SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
(Engineering College), VIDISHA M.P.
(An Autonomous Institute Affiliated to RGPV Bhopal)
DEPARTMENT OF CS & IT

Semester/Year		VI/III	Program		B.Tech – Internet of Things
Subject Category	DC	Subject Code:	IoT 2061	Subject Name	Automata and Compiler Design

Maximum Marks Allotted						Contact Hours			Total Credits
Theory			Practical		Total Marks				
ES	MS	Quiz/Assignment	ES	LW		L	T	P	
70	20	10			100	3	0	0	3

Prerequisites:

Formal Languages and Automata Theory, Graph Theory.

Course Objective:

- This course aims at introducing the major concepts of language translation and phases of compiler, besides the techniques used in each phase
- The purpose of this course is to acquaint the student with an overview of the theoretical foundations of computer science from the perspective of formal languages.

UNITs	Descriptions	Hrs.
I	Introduction: Alphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition table, Language of DFA, Nondeterministic finite Automata (NFA), Equivalence of NFA and DFA, Minimization of Finite Automata, Regular Expressions, Arden's theorem.	8
II	Compiler Structure: Compilers and Translators, Various Phases of Compiler, Symbol Table management Error Detection and Recovery, Pass Structure of Compiler, Bootstrapping of Compiler. Lexical Analysis. The Syntactic Specification of Programming Languages: CFG, Chomsky hierarchy, Derivation and Parse tree, Ambiguity, Capabilities of CFG.	8
III	Basic Parsing Techniques: Top-Down parsers with backtracking, Recursive Descent Parsers, Predictive Parsers. Bottom–up Parsers, Shift-Reduce Parsing, Operator Precedence Parsers, LR parsers (SLR, Canonical LR, LALR) Syntax Analyzer Generator: YACC.	8
IV	Intermediate Code Generation: Different Intermediate forms: three address code, Quadruples & Triples. Syntax Directed translation mechanism and attributed definition. Translation of Declaration, Assignment, and Control flow, Boolean expression, Array References in arithmetic expressions, procedure calls, case statements, postfix translation.	8
V	Run Time Memory Management: Static and Dynamic storage allocation, stack based memory allocation schemes. Code Optimization and Code Generation: Local optimization, Loop optimization, Peephole optimization, Basic blocks and flow graphs, DAG, Data flow analyzer, Machine Model, Order of evaluation, Register allocation and code selection.	8
Total Hours		40

Course Outcomes:

CO1: Explain finite state machines for modeling and their power to recognize the languages.
CO2: Understand the functionality of parsing mechanisms.
CO3: Construct syntax trees and generate intermediate code
CO4: Understand the concepts of storage administration for different programming environments.
CO5: Understand the concepts of optimization and generate the machine code..

Text Book

1. Louden, "Compiler construction", Cengage learning.

Reference Books

1. Alfred V Aho, Jeffrey D. Ullman, "Principles of Compiler Design", Narosa.
2. A.V. Aho, R. Sethi and J.D Ullman, "Compiler: principle, Techniques and Tools", AW.

3. Michal Sipser, “Theory of Computation”, Cengage learning. □ H.C. Holub, “Compiler Design in C”, Prentice Hall Inc.
4. Hopcroft, Ullman, “Introduction to Automata Theory, Languages and Computation”, Pearson Education.
5. K.L.P. Mishra and N.Chandrasekaran, “Theory of Computer Science : Automata, Languages and Computation”,PHI

List/Links of e-learning resource

- https://nptel.ac.in/courses/106105190

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	2	3	3	2	2							3	2	2
CO-2	2	2	3	2								2		
CO-3	2	2	3	2	1							2	2	2
CO-4	3	3	1									1	2	
CO-5	3	3	3	2	3									

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	
Subject handled by department	Department of CS & IT

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DEPARTMENT OF CS & IT

Semester/Year		VI/III	Program		B.Tech – Internet of Things
Subject Category	DE	Subject Code:	IoT 2062 (DE – 1A)	Subject Name	Introduction to IoT Development Boards

Maximum Marks Allotted						Contact Hours			Total Credits
Theory			Practical		Total Marks				
ES	MS	Quiz/Assignment	ES	LW		L	T	P	
70	20	10	30	20	150	3	0	2	4

Prerequisites:

Microprocessor and Microcontroller

Course Objective:

- To give students hands-on experience using different IoT architectures.
- To provide skills for interfacing sensors and actuators with different IoT architectures.
- To develop skills on data collection and logging in the cloud.

