Bangabandhu Sheikh Mujibur Rahman Digital University, Bangladesh

Department of Information & Communication Technology

Lab Syllabus for

B.Sc (Engg.) in Internet of Things

Session: 2018-19; 2019-20; 2020-21

Table of Contents

YEAR I: SEMESTER I

HUM 4104	Communicative English Language Lab	**Credit 1.50**	**Credit Hour: 3hr/week**
Date of Course Design:		**Designed By:**	
Required Tools: CALL Softwares and Sound Systems, Computer			

Week 1	Communication and the barriers in communication
Week 2	Introducing the receptive and productive skills, Public speaking
Week 3	Introducing and how to address different situations
Week 4	Tips for presentation development
Week 5	Practice sessions :group work, pair work and individual presentation
Week 6	Speech giving
Week 7	Listening and barriers of listening
Week 8	Practice sessions from the exercises
Week 9	Practice sessions from the exercises
Week 10	Reading, types of reading with exercises
Week 11	Practice session on reading
Week 12	Practice sessions on reading
Week 13	Writing Academic Report and different Practice sessions

Week 14	Final presentation and Report Submission

PHY 4102	Applied Physics Lab	**Credit 1.50**	**Credit Hour: 3hr/week**
Date of Course Design:		**Designed By:**	
Required Tools:			

Week 1	To determine the resistance of a galvanometer by half deflection method and to find its figure of merit.
Week 2	To convert the galvanometer (of known resistance and figure of merit) into a voltmeter of desired range (say 0 to 3v) and to verify the same.
Week 3	To measure the length of rod with vernier calipers.
Week 4	To measure the diameter of a piece of wire with screw gauge and to find its average section.
Week 5	To convert the given galvanometer (of known resistance and figure of merit) into an ammeter of a desired range (say 0 to 30 mA) and verify the same.
Week 6	Review class
Week 7	Lab test-1
Week 8	To verify that current and voltage are directly proportional using a constant resistor.
Week 9	Observe how a capacitor can be charged and discharged in an RC circuit
Week 10	Observe how an LR circuit works.
Week 11	Observe how an LC circuit works.

Week 12	Observe how an LRC circuit works.
Week 13	Practice Class
Week 14	Review Class

ICT 4142	Introduction to Programming Lab	**Credit 1.50**	**Credit Hour: 3hr/week**
Date of Course Design:		**Designed By:**	

Required Software Tools: Codeblocks/Turbo C

Language: C

Week 1	Editors, IDEs, Elementary Programming
Week 2	Control Statement-1
Week 3	Control Statement-2
Week 4	Control Statement-3
Week 5	Functions, Input and Output statements
Week 6	Arrays

Week 7	Character and Strings
Online Test-1	
Week 8	Pointers
Week 9	Pointers
Week 10	Structure
Week 11	Structure and Union
Week 12	Data Files
Week 13	Low Level Programming
Week 14	Review
Online Test-2	

YEAR I: SEMESTER II

HUM 4106	ব্যবহারিক বাংলা ল্যাব	**Credit 1.50**	**Credit Hour: 3hr/week**
Date of Course Design:		**Designed By: Mohammad Mamun Or Rashid**	
Required Tools:			

