u>UNIT – 04</u>	<p><u>INTRODUCTION TO VIRTUAL REALITY:-</u></p> <p>Basic Concepts of virtual reality.</p>	[6]
<u>UNIT – 05</u>	<p><u>MULTIMEDIA SYSTEM AND ITS APPLICATIONS: -</u></p> <p>Music & Sound: Audio basic concepts, Analog and Digital concepts, MIDI hardware, MIDI file. Sound- editing process. Audio file format, MIDI versus digital. Audio, Video: Basic concepts, Analog Video & Digital Video, Video capture & editing, Video file format. Text & Images: Introduction, file format.</p>	[12]

- A) Course Code : 2000505C / 2000508C / 2000511C
 B) Course Title : Internet of Things (Basic)
 C) Pre- requisite Course(s) : Digital Electronics, Electronics Circuits, Fundamentals of Computers and Computer networks

D) Rationale:

The Internet of Things (IoT) is the upcoming field that has the capability to connect everything on the earth. This course focuses on the development of IoT concepts such as sensing, actuation with implementation of communication protocols.

The course also focuses on real life aspects of IoT and how to integrate it in real life projects. The course will simplify the concept of IoT by using the Node MCU board for IoT application development. In this course students will learn about the use of Node MCU and its applications as a beginner/intermediate in the field of IoT. Apart from this, students will learn about the APIs, by using which integration of features like send Email, WhatsApp messages and notification based on certain events in projects is possible. Overall, this course covers both hardware and software aspects of IoT with practical exposure.

- E) **Course Outcomes (COs):** After the completion of the course, teachers are expected to ensure the accomplishment of following course outcomes by the learners. For this, the learners are expected to perform various activities related to three learning domains (Cognitive, Psychomotor and Affective) in classroom/ laboratory/ workshop/ field/ industry.

After completion of the course, the students will be able to-

- CO-1 Describe the functions of each block of the basic IoT system
- CO-2 Explain communication protocol used in IoT and its applications
- CO-3 Use appropriate sensors for the specific measurement through the IoT platform
- CO-4 Explain APIs, client-server connections and its integration in real life applications.
- CO-5 Build and test a complete, working IoT system involving prototyping, programming, and data analysis

F) **Suggested Course Articulation Matrix:**

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes (PSOs) (if any)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO-1	3	-	-	-	-	-	-			
CO-2	1	2	2	2	2	-	-			
CO-3	1	3	2	2	2	2	2			
CO-4	1	1	2	3	-	2	2			
CO-5	1	1	3	2	2	3	3			

Legend: High (3), Medium (2), Low (1) and No mapping (-)

G) Scheme of Studies:

CourseCode	CourseTitle	Scheme of Studies (Hours/Week)					
		Classroom Instruction (CI)		Lab Instruction (LI)	Notional Hours (SW+SL)	Total Hours (CI+LI+SW+SL)	Total Credits(C) (CI+LI+SW+SL)
		L	T				
2000505 C / 2000508 C / 2000511C	Internet of Things (Basic)	02	-	04	02	08	05

Legend:

CI: Classroom Instruction (Includes different instructional/implementation strategies i.e. Lecture (L), Tutorial (T), Case method, Demonstrations, Video demonstration, Problem based learning etc. to deliver theoretical concepts)

LI: Laboratory Instruction (Includes experiments/practical performances in laboratory, workshop, field or other locations using different instructional/Implementation strategies)

Notional Hours: Hours of engagement by learners, other than the contact hours for ensuring learning.

SW: Sessional Work/Term work (includes assignments, seminars, micro projects, industrial visits, any other student activities etc.)

SL: Self Learning, MOOCs, spoken tutorials, open educational resources (OERs)

C: Credits = (1 x CI hours) + (0.5 x LI hours) + (0.5 x Notional hours)

Note: SW and SL have to be planned by the teacher and performed by the learner under the continuous guidance and feedback of teacher to ensure outcome of learning.

H) Scheme of Assessment:

Course Code	Course Title	Scheme of Assessment (Marks)						Total Marks (TA+SWA+LA)
		Theory Assessment (TA)		Sessional Work Assessment (SWA)		Lab Assessment (LA)		
		Progressive Theory Assessment (PTA)	End Theory Assessment (ETA)	Progressive Sessional Work Assessment (PSWA)	End Sessional Work Assessment (ESWA)	Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)	
2000505 C / 2000508 C / 2000511C	Internet of Things (Basic)	30	70	20	30	20	30	200

Legend:

PTA: Progressive Theory Assessment in class room (includes class test, mid-term test and quiz using online/offline modes)

PLA: Progressive Laboratory Assessment (includes process and product assessment using rating Scales and rubrics)

SWA: Sessional Work/Term work & Self Learning Assessment (Includes assessment related to student performance in self learning, assignments, Seminars, micro projects, industrial visits, any other student activities etc.)