UNITs	Descriptions	Hrs.
I	**Introduction to Embedded Systems:** Definition of System &Embedded System, Embedded Systems Vs General Computing Systems, Architecture of Embedded Systems: Hardware & software, Design and Development Process, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.	**6**
II	Introduction to Digital Sensor: Temperature, Gas, IR, Ultrasound, Soil Moisture, PIR Sensor, Sound Sensor, RGB LED, Photo resistor etc.	8
III	Arduino Uno – Getting started with the Uno boards, Pin Diagram and Architecture, programming and connection of sensors to the Uno board, reading values of sensors from the Uno board.	8
IV	ESP 8266-12E Node MCU – Getting started with the ESP board, Pin Diagram and architecture. Micropython and IDE, Flushing the ESP8266 board with micropython, connecting sensors to the ESP board and its programming. Connecting ESP board to WiFi, Interfacing ESP with the Cloud (REST APIGET, POST, MQTT).	10
V	Raspberry Pi - R-Pi introduction of the board, pin diagram, architecture and its features. R-Pi programming and Interfacing with different sensors.	8
Total Hours		40

Course Outcomes:

CO 1: To know basics of development boards.
CO2: To know about the Arduino board and its interfacing with various components.
CO 3: To know about the ESP 8266 board and its interfacing with various components.
CO4: To know about the Raspberry Pi architecture. .
CO5: To know about the Raspberry Pi and its interfacing with various components.

Text Book

1. Dr. Jeeva Jose, Internet of Things, Khanna Publishing House
2. Rao, M. (2018). Internet of Things with Raspbery Pi 3: Leverage the power of Raspberry Pi 3 and JavaScript to build exciting IoT projects. Packt Publishing Ltd
3. Baichtal, J. (2013). Arduino for beginners: essential skills every maker needs. Pearson Education
4. Schwartz, M. (2016). Internet of Things with ESP8266. Packt Publishing Ltd.

Reference Books

1. Richardson, M., & Wallace, S. (2012). Getting started with raspberry PI. " O'Reilly Publisher

Media, Inc."

List/Links of e-learning resource

- https://onlinecourses.nptel.ac.in/noc20_ee98/preview

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	2	1	2										1	2
CO-2	3	2	2	1									1	2
CO-3	3	2	2	1									2	1
CO-4	3	2	2	1									2	1
CO-5	2	2	1										1	1

Suggestive list of experiments:

1.IR OBSTACLE SENSOR- If object is detected pin 13 will go high (onboard LED ON) and "object detected" message will be displayed in serial monitor If object is not detected pin 13 will go low (onboard LED OFF) and "object not detected" message will be displayed in serial monitor.

2. GAS SENSOR- If Gas is detected pin 13 will go high (onboard LED ON) and "gas detected" message will be displayed in serial monitor If Gas is not detected pin 13 will go low (onboard LED OFF) and "gas not detected" message will be displayed in serial monitor.

3. FIRE SENSOR- If FIRE is detected pin 13 will go high (onboard LED ON) and "FIRE detected" message will be displayed in serial monitor If FIRE is not detected pin 13 will go low (onboard LED OFF) and "FIRE not detected" message will be displayed in serial monitor.

4. RELAY SHIELD- Controlling relay shield from serial monitor.

5. GSM SHIELD- If GAS is detected pin 7 will go LOW and "GAS detected" message will be sent to destination number.

6. Analog to Digital and PHOTORESISTOR- light-dependent resistor (LDR), the photo resistor adjusts its resistance according to the light received from the environment. It works not only with sunlight, but also with artificial light. Now lets see how we can integrate it to the real world.