Week 1	বর্ণপরিচিতি ও প্রাক-প্রস্তুতি : বাংলা ধ্বনি, বর্ণ ও অক্ষর পরিচয়, যুক্তবণ, কোর্স সম্পর্কে ধারণা ও বরফ-গলা পর্ব
Week 2	বাংলা লেখা (সৃজনশীল) : গল্প লেখা, স্মৃতিকথা লেখা, প্রতিবেদন লেখা এক হাজার শব্দের মধ্যে সৃজনশীল রচনা লিখন, পাঁচশ শব্দের সংবাদ প্রতিবেদন রচনা
Week 3	বাংলা লেখা (নিয়মকানুন) : বর্ণ, বানান, প্রমিত বানানরীতি, বিরাম চিহ্ন, বাক্যে অশুদ্ধি বাংলা একাডেমি প্রমিত বানান-রীতি পাঠ করা, ভুল বানান শুদ্ধকরণ, বিরাম চিহ্ন বসানো, বাক্য শুদ্ধিকরণ, প্রফ দেখা অনুশীলন , কুইজ
Week 4	বাংলা লেখা (তথ্যপ্রযুক্তি) : কম্পিউটারে বাংলা, ওয়ার্ড ও পাওয়ার পয়েন্টে বাংলা লখো, কিবোর্ডের মাধ্যমে যুক্তবর্ণসহ কম্পিউটার কম্পোজ ও পেইজমেকিং
Week 5	বাংলা বলা : আঞ্চলিকতা ও প্রমিত উচ্চারণ, বাংলা উচ্চারণরীতি, নির্বাচিত শব্দতালিকা সবার অঞ্চলের নামপ্রকাশ, প্রমিত উচ্চারণ ও আবৃত্তির নিয়ম, উচ্চারণের জন্য গুরুত্বপূর্ণ শব্দের তালিকা পাঠ
Week 6	রিভিউ ক্লাস
Week 7	কুইজ,অ্যাসাইনমেন্ট
Week 8	বাংলা বলা : উপস্থিত বক্তৃতা, বিতর্ক, সংবাদপাঠ ও উপস্থাপনা মুক্ত বক্তৃতা, বিতর্ক: সামাজিক গণমাধ্যমের পক্ষে-বিপক্ষে প্রভৃতি
Week 9	বাংলা পঠন (আনন্দপাঠ) : ছোটগল্প, নিবন্ধ, ভ্রমণ তারা তিনজন- বুদ্ধদেব বসু, অযান্ত্রিক সুবোধ ঘোষ, মুজতবা আলী- দেশে বিদেশে
Week 10	বাংলা পঠন (তথ্যপ্রযুক্তি) : সংলাপ তৈরি, পদ-প্রকরণ বাছাই, ভুল বাক্য-শুদ্ধ বাক্য তৈরি ভাষিক গঠন অনুধাবন, আইসিটির সঙ্গে বাংলা ভাষার নির্ভরতা, এনএলপি
Week 11	বাংলা শ্রবণ : কবিতা, শ্রুতিনাটক, পডকাস্ট অডিও রবীন্দ্রনাথ ঠাকুরের নির্ঝরের স্বপ্নভঙ্গ, জসীম উদ্দীনের কবর; আবার আসিব ফিরে, রাজা ঔদিপৌস
Week 12	বাংলা শ্রবণ : প্রমিত ভাষায় তৈরি চলচ্চিত্র, ভিডিও দেখা

Week 13	প্রেজেন্টেশন (গ্রুপ ভিত্তিক)
Week 14	প্রেজেন্টেশন (গ্রুপ ভিত্তিক)

ICT 4254	Data Structure and Algorithm Lab	**Credit: 1.5**	**Credit Hour: 3hr/week**
Date of Course Design:		**Designed By:**	

Required Software Tools: Codeblocks/Turbo C/Eclipse
Language: C/c++

Week 1	Array: Traverse, Insertion, Deletion; Searching: Linear Search, Binary Search
Week 2	Sorting: Bubble sort, Insertion sort, Selection Sort
Week 3	Divide and Conquer: Merge Sort
Week 4	Greedy: Fractional Knapsack problem, Activity Selection Problem
Week 5	Dynamic Programming: 0-1 Knapsack Problem, Longest Common Subsequence
Week 6	Operations on Linked List: Creation, Insertion, Deletion, Traversal
Week 7	Review Class/Online Test 1
Week 8	Stack

Week 9	Queue
Week 10	Recursion, Sorting: Quick sort, Heap Sort
Week 11	Tree Implementation: BST, MST, Huffman Tree
Week 12	Graph Implementation: BFS, DFS, Topological Sorting, SCC
Week 13	Graph: Single source Shortest Path: Dijkstra's Algorithm, All Pairs Shortest Path: Floyd Warshall's Algorithm
Week 14	Review Class/ Online Test 2

PHY 4104	Introduction to Electronic Devices, Circuits and Machine Lab	**Credit: 1.5**	**Credit Hour: 3hr/week**
Date of Course Design:November 01, 2022		Designed By: **Dr. Md. Sazzadur Rahman**	
Required Tools:			

Week 1	Characteristics of pn junction diode
Week 2	Characteristics of Zener diode
Week 3	Hands on training on oscilloscope

Week 4	Implementation of half-wave & full-wave rectifiers
Week 5	Implementation of bridge rectifier
Week 6	Implementation of different filter with full-wave rectifier to reduce the ripple factor
Week 7	Implementation of clipper circuit
Week 8	Implementation of clamper circuit
Week 9	Input and output characteristics of npn transistor under common emitter configuration.
Week 10	Ohm's law verification and it’s applications
Week 11	Verification of Norton’s theorem
Week 12	Verification of superposition theorem
Week 13	Analysis of electrical circuit’s networks
Week 14	Review Lab