Note: Separate passing is must for progressive and end semester assessment for both theory and practical.

Theory: 100 marks

Practical 50 marks

I) Course Curriculum Detailing:

This course curriculum detailing depicts learning outcomes at course level and session level and their attainment by the students through Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW) and Self Learning (SL). Students are expected to demonstrate the attainment of Theory Session Outcomes (TSOs) and Lab Session Outcomes (LSOs) leading to attainment of Course Outcomes (COs) upon the completion of the course. While curriculum detailing, NEP 2020 related reforms like Green skills, Sustainability, Multidisciplinary aspects, Indian Knowledge System (IKS) and others must be integrated appropriately.

J) Theory Session Outcomes (TSOs) and Units: [2000505C]

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
<p>TSO.1.a. Describe the concept of IoT.</p> <p>TSO.1.b. Explain the functions of each block of the Basic IoT system.</p> <p>TSO.1.c. Compare features of various IoT platforms</p> <p>TSO.1.d. List IoT Real time Applications.</p> <p>TSO.1.e. Describe the functioning of given real-time applications</p>	<p>Unit-1.0 Introduction to IoT</p> <p>Basics of IoT, concepts of IoT, History of IoT</p> <p>Basic IoT System and its building blocks</p> <p>Various platforms for IoT (e.g. AWS, AZURE, GCP)</p> <p>Introduction to Python programming and IoT software</p> <p>Applications of IoT</p>	<p>CO-1 and CO-5</p>
<p>TSO.2.a. Explain various communication protocols.</p> <p>TSO.2.b. Explain working and application of blue tooth</p> <p>TSO.2.c. Explain working and application of ZigBee</p> <p>TSO.2.d. Explain working and application of LoRa</p> <p>TSO.2.e. Explain working and application of Wi-fi</p>	<p>Unit 2. IoT Communication protocols</p> <p>Basics of given communication protocol along with its applications</p> <p>Explain Communication Protocols</p> <p>MQTT</p> <p>Bluetooth Low Energy</p> <p>ZigBee</p> <p>LoRa</p> <p>Wi-fi</p>	<p>CO-1 and CO2</p>
<p>TSO.3.a. Differentiate between sensor and Actuator.</p> <p>TSO.3.b. Classify IoT sensors on the basis of their application.</p> <p>TSO.3.c. Describe the function of each block of Node MCU.</p> <p>TSO.3.d. Explain the procedure to connect sensors with Node MCU.</p>	<p>Unit-3.0 Sensors and Hardware for IoT</p> <p>Sensors and Actuators, Transducers, Classifications of sensors, IoT Sensors Development Boards, classifications, and basics of wireless networks, WiFi libraries</p> <p>Introduction to node MCU, block diagram, functions, interfacing with sensors and publishing data on webserver</p> <p>Device integration with node MCU</p> <p>Interfacing of sensors with boards</p>	<p>CO-1, CO-3 and CO-5</p>
<p>TSO.4.a. Define APIs and its uses</p> <p>TSO.4.b. Explain working and application of REST.</p> <p>TSO.4.c. Explain working and application of SOAP</p> <p>TSO.4.d. Explain working and application of json</p> <p>TSO.4.e. Explain the integration of API in IoT application development.</p>	<p>Unit.4 IoT APIs and its Integration</p> <p>Explain APIs and its use</p> <p>Explanation of given IoT APIs along with its applications</p> <p>MQTT, Broker, subscriber, publisher</p> <p>REST</p> <p>SOAP</p> <p>4.5 JSON</p> <p>4.6 Programming API using Python</p>	<p>CO-1 and CO-4</p>

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
TSO.5.a. Differentiate between industrial IoT and IoT. TSO.5.b. Describe the applications of IoT in the medical field. TSO.5.c. Describe the medical applications of IoT in the agriculture field. TSO.5.d. Describe the innovative IoT applications.	Unit. 5 IoT Applications: - Industrial IoT and Internet of everything IoT for consumer electronics products IoT for Medical applications IoT for Agriculture IoT for security and Law enforcement	CO-1 and CO-5

Note:One major TSO may require more than one Theory session/Period.