7. Interfacing of DHT11.

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Semester/Year		VI/III	Program		B.Tech – Internet of Things
Subject Category	DE	Subject Code:	IoT 2062 (DE – 1B)	Subject Name	Soft Computing

Maximum Marks Allotted						Contact Hours			Total Credits
Theory			Practical		Total Marks				
ES	MS	Quiz/Assignment	ES	LW		L	T	P	
70	20	10	30	20	150	3	0	2	4

Prerequisites:

NA

Course Objective:

- Develop the skills to gain a basic understanding of neural network theory and fuzzy logic theory.
- Introduce students to artificial neural networks and fuzzy theory from an engineering perspective

UNITs	Descriptions	Hrs.
I	Soft Computing: Introduction of soft computing, soft computing vs. hard computing, various types of soft computing techniques, applications of soft computing. Neural Network : Structure and Function of a single neuron: Biological neuron, artificial neuron, Difference and characteristics and applications of ANN, Evolution of Neural Networks, Basic Models of Artificial Neural Network, Important Terminologies of ANNs, McCulloch-Pitts Neuron model. Widrow & Hebbs learning rule/Delta rule.	8
II	Supervised Learning Network Introduction, Perception Networks, Back-Propagation Network, Radial Basis Function Network, Time Delay Neural Network Single layer network, Perceptron training algorithm, Linear separability, , ADALINE, MADALINE. Introduction of MLP, Error back propagation algorithm and its applications	8
III	Unsupervised Learning Networks Introduction, Fixed Weight Competitive Nets, Kohonen Self-Organizing Maps, Adaptive Resonance Theory (ART 1,ART 2): Architecture, classifications, Implementation and training Counter propagation network, architecture, functioning & characteristics of counter Propagation network, Hopfield/ Recurrent network, configuration, stability constraints, associative memory, Hopfield v/s Boltzman machine. Associative Memory.	8
IV	Fuzzy Logic: Fuzzy set theory, Fuzzy set versus crisp set, Crisp & fuzzy relations, Fuzzy systems: crisp logic, fuzzy logic, , Predicate Logic, introduction & features of membership functions, Fuzzy rule base system: Defuzzification Methods,Fuzzification ,fuzzy propositions, formation, decomposition & aggregation of fuzzy rules, fuzzy reasoning, fuzzy inference systems, fuzzy decision making & Applications of fuzzy logic.	8
V	Genetic algorithm : Fundamentals of Genetic Algorithms History, Basic Concepts, Creation of Offsprings, Working Principle, working principle, encoding, fitness function, reproduction,	8

	Genetic modelling: Inheritance operator, cross over, inversion & deletion, mutation operator, Bitwise operator, Generational Cycle, Convergence of GA, Applications & advances in GA, Differences & similarities between GA& other traditional method.	
Total Hours		40

Course Outcomes:

CO-1: Describe neural network, list the models of NN, and relate them
CO-2: Discuss perception, back propagation networks and explain MLP, its applications
CO-3: Illustrate about architecture, classification, functioning and characteristics of network
CO-4: Compare, explain fuzzy logic, fuzzy systems & categorize applications
CO-5: Design genetic algorithms applications

Text Book

1. Neural Network, Fuzzy logic,and Genetic Algortihms Synthesis and Applications, S.Rajsekaran ,G.A VijayalakshmiPai

Reference Books

1. Neural Networks: A Comprehensive Foundation (2nd Edition), Simon Haykin, Prentice Hall.
2. Elements of artificial neural networks by Kishan Mehrotra, Chilukuri K. Mohan and Sanjay Ranka.
3. Neural networks and fuzzy systems by Bart Kosko, Prentice Hall of India.
4. Fundamentals of artificial neural networks by Mohammad H. Hassoun, Prentice Hall of India.