YEAR II: SEMESTER I

IoT 4212	Sensor Technology Lab	**Credit: 1.5**	**Credit Hour: 3hr/week**
Date of Course Design: 10th October, 2021		**Designed By:**	
Required Software Tools: Arduino IDE, Thonny **Languages:** Arduino Programming in C, Python			

Week 1	Sensors, Actuators, Microcontroller and Microprocessor: Identifying components and sensors from characteristics features.
Week 2	Simulation with sensor and actuator using simulation environment.
Week 3	Digital Read and Write using Button, LED and Buzzer. Using the tinkercad interface count 0 to 63 using a set of leds and Arduino.
Week 4	Analog Read and Write using Photoresistor and LED Sensor.
Week 5	Calibrate Color Sensor and read RGB values from it using TCS 3200 sensor.
Week 6	Measure the temperature and humidity with the am2301 humidity sensor (DHT21)
Week 7	Project Proposal Submission
Week 8	Detect the movement/motion using Passive Infrared Sensor and Arduino.
Week 9	A. Write a message on LCD Display with Arduino UNO and LCD (16 x 2) display. B. Measure the temperature and humidity with the AM2301 humidity sensor (DHT21) and display it on the LCD monitor.
Week 10	Sonar Sensor interfacing with arduino and display the output to LCD
Week 11	Install the Raspbian Operating System to the Raspberry PI.
Week 12	Write LED and Buzzer using Python Programming in Raspberry PI.

Week 13	Technical Writing tools, Review Class and Quiz.
Week 14	Final Project Submission

ICT 4252	Object Oriented Programming Lab	**Credit: 1.5**	**Credit Hour: 3hr/week**
Date of Course Design: 7th November, 2021		**Designed By:**	

Required Software Tools: PyCharm/Jupyter Notebook/Netbeans
Language: Python/Java/C++

Week 1	Demonstrate the basic concepts of problem solving in object-oriented paradigm. Discuss about Variables, Data types, Operators, Control statements etc.
Week 2	Classes and Objects: Introducing class and object, constructors, destructors, and understanding class members and their properties.
Week 3	Methods: Implementing the concepts of methods.
Week 4	UML Modeling notations for class, Encapsulation applications and data hiding,
Week 5	Inheritance; demonstrate case studies based on real-life problems.
Week 6	Inheritance; demonstrate case studies based on real-life problems.
Week 7	Online Test 1
Week 8	Working with polymorphism: operator overloading, demonstrate case studies based on real-life problems.
Week 9	Working with polymorphism: operator overloading, demonstrate case studies based on real-life problems.
Week 10	Abstract classes, data abstraction.

Week 11	Working with Files.
Week 12	Exceptions and Error Handling
Week 13	Review class
Week 14	Online Test 2

ICT 4254	Database Management System Lab	**Credit: 1.5**	**Credit Hour: 3hr/week**
Date of Course Design: 7th November, 2021		**Designed By:**	

Required Software Tools: MySQL php myadmin, Apache web server; /Oracle/ Microsoft SQL server
Language: Structured Query Language (SQL)

Week 1	Conceptual Designing using ER Diagrams (Identifying entities, attributes, keys, and relationships between entities, cardinalities, generalization, specialization, etc.) Case study: Student Information System Library Management System/Banking System/ Payroll System
Week 2	Converting ER Model to Relational Model (Represent entities and relationships in Tabular form, represent attributes as columns, identifying keys)
Week 3	Normalization -To remove the redundancies and anomalies in the above relational tables, Normalize up to the Third Normal Form

Week 4	Creation of Tables using SQL- Overview of using SQL tool, Data types in SQL. Practicing DDL Commands: Create, Alter, Drop Creating Tables (along with Primary and Foreign keys), Altering Tables, Truncating and Dropping Tables.
Week 5	Practicing DML commands- Insert, Select, Update, Delete; Understanding Constraints- NOT NULL, Unique, check, primary key, foreign key, integrity constraints.
Week 6	Understanding the concept of administrative commands (Managing Users): - Create User, Delete User, Managing Passwords Practicing DCL Commands: Grant, Revoke; Views creation, and dropping.
Week 7	Practicing Queries using any, all, in, exists, not exists. Implementation of different types of operators in SQL: Arithmetic Operators, Logical Operators, Comparison Operator, Special Operator Set operations (UNION, INTERSECT).
Week 8	Practicing Sub queries (Nested, Correlated) and Joins (Inner, Outer, natural and Equi),
Week 9	Practice Queries using Inbuilt functions and aggregate functions (COUNT, SUM, AVG, MAX, MIN), Group by, having. Indexing.
Week 10	Study and Implementation of Database Backup & Recovery Commands; Practicing MySQL Transaction- Commit, Savepoint, Rollback.