K) Laboratory (Practical) Session Outcomes (LSOs) and List of Practical [2000508 C]

Practical/Lab Session Outcomes (LSOs)	S. No.	Laboratory Experiment/Practical Titles	Relevant COs Number(s)
LSOs 1.1 List various IoT platforms. List Down broad features of given platforms. List IoT based features in python language.	1.	Prepare a list of platforms used for IoT. Prepare a list of features of above IoT platforms. Prepare a list of features provided by python language for IoT applications.	CO-1
LSOs 2.1 Arduino connection with Arduino IDE. Connect Bluetooth with Arduino. verification of data communication with Bluetooth.	2.	Establish connectivity between various components of IoT. Establish connection between Arduino and Bluetooth module. Establish connection using WiFi	CO-2
LSO 3.1 Measure the temperature of the given sensor. LSO 3.2 Measure the humidity of the given sensor. LSO 3.3 Measure the pressure of the given sensor.	3.	Publish data on the IoT platform. Measure the temperature of a remotely located temperature sensor Using IOT based temperature data-monitoring system. Measure the humidity of a remotely located humidity sensor Using IOT based humidity data-monitoring system. Measure the pressure of a remotely located pressure sensor Using IOT based pressure data-monitoring system.	CO-3
LSO 4.1 Working with APIs. LSO 4.2 Implementation of APIs using POSTMAN Application.	4	Download and Configure POSTMAN Application Verify REST APIs through POSTMAN. Verify JSON APIs through POSTMAN. Verify SOAP APIs through POSTMAN.	CO-4
LSO 5.1 Identification of components for various applications. LSO 5.2 Estimate the cost for components.	5.	Identify components for given project Estimate the cost to make Project working.	CO-5

L) Sessional Work and Self Learning: [2000511C]

a. **Assignments:** Questions/Problems/Numerical/Exercises to be provided by the course teacher in line with the targeted COs.

b. Micro Projects:

1. Prepare a report on IoT Systems using Internet data.
2. Market survey to identify various types of IoT sensors and its pricing.
3. Interface IR sensor with Arduino and send the data to Arduino cloud.
4. Send IoT data using Node MCU to things Speak cloud.
5. Interface Bluetooth module with Arduino and send data using the Bluetooth module.

c. Other Activities:

1. Seminar Topics: - “Future of IoT”
“Technologies for IoT”, “Smart City and IoT”
2. Visit to industry for latest IoT setup in industrial process.
3. Surveys of market for availability of various types of sensors and its pricing.
4. Product Development: Development of projects for real life problem solution using IoT.
5. Software Development: various open source platform operations.

6. Self-learning topics:

1. IoT hardware and their use for various applications
2. IoT sensors technical specifications
3. IoT enabled services

M) Course Evaluation Matrix: The course teacher has to decide and use appropriate assessment strategy and its weightage in theory, laboratory and sessional work for ensuring CO attainment. The response/performance of each student in each of these designed activities is to be used to calculate **CO attainment**.

COs	Course Evaluation Matrix						
	Theory Assessment (TA)**		Sessional Work Assessment (SWA)			Lab Assessment (LA)#	
	Progressive Theory Assessment (PTA) Class/Mid Sem Test	End Theory Assessment (ETA)	Sessional Work & Self Learning Assessment			Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)
			Assignments	Micro Projects	Other Activities*		
CO-1	10%	10%	20%	--	33%	10%	20%
CO-2	15%	10%	20%	--	33%	15%	20%
CO-3	30%	30%	20%	--	34%	15%	20%
CO-4	20%	30%	20%	50%	--	30%	20%
CO-5	25%	20%	20%	50%	--	30%	20%
Total Marks	30	70	20	20	10	20	30
			50				

Legend:

* : Other Activities include self learning, seminar, visits, surveys, product development, software development etc.

** : Mentioned under point- (N)

: Mentioned under point-(O)

Note: For indirect assessment of COs, Course exit survey can be used which comprises of questions related to achievement of each COs.

N) Specification Table for End Semester Theory Assessment: The course teacher has to decide and use appropriate assessment strategy and its weightage in theory, laboratory and sessional work for ensuring CO attainment. The response/performance of the student in each of these designed activities is to be assessed to calculate CO attainment.

Unit Title and Number	Relevant COs Number(s)	Total Marks	ETA (Marks)		
			Remember (R)	Understanding (U)	Application & above (A)
Unit-1.0. Introduction to IoT	CO-1	5	3	2	-
Unit-2.0. IoT Communication protocols	CO-2	9	4	3	2
Unit-3.0. Sensors and Hardware for IoT	CO-3	19	5	6	8
Unit-4.0 IoT APIs and its Integration	CO-4	19	5	5	9
Unit-5.0. IoT Applications	CO-5	18	3	6	9
Total Marks		70	20	22	28

Note: Similar table can also be used to design class/mid-term/ internal question paper for progressive assessment.