List/Links of e-learning resource

- https://archive.nptel.ac.in/courses/106/105/106105173/

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	2	1	2										1	2
CO-2	3	2	2	1									1	2
CO-3	3	1	2	1									1	2
CO-4	3	1	2	1										2
CO-5	2	2	1										1	2

Suggestive list of experiments:

1. Create a perceptron with appropriate number of inputs and outputs. Train it using fixed increment learning algorithm until no change in weights is required. Output the final weights
2. Write a program to implement artificial neural network without back propagation. Write a program to implement artificial neural network with back propagation.
3. Implement Union, Intersection, Complement and Difference operations on fuzzy sets. Also create fuzzy relation by Cartesian product of any two fuzzy sets and perform max-min composition on any two fuzzy relations.
4. Implement travelling sales person problem (tsp) using genetic algorithms.
5. Plot the correlation plot on dataset and visualize giving an overview of relationships among data on soya bins data. Analysis of covariance: variance (ANOVA), if data have categorical variables on iris data.
6. Implement linear regression and multi-regression for a set of data points
7. Implement crisp partitions for real-life iris dataset
8. Write a program to implement Hebb's rule Write a program to implement Delta rule.
9. Write a program to implement logic gates.
10. Implement svm classification by fuzzy concepts.

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Approval by Academic council on	
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Subject handled by department	Department of CS & IT

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DEPARTMENT OF CS & IT

Semester/Year		VI/III	Program		B.Tech – Internet of Things
Subject Category	DE	Subject Code:	IoT 2063 (DE – 2A)	Subject Name	Web Engineering

Maximum Marks Allotted						Contact Hours			Total Credits
Theory			Practical		Total Marks				
ES	MS	Quiz/Assignment	ES	LW		L	T	P	
70	20	10	30	20	150	3	0	2	4

Prerequisites:

Course Objective:

- Understand the characteristics of web applications
- Learn to Model web applications
- Be aware of Systematic methods
- Be familiar with the testing techniques for web applications

UNITs	Descriptions	Hrs.
I	**Introduction To Web Engineering And Requirements Engineering**, Motivation, Categories of Web Applications, Characteristics of Web Applications, Product-related Characteristics, Usage related Characteristics, Development-related Characteristic, Evolution of web engineering – Requirements Engineering Activities RE Specifics in Web Engineering, Principles for RE of Web Applications, Adapting RE Methods to Web Application Development, Requirement Types, Notations, Tools	8
II	**Web Application Architectures & Modelling Web Applications:** Introduction- Categorizing Architectures, Specifics of Web Application Architectures, Components of a Generic Web Application Architecture, Layered Architectures, 2-Layer Architectures, N-Layer Architectures Data-aspect Architectures, Database-centric Architectures, Architectures for Web Document Management, Architectures for Multimedia Data Modeling Specifics in Web Engineering, Levels, Aspects, Phases Customization, Modeling Requirements, Hypertext Modeling, Hypertext Structure Modeling Concepts.	8
III	**Web Application Design** Introduction, Web Design from an Evolutionary Perspective, Information Design, Software Design: A Programming Activity, Merging Information Design and Software Design, Problems and Restrictions in Integrated Web Design, A Proposed Structural Approach, Presentation Design, Presentation of Nodes and Meshes, Device-independent Development, Approaches, Inter action Design, User Interaction User Interface Organization, Navigation Design, Designing a Link Representation, Designing Link Internals, Navigation and Orientation, Structured Dialog for Complex Activities, Interplay with Technology and Architecture, Functional Design.	8

IV	**TESTING WEB APPLICATIONS** Introduction, Fundamentals, Terminology, Quality Characteristics, Test Objectives, Test Levels, Role of the Tester, Test Specifics in Web Engineering, Test Approaches, Conventional Approaches, Agile Approaches, Test Scheme, Three Test Dimensions, Applying the Scheme to Web Applications, Test Methods and Techniques, Link Testing, Browser Testing, Usability Testing, Load, Stress, and Continuous Testing, Testing Security, Test-driven Development, Test Automation, Benefits and Drawbacks of Automated Test, Test Tools.	8
V	**WEB PROJECT MANAGEMENT** Understanding Scope, Refining Framework Activities, Building a Web Team, Managing Risk, Developing a Schedule, Managing Quality, Managing Change, Tracking the Project. Introduction to node JS – web sockets.	8
Total Hours		40