Week 11	Practicing Triggers – the creation of trigger, Insertion using the trigger, Deletion using the trigger, Updating using trigger
Week 12	MySQL Database Connection using PHP
Week 13	NoSQL database
Week 14	Project Preparation; Submission;

YEAR II: SEMESTER II

IoT 4214	Microcontroller and Interfacing IoT Lab	**Credit: 1.5**	**Credit Hour: 3hr/week**
Date of Course Design: 3rd April, 2022		**Designed By:**	
Required Software Tools: Arduino IDE, Processing IDE **Languages:** Arduino Programming in C			

Week 1	Introduction to Arduino (Design a system to demonstrate a street traffic system).
Week 2	Connecting Arduino to Processing (Sending data from Arduino to Processing, Receiving data from Arduino in Processing, Sending data from Processing to Arduino, Receiving data from Processing in Arduino, Interfacing Arduino Uno, Ultrasonic sensor and Processing).
Week 3	Interfacing Photoresistor with Arduino (Interfacing Arduino Uno with LDR sensor and

	Buzzer, Smart Street Lights Using LDR and Ultrasonic Sensor).
Week 4	Turbidity Sensor with Arduino and LCD display for water quality monitoring.
Week 5	4x4 Keypad Interfacing with Arduino UNO (Password-based Door Lock Security System Using Arduino & Keypad). **Project Idea Submission.**
Week 6	Calculator with Arduino & LCD 16×2.
Week 7	**Presentation on Project Proposal**
Week 8	Simple Digital Voltmeter with an Arduino.
Week 9	Arduino Push Button Counter using LCD.
Week 10	Turn on and Off a Lamp Clapping Twice Using Arduino.
Week 11	IoT Controlled LED using ESP32 with Blynk App.
Week 12	7 Segment Display Interfacing with Arduino.
Week 13	Arduino Hardware and Software Interrupt Programming.
Week 14	Review Class and Project Submission.

ICT 4256	Data Communication and Networks Lab	Credit: 1.5	Credit Hour: 3hr/week
Date of Course Design: 4th April, 2022		**Designed By:**	
Required Software Tools: Cisco Packet Tracer			

Week 1	Installation of Cisco packet tracer, basic introduction of the software workspace and network devices.
Week 2	Working principle of Switch, Hub, Repeater, Bridge and Router.
Week 3	Topology Implementation: Bus, Mesh, Star, Ring, Tree, Hybrid.
Week 4	Physical Implementation of TIA/EIA-568-A, T-568B RJ45 Wiring Standard for cross-over and Straight Through RJ-45 cables.
Week 5	Implementation of Static and Dynamic Routing: Routing Information Protocol using Cisco Packet Tracer.
Week 6	Implementation of Dynamic Routing: EIGRP, OSPF routing Protocol using Cisco Packet Tracer.
Week 7	Implementation of Wireless LAN configuration using Cisco Packet Tracer.
Week 8	Lab Test-1
Week 9	Implementation of Basic IP phone configuration using Cisco Packet Tracer.
Week 10	Configuration of TELNET using Cisco packet Tracer.
Week 11	Configuration of Secure Shell (SSH) using Cisco Packet Tracer.
Week 12	Implementation of IPv4 - Subnetting.
Week 13	Basic IOT Devices Simulation using Cisco Packet Tracer.

Week 14	Connect and Monitor IoT Devices using Cisco Packet Tracer.