O) Specification Table for Laboratory (Practical) Assessment:

SN	Laboratory Practical Titles	Relevant COs Number(s)	PLA/ELA		
			Performance		Viva-Voce (%)
			PRA (%)	PDA (%)	
1.	Prepare a list of platforms used for IoT.	CO-1	60	30	10
2.	Prepare a list of features of above IoT platforms.	CO-1	60	30	10
3.	Prepare a list of features provided by python language for IoT applications.	CO-1	60	30	10
4.	Establish connectivity between various components of IoT.	CO-2	60	30	10
5.	Establish connection between Arduino and Bluetooth module.	CO-2	60	30	10
6.	Establish connection using WiFi	CO-2	70	20	10
7.	Publish data on the IoT platform.	CO-3	70	20	10
8.	Measure the temperature of a remotely located temperature sensor Using IOT based temperature data-monitoring system.	CO-3	60	40	10
9.	Measure the humidity of a remotely located temperature sensor Using IOT based temperature data-monitoring system.	CO-3	60	40	10
10.	Measure the pressure of a remotely located temperature sensor Using IOT based temperature data-monitoring system.	CO-3	60	40	10
11.	Publish the data using Mqtt	CO-4	60	30	10
12.	Download and Configure POSTMAN Applications	CO-4	60	30	10
13.	Verify REST APIs through POSTMAN.	CO-4	60	30	10
14.	Verify JSON APIs through POSTMAN.	CO-4	60	30	10
15.	Verify SOAP APIs through POSTMAN.	CO-4	60	30	10
16.	Identify components for given project	CO-5	50	40	10
17.	Estimate the cost to make Project working.	CO-5	50	40	10

Note: This table can be used for both end semester as well as progressive assessment of practical. Rubrics need to be prepared by the course teacher for each experiment/practical to assess the student performance.

Computer Hardware & Networking Lab

SUBJECT CODE: 2018506	Practical			No. of period in one session:			Credits 01
	No. of Periods per Week			Full Marks:	:	25	
	L	T	P/S	Internal (PA)	:	07	
	-	-	02	External (ESE)	:	18	

Course Learning Objective:

Platform Used (In case of Software & Hardware):

1. Client Machines (Computers with windows / Linux and latest configuration) with Printer: Laser jet.
2. Network Tool kit: clamping, crimping tool, network tester, line tester .
3. Network Accessories: RJ 45, UTP cable, T connector, Optical Fiber, Coaxial Cable, Modem, various connectors, 1000Mbps NIC.
4. UPS system 6KVA online.
6. Router, Repeater, Bridges: Latest configuration.
7. Computer Hub 8/ 16 node with console port.
8. Modem – Latest configuration.
9. Ethernet Switch 4/8/16/24/32.
10. LAN Cable (CAT6, CAT5). Coaxial Cable, UTP Cable, STP Cable, Fiber Optic Cable.
11. Firewall with high security and high storage.
12. MS office latest version.
11. Antivirus Software (online protection with firewall securities).
12. RS 232 cable and connector.

Course Outcomes:

1. Maintain wired computer network topologies.
2. Use the relevant network model for the specified data communication system.
3. Maintain relevant transmission medium and modem for data transmission.
4. Analyze error detection/correction and flow control of data in the data network.
5. Configure the network component and assign IP address.

CONTENTS : Practical		Hrs.	Marks
<u>UNIT – 01</u>	Identify motherboard components	[04]	
<u>UNIT – 02</u>	RAM identification, removal, installation.	[03]	
<u>UNIT – 03</u>	CMOS setup.	[03]	
<u>UNIT – 04</u>	Print a summary of your system Hardware.	[03]	
<u>UNIT – 05</u>	Upgrading memory.	[03]	
<u>UNIT – 06</u>	Hard drive, optical drive installation.	[03]	
<u>UNIT – 07</u>	How to recover lost data on hard drive.	[03]	
<u>UNIT – 08</u>	Trouble shooting keyboard ,monitor, printer- a) few keys do not work. b) keyboard does not work at all. c) key continuous to repeat after being released. d) key produces wrong character. e) Power light (led) does not go on, no picture. f) Power LED light is on no picture power up . g) Power on but monitor display wrong character.	[03]	
<u>UNIT – 09</u>	Printer Problems 9.1 laser printer: a) Printer never leaves warm-up mode. b) Paper Jam message is displayed	[04]	

	c) Printed messages are distorted 9.2 DMP a) Print head moves back and forth but nothing prints. b) Print self test works but printing from a computer application does not work etc.,		
<u>UNIT – 10</u>	Installation of operating system	[03]	
<u>UNIT – 11</u>	Installation of Network card.	[03]	
<u>UNIT – 12</u>	Preparing the UTP cable for cross and direct connections using crimping tool.	[03]	
<u>UNIT – 13</u>	Installation of a switch and connecting systems to a network switch.	[03]	
<u>UNIT – 14</u>	Installation of a modem (internal, external or USB) and connecting to internet.	[03]	
<u>UNIT – 15</u>	Using FTP for uploading and downloading files.	[03]	
<u>UNIT – 16</u>	Installation and configuring the proxy server for internet access.	[03]	