Course Outcomes:

CO-1: Understand and apply the characteristics of web applications by requirements engineering.
CO-2: Categorizing web architecture and model web applications.
CO-3: Design and development of web applications.
CO-4: Applying various test on web applications.
CO-5: Scope and utility of web project management.

Text Book

1.Gerti Kappel, Birgit Proll, "Web Engineering", John Wiley and Sons Ltd.

Reference Books

1. Roger S. Pressman, David Lowe, "Web Engineering", Tata McGraw Hill Publication.
2. Guy W. Lecky-Thompson, "Web Programming", Cengage Learning.
3. Chris Bates, "Web Programming: Building Internet Applications", Third Edition, Wiley India Edition.
4. John Paul Mueller, "Web Development with Microsoft Visual Studio 2005", Wiley Dream Tech.

List/Links of e-learning resource

- https://nptel.ac.in/courses/106105084

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	2	1	2										1	2
CO-2	3	2	2	1									1	2
CO-3	3	2	2	1									1	2
CO-4	3	2	2	1										2
CO-5	2	2	1										1	2

Suggestive list of experiments:

1. Design the following static web pages required for an online book store web site. 1) HOME PAGE: The static home page must contain three frames. 2) LOGIN PAGE 3) CATOLOGUE PAGE: The catalogue page should contain the details of all the books available in the web site in a table. 4) REGISTRATION PAGE
2. Write JavaScript to validate the following fields of the Registration page. 1. First Name (Name should contains alphabets and the length should not be less than 6 characters). 2. Password (Password should not be less than 6 characters length). 3. E-mail id (should not contain any invalid and must follow the standard pattern name@domain.com) 4. Mobile Number (Phone number should contain 10 digits only). 5. Last Name and Address (should not be Empty).

3. Develop and demonstrate the usage of inline, internal and external style sheet using CSS
4. Develop and demonstrate JavaScript with POP-UP boxes and functions for the following problems: a) Input: Click on Display Date button using onclick( ) function Output: Display date in the textbox b) Input: A number n obtained using prompt Output: Factorial of n number using alert c) Input: A number n obtained using prompt Output: A multiplication table of numbers from 1 to 10 of n using alert d) Input: A number n obtained using prompt and add another number using confirm Output: Sum of the entire n numbers using alert
5. Write an HTML page that contains a selection box with a list of 5 countries. When the user selects a country, its capital should be printed next in the list. Add CSS to customize the properties of the font of the capital (color, bold and font size).
6. Write an HTML page including any required JavaScript that takes a number from text field in the range of 0 to 999 and shows it in words. It should not accept four and above digits, alphabets and special characters.
7. Develop and demonstrate PHP Script for the following problems: a) Write a PHP Script to find out the Sum of the Individual Digits. b) Write a PHP Script to check whether the given number is Palindrome or not
8. Create an XML document that contains 10 users information. Write a Java Program, which takes User Id as input and returns the user details by taking the user information from XML document using DOM parser or SAX parser.

Recommendation by Board of studies on	
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Subject handled by department	Department of CS & IT

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DEPARTMENT OF CS & IT

Semester/Year		VI/III	Program		B.Tech – Internet of Things
Subject Category	DE	Subject Code:	IoT 2063 (DE – 2B)	Subject Name	Computer Graphics

Maximum Marks Allotted						Contact Hours			Total Credits
Theory			Practical		Total Marks				
ES	MS	Quiz/Assignment	ES	LW		L	T	P	
70	20	10	30	20	150	3	0	2	4

Prerequisites:

Basic Knowledge of Matrix, 2-dimensional & 3-dimensional concepts**.**

Course Objective:

- Understand the basic concepts of computer graphics and its applications.
- Apply and analyze the algorithms to draw graphics output primitives.
- Apply and create 2-D & 3-D transformation on various objects.