ICT 4258	Web Application Engineering Lab	**Credit: 1.5**	**Credit Hour: 3hr/week**
Date of Course Design: 3rd April, 2022		**Designed By:**	

Required Software Tools: Visual Studio/ Notepad++/Sublime Text; MySQL php myadmin, Apache web server, Xampp;

Weeks	**Experiments**
Week 1	HTML 5: Image, Hyperlinks, List, Nested Lists, Tables (rowspan, colspan), Audio, Video, flat icon, iframe, embed object
Week 2	HTML5: Forms
Week 3	CSS: Box model, Padding, Margin, Float, Position, Overflow, Z-index, Color
Week 4	CSS: Grid System/column layout(2,3,4 column), Animation, Font
Week 5	JavaScript: variable, function, loop, array
Week 6	JavaScript: Date, DOM, JS objects/json, event handling
Week 7	PHP: Insert, view (MySQL connection)
Week 8	PHP: Delete, Edit;

Week 9	PHP
Week 10	Introduction to AJAX/jQuery
Week 11	JS charts from MySQL data
Week 12	Version Control System: Introduction to Git & Github
Week 13	Final Project Preparation
Week 14	Final Project Submission

ICT 4260	Operating Systems Lab	**Credit: 1.5**	**Credit Hour: 3hr/week**
Date of Course Design: 3rd April, 2022		**Designed By:**	

Application Software: Codeblocks, VMware
Operating Systems: Linux, Windows

Week 1	Title: Shell Script Commands Outline: Shell, Navigation, Exploring the System, Manipulating Files and Directories.
Week 2	Title: Shell Script Commands Outline: File Permission, Searching for Files, Text Processing, and Processes.
Week 3	Title: Shell Script Commands Outline: Shell script commands: Redirection, Network, Achieving, and Backup.

Week 4	Title: Basic Shell Programming Outline: Writing first script, Variable and Constants, Top Down design, and Flow control with if.
Week 5	Title: Shell Programming Outline: Looping with while, for; Branching with the case, etc.
Week 6	Title: Shell Programming Outline: String, Numbers and Arrays
Week 7	Title: Scheduling algorithms I Outline: First Come First Serve (FCFS), Shortest Job First (SJF),
Week 8	Title: Scheduling algorithms II Outline: Priority Scheduling, Round Robin
Week 9	Title: Process Synchronization Outline: Producer Consumer Problem
Week 10	Title: Memory management scheme and Page Replacement Outline: Best Fit, First Fit, Worst Fit
Week 11	Title: Memory management scheme and Page Replacement Outline: Segmentation, Paging
Week 12	Title: Page Replacement algorithm Outline: First In First Out (FIFO), Least Recently Used (LRU), Optimal Page Replacement
Week 13	Title: Deadlock and Deadlock Prevention Outline: Bankers Algorithm and Analysis
Week 14	Mini Project: Operating System Design

YEAR III: SEMESTER I

ICT 4352	Programming Embedded System Lab	Credit: 1.5	Credit Hour: 3hr/week
Date of Course Design: 3rd April, 2022		**Designed By:**	

Required Software Tools: Arduino IDE, Raspbian OS/Noobs/Linux based OS, Thonny IDE.
Language: Python, Modified C++.

Weeks	Experiments
Week 1	Study different types of microcontroller board. (Arduino nano, uno, mega, esp32, esp 8266). Interfacing the boards with LCD.
Week 2	Study and differentiate between different versions of Raspberry Pi. Installation of operating systems (NOOBS/Raspbian OS) for Raspberry-Pi and blink a LED; LED Fading.
Week 3	Understanding the connectivity of Raspberry-Pi circuit withAM2301/DHT11/DHT21.
Week 4	A. Understanding the connectivity of Raspberry-Pi circuit with IR sensor. Write an application to detect obstacles and notify users using LEDs. B. Simulate any of the following activities (only simulation is required) i. Smart dustbin. ii. Line follower robot. iii. Control Air conditioner iv. Energy saving smart street light

Week 5	A. Interface Raspberry Pi with servo motor. B. Simulate any of the following activities. i. Smart Garage Gate using IR sensor, Servo motor, Buzzer and Raspberry pi ii. Smart Toll Tax System. iii. Control Servo motor from Webpage. iv. Automatic Door Opening System using Servo v. Smart dustbin with servo motor, IR Sensor, and Raspberry pi.
Week 6	A. Interface Raspberry Pi with stepper motor B. Simulate one of the projects according to your own choice using Raspberry-Pi and stepper motor. i. Detect object and operate stepper motor accordingly ii. Web controlled stepper motor.
Week 7	Working with Pi Camera Module (Image Capture, Video Capture).
Week 8	A. Build a motion detection system with a Raspberry Pi. B. Develop a real time application on- Smart Security and surveillance system using PIR motion sensor and pi camera.
Week 9	A. Interface Relay and a Buzzer with Raspberry pi. B. Interface Raspberry pi with 4*4 or 4*3 interface keyboard. Whenever a key is pressed, it should be displayed on LCD using Arduino Uno. C. Simulate a real time project- Password Based Door Lock Security System Using 4*4 keypad and raspberry pi.
Week 10	A. Interface LED with Raspberry pi using Wiring Pi GPIO Interface library. B. Control LED from the web using raspberry pi. C. Create a simple web interface for Raspberry-Pi to control connected LEDs remotely through the interface.