OBJECT ORIENTED PROGRAMMING THROUGH C++ Lab

SUBJECT CODE: 2018507B	Practical			No. of period in one session: 40			Credits
	No. of Periods per Week			Full Marks :			02
	L	T	P/S	Internal (PA) :			
	-	-	04	External (ESE) :			
			25				
			07				
			18				

Course Learning Objective

The learning objectives of this course are:

- To understand how C++ improves C with object-oriented features.
- To learn how to write inline functions for efficiency and performance.
- To learn the syntax and semantics of the C++ programming language.
- To learn how to design C++ classes for code reuse.
- To learn how to implement copy constructors and class member functions.
- To understand the concept of data abstraction and encapsulation.
- To learn how to overload functions and operators in C++.
- To learn how containment and inheritance promote code reuse in C++.
- To learn how inheritance and virtual functions implement dynamic binding with polymorphism.
- To learn how to design and implement generic classes with C++ templates.
- To learn how to use exception handling in C++ programs.

CONTENTS : Theory		Hrs.	Marks
<u>UNIT – 01</u>	Programming exercise on executing a Basic C++ Program.	[05]	
<u>UNIT – 02</u>	Programming Exercise on Control Statement (if-else, elseif ladder)	[05]	
<u>UNIT – 03</u>	Programming exercise on loop Control Statement (for, while, do-while)	[05]	
<u>UNIT – 04</u>	Programming exercise on Function.	[05]	
<u>UNIT – 05</u>	Programming exercise on creating classes and their object.	[05]	
<u>UNIT – 06</u>	Programming exercise to demonstrated constructor and destructor.	[05]	
<u>UNIT – 07</u>	Programming exercise on operator overloading.	[05]	
<u>UNIT – 08</u>	Programming exercise to illustrate concept of Inheritance.	[05]	

Multimedia Technology Lab.

SUBJECT CODE: 2018508B	Practical			No. of period in one session: 50			Credits 02
	No. of Periods per Week			Full Marks :			
	L	T	P/S	Internal (PA)	:	20	
	-	-	04	External (ESE)	:	30	

Course Objective: Creation of Web page using Integrated Development Environments.

CONTENTS : Practical		Hrs.	Marks
<u>UNIT – 01</u>	Create web page using structure tags to display sample message	[04]	
<u>UNIT – 02</u>	Create a web page for displaying a paragraph using block level tags, HR tags	[04]	
<u>UNIT – 03</u>	Create a web page for implementing different types of Lists	[04]	
<u>UNIT – 04</u>	Create a web page to link- a) A different web page of same site. b) A different location on the same web page c) A specific location on different web page of same site.	[04]	
<u>UNIT – 05</u>	Insert images on web page using various attributes	[04]	
<u>UNIT – 06</u>	Create a web page to implement Frame tags, Tables tags	[04]	
<u>UNIT – 07</u>	Create a web page for demonstration of CSS by applying V 06* Internal/External/ Inline style	[03]	
<u>UNIT – 08</u>	Install a web server and publish a website on Intranet and publish it on internet.	[04]	
<u>UNIT – 09</u>	Design a Visiting Card containing at least one graphic and text information	[03]	
<u>UNIT – 10</u>	You are given a picture of a garden as background. Extract the image of a butterfly from another picture and organize it on the background.	[04]	
<u>UNIT – 11</u>	Shape Distortion: Create a square and gradually convert it into a circle	[04]	
<u>UNIT – 12</u>	Spotlight: Create a text on one layer; format the text with suitable size, color and style. With the help of another layer, position a spotlight on the text and move the spotlight from left to right.	[04]	
<u>UNIT – 13</u>	"Simulation of a Raindrop: In the first layer, draw a raindrop that falls on the ground. Show the splash effect, when it touches the ground on another layer."	[04]	

SUMMER INTERNSHIP (6 WEEKS) AFTER IV SEMESTER

Subject Code 2018509	Term Work			No of Period in one session:			Credits
	No. of Periods Per Week			Full Marks			
	L	T	P/S	Internal (PA)	:	15	02
	—	—	4 week	External (ESE)	:	35	