UNITs	Descriptions	Hrs.
I	Basic of Computer Graphics, Applications of computer graphics, Display devices, Cathode Ray Tube, quality of phosphors, CRTs for color display, beam penetration CRT, The Shadow - Mask CRT, Direct View Storage Tube, LED and LCD. Graphics input devices, Graphics software and standards.	8
II	Output primitives, attributes of output primitives, point and line style, color and intensity, Area filling algorithms, Scan line algorithm, boundary fill & flood fill algorithm, Antialiasing techniques, Line drawing- various algorithms and their comparison, circle generation - Bresenham's midpoint circle drawing algorithm.	8
III	Transformation- Basic Transformations, Matrix Representation and Homogeneous Coordinates, translation, scaling, rotation, reflection, sheering, composite transformation, Window to view port transformation, line clipping algorithm; Cohen Sutherland, polygon clipping; Sutherland Hodgman algorithm.	8
IV	Need for 3-Dimensional imaging, techniques for 3-Dimesional displaying, 3D transformation, projection and its types, Curve-parametric and non-parametric functions, Bezier (Bernstein Polynomials) Curves, Cubic-Splines, B-Splines, Need for hidden surface removal, Back face detection, Z-buffer method, Painter's algorithm	8
V	Shading Algorithms-Phong's shading model, Gouraud shading, Shadows and background, illumination, light sources, illumination methods (ambient, diffuse reflection, specular reflection), Color models: properties of light, XYZ, RGB, YIQ and CMY color models.	8
Total Hours		40

Course Outcomes:

CO-1: To understand the Graphics systems, its applications, hardware & software requirement.
CO-2: To apply scan conversion algorithms of various graphics output primitives.
CO-3: To understand the basic principles of homogeneous coordinate systems, 2-dimensional & 3-dimensional computer graphics systems.
CO-4: To create geometrical transformation on 2-dimensional & 3-dimensional objects.

CO-5: To apply window into viewport, clipping algorithms of graphics objects against a window.

Text Book

1. Computer Graphics C Version, Donald Hearn & M. Pauline Baker, Pearson Education, New Delhi.

Reference Books

1. James D. Foley, Andries Van Dam, Steven K. Feiner, John F. Hughes, Computer Graphics- Principles and practice, Second Edition in C, Pearson Education.
2. OpenGL ES 3.0 Programming Guide 2nd Edition (English, Paperback, Budi Rijanto Purnomo, Dan Ginsburg), PEARSON.
3. Rogers, "Procedural elements of Computer Graphics", Tata McGraw Hill.
4. Parekh, "Principles if multimedia", Tata McGraw Hill.

List/Links of e-learning resource

- https://nptel.ac.in/courses/106106090

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	1	3		2									1	2
CO-2	2	2											1	2
CO-3	2	3	1										2	1
CO-4	1	2											1	3
CO-5	3	1		1									2	2

Suggestive list of experiments:

1. Implement Brenham's line drawing algorithm for all types of slope
2. Create and rotate a triangle about the origin and a fixed point.
3. Draw a color cube and spin it using OpenGL transformation matrices.
4. Draw a color cube and allow the user to move the camera suitably to experiment with perspective viewing
5. Clip a lines using Cohen-Sutherland algorithm.
6. To draw a simple shaded scene consisting of a tea pot on a table. Define suitably the position and properties of the light source along with the properties of the surfaces of the solid object used in the scene
7. Design, develop and implement recursively subdivide a tetrahedron to form 3D sierpinskigasket. The number of recursive steps is to be specified by the user.
8. Develop a menu driven program to animate a flag using Bezier Curve algorithm
9. Develop a menu driven program to fill the polygon using scan line algorithm

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Subject handled by department	Department of CS & IT

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Semester/Year		VI/III	Program		B.Tech – Internet of Things
Subject Category	DE	Subject