	i. IoT based Weather Station: Wirelessly Monitoring Temperature and Relative humidity. ii. Web controlled smart home.
Week 11	A. RFID and Raspberry Pi integration using MQTT. B. Complete the projects: (At least 2) i. RFID based attendance system using MYSQL and Raspberry Pi. ii. RFID based Door Lock system. iii. Parking System Using RFID and Raspberry Pi.
Week 12	Review Lab, Quiz Test, Project Preparation (Groupwise; Member: 2-3 Students)
Week 13	Project Presentation(Groupwise; Member: 1-2 Students)
Week 14	Project Submission (Groupwise; Member: 1-2 Students)

ICT 4354	Software Engineering Lab	**Credit: 1.5**	**Credit Hour: 3hr/week**
Date of Course Design: 3rd April, 2022		**Designed By:**	
Required Software Tools: For diagrams: Draw.io, Visual Paradigm; Coding: NetbeansIDE/Codeblocks / Visual Studio Code; Project management tool: Jira; Database: MySQL; API: JDBC			

Languages: Java

Week 1	Problem Analysis and Project Planning – Identify Project scope, Objectives and Infrastructure of a particular project.
Week 2	Do requirement analysis and develop Software Requirement Specification Sheet (SRS) in line with the IEEE recommended standards for the project.
Week 3	Develop data flow diagrams (DFD) model (level-0, level-1 DFD and Data dictionary) and ER diagram of the project (Use of a CASE tool required).
Week 4	Perform the user's view analysis: Use case diagram and draw the structural view diagram: Class diagram, Object diagram. (Use of a CASE tool required).
Week 5	Draw the behavioral view diagram: Sequence diagram, Activity diagrams (Use of a CASE tool required).
Week 6	Learn about Project Management Tools for Software Development.
Week 7	Learn about software project development using Java.
Week 8	Add interface to the class diagram and implement the design by coding.
Week 9	Implementation of MVC framework in software development using Java.
Week 10	Creating GUI Using Java Swing.
Week 11	Java Database Connectivity with MySQL.
Week 12	Learn how to design test cases of a software project. Perform various techniques for testing using a testing tool.
Week 13	Project assessment and Presentation feedback (Groupwise; Member: 1-2 Students)
Week 14	Project assessment and Presentation feedback (Groupwise; Member: 1-2 Students)

IoT 4312	Wireless Communication for IoT Lab	**Credit: 1.5**	**Credit Hour: 3hr/week**
Date of Course Design: 3rd April, 2022		Designed By:	

Required Software Tools: Arduino IDE
Languages: Arduino Programming in C

Week 1	Interfacing DHT21 sensor with ESP32/ESP8266 wireless microcontroller.
Week 2	Interfacing DHT21 sensor and LCD monitor with ESP32/ESP8266 wireless microcontroller.
Week 3	Test the Wi-Fi Library Functions with ESP32/ESP8266 wireless microcontroller.
Week 4	Interfacing Flame/Gas Sensor with ESP32/ESP8266 wireless microcontroller.
Week 5	Actuator Control with Blynk server and NodeMCU (ESP8266) using Mobile/Web interface.
Week 6	Implement the Client-Server Wi-Fi Communication with NodeMCU (ESP8266).
Week 7	Project Proposal Submission
Week 8	Interfacing RFID wireless sensor with any microcontroller.
Week 9	Interfacing DHT21 sensor with Arduino microcontroller using Bluetooth module.
Week 10	Interfacing IR Transmitter and Receiver Arduino microcontroller.
Week 11	Interfacing any sensor/actuator with the Zigbee module.
Week 12	GPS Module Interfacing with NodeMCU ESP8266.
Week 13	Review Class and Quiz
Week 14	Final Project Submission

YEAR III: SEMESTER II

ICT 4362	Artificial Intelligence Lab	**Credit: 1.5**	**Credit Hour: 3hr/week**
Date of Course Design: November 01, 2022		Designed By:	

Required Software Tools: Pycharm/Google Colaboratory/Jupyter/Visual Studio Code
Languages: Python

Week 1	Blind Search: Breadth-First Search, Depth-First Search
Week 2	Blind Search: Uniform Cost Search, Depth-Limited Search, Iterative Deepening Search
Week 3	Heuristic Search: Greedy Best First Search, A*Search
Week 4	Heuristic Search: Recursive best-first search and Simplified Memory Bounded A*
Week 5	Local Search: Simulated Annealing, Hill Climbing
Week 6	Adversarial Search, Mini-Max Algorithm, Alpha-Beta Pruning
Week 7	Review/Test

Week 8	Logic Programming, Logical Inference; Rule-based programming
Week 9	Uncertainty: Bayes Theorem, Bayesian Belief Network
Week 10	Planning: STRIPS
Week 11	Genetic Algorithm implementation using Python.
Week 12	Perceptron Learning Algorithm using Python.
Week 13	Game Planning
Week 14	Review/Test

IoT 4314	Data Science Lab	**Credit: 1.5**	**Credit Hour: 3hr/week**
Date of Course Design: November 01, 2022		Designed By:	
Required Software Tools: Jupyter/Google Colaboratory/Pycharm/Visual Studio Code Languages: Python			

Week 1	Numpy Array
Week 2	Data handling with pandas.

Week 3	Visualization methods
Week 4	Data cleaning and curating; Project Idea
Week 5	Similarity dissimilarity measures; Project Idea finalization
Week 6	Regression problems: Linear Regression, Logistic Regression
Week 7	Classifications: Decision Tree, Naive Bayes Classifier,
Week 8	Classifications: SVM, Classification by using frequent pattern
Week 9	Clustering: K-means, BIRCH; Project Review
Week 10	Clustering: DBSCAN, Clique
Week 11	Outliers; Project Review
Week 12	Hadoop Basics
Week 13	Hadoop Map Reduce
Week 14	Project Evaluation

IoT 4316	Real Life Application of IoT Lab	Credit: 1.5	Credit Hour: 3hr/week
Date of Course Design:November 01, 2022		Designed By:	

Required Software Tools: Arduino IDE, Matlab
Languages: Arduino Programming in C, Python

Week 1	Smart Home: 1. IoT based Web Controlled Home Automation using Raspberry Pi 2. Automate Entry With an Arduino RFID Door Lock 3. Set Up Blynk to Control Your IoT Devices From Your Phone 4. Smart Gas Leakage Detector Bot 5. IOT Theft Detection Using Raspberry Pi 6. Log Temperature Sensor Data to Google Sheet using NodeMCU ESP8266- https://circuitdigest.com/microcontroller-projects/log-temperature-sensor-data-to-google-sheet-using-nodemcu-esp8266 7. Sending Temperature and Humidity sensor data to Firebase Real-Time Database using NodeMCU ESP8266- https://circuitdigest.com/microcontroller-projects/sending-temperature-and-humidity-data-to-firebase-database-using-esp8266 8. How to Build NodeMCU Webserver and control an LED from a Webpage- https://circuitdigest.com/microcontroller-projects/build-a-nodemcu-webserver-to-control-led-from-webpage 9. Smart Wi-Fi Video Doorbell using ESP32 and Camera- https://circuitdigest.com/microcontroller-projects/diy-smart-wifi-video-doorbell-using-esp32-and-camera References: 1. https://www.makeuseof.com/tag/budget-smart-home-projects/ 2. https://nevonprojects.com/iot-theft-detection-using-raspberry-pi/

Week 2	Smart Health: 1. **Web-centric children's diabetic management system**. (Pulse oximeter, Blood Pressure, Body Weight Sensor) 2. **Community based IoT personalized health care system**. (Diagnostic Reader, LoRA Radio, Disposal Key Kit, Diagnostic Flow Strips) 3. IOT Based Person/Wheelchair Fall Detection- https://nevonprojects.com/iot-based-personwheelchair-fall-detection/
Week 3	Smart Health:
Week 4	Smart Transportation: Intelligent transportation system (ITS) 1. Adaptive traffic signals (IR, PIR, Motion, Pi, Pi-Camera, LCD,) 2. Smart pedestrian safety
Week 5	Smart City: 1. Parking solutions 2. Smart corridors 3. IOT Based Toll Booth Manager System- https://nevonprojects.com/iot-based-toll-booth-manager-system/
Week 6	1. Smart Agriculture: 2. IoT based Smart Agriculture & Automatic Irrigation System, 3. Smart Farming.

	4. (Temperature and humidity sensor, Air Quality/gas sensor, Light sensor, Soil moisture sensor, Barometric pressure sensor, GSM module, LCD display, DHT11/DHT21, Node MCU, Motor Pump)
Week 7	Smart Environment: 5. IoT based Smart Waste Management System. https://www.pantechsolutions.net/iot-based-smart-waste-management-system-for-smart-city 6. IoT based Air Pollution Monitoring System https://circuitdigest.com/microcontroller-projects/iot-air-pollution-monitoring-using-arduino 7. Automation using IOT in Greenhouse Environment- https://www.irojournals.com/itdw/V1/I1/05.pdf https://www.projectsof8051.com/iot-based-greenhouse-monitoring-and-control-system-project/ 8. IOT Based Greenhouse Environment Monitoring and Controlling System using Arduino Platform- https://ieeexplore.ieee.org/document/8342795 9. IOT Energy Meter with Current, Voltage and Cost Monitoring System- https://nevonprojects.com/iot-energy-meter-with-current-voltage-and-cost-monitoring-system/
Week 8	Industrial IoT: Smart Supply Chain: Real-time location-tracking, Inventory tracking, Storage condition monitoring,
Week 9	Smart Grid: IoT based Smart Grid System using Arduino Hardware • Arduino UNO • Nodemcu ESP8266 • Signal Condition Board • Current Transformer • Power Transformer

	• LCD 16×2 or 20 x 4 • Load Software • Arduino IDE • Orcad Design • Android App https://www.pantechsolutions.net/iot-based-smart-grid-system-using-arduino
Week 10	Smart Retail 1. Smart Shelves 2. Asset Tracking 3. Supply Chain & Logistics https://behrtech.com/blog/smart-retail-8-innovative-examples-of-iot-in-retail/
Week 11	Smart Education: 1. Smart Attendance Monitoring System using IoT
Week 12	1. How to install Windows 10 IoT Core on Raspberry Pi- https://circuitdigest.com/microcontroller-projects/how-to-install-windows-10-iot-core-on-raspberry-pi
Week 13	Project
Week 14	Project Submission
References:	

1. https://www.projectpro.io/article/top-20-iot-project-ideas-for-beginners-in-2021/428
2. https://circuitdigest.com/microcontroller-projects?page=3
3.

YEAR IV: SEMESTER I

IoT 4412	Mobile Platform for IoT Devices Lab	**Credit: 1.5**	**Credit Hour: 3hr/week**
Date of Course Design:November 01, 2022		Designed By:	
Required Software Tools: Android Studio Languages: Java/C++			

Week 1	Develop an application that uses GUI components, Font and Colors
Week 2	Develop an application that uses Layout Managers and event listeners.
Week 3	Develop a native calculator application.
Week 4	Write an application that draws basic graphical primitives on the screen.
Week 5	Develop an application that makes use of databases.
Week 6	Develop an application that makes use of RSS Feed.

Week 7	Develop an application to blink LEDs.
Week 8	Develop a native application that uses GPS location information.
Week 9	Implement an application that writes data to the SD card.
Week 10	Implement an application that creates an alert upon receiving a message.
Week 11	Write a mobile application that creates an alarm clock.
Week 12	Project
Week 13	Project Preparation
Week 14	Project Submission

ICT 4400	Thesis/Project	**Credit 1.50**	**Credit Hour: 3hr/week**
Date of Course Design:		**Designed By:**	
Required Tools:			
The students of department of ICT, BDU are instructed to focus on the following points during their B.Sc thesis proposal presentation: 1. Problem Statement: A clear definition of the problem at hand with examples and illustrations is expected.			

2. Present State/Literature: A brief literature review, i.e., the present state of the problem is expected.

3. Limitations of current state of the art (if any): If there is any limitation of the current state of the art, it must be discussed.

4. Objectives and Outcomes: The objectives and the outcomes must be spelled out clearly.

5. Methodology: The methodology to conduct the research must be discussed. If some progress has already been made, this can be presented briefly. For experimental work the description of experimental setup including datasets must be presented.

6. Presentation: The presentation skill of the student will be judged. The timing will be strict and he will be stopped abruptly when the time is up and the members may evaluate only based on what has been presented. Currently, the timing has been set to 15 minutes.

7. Q&A performance: The ability to handle the Q&A will be judged here.

Reference:

- https://www.cs.swarthmore.edu/~newhall/thesis_guide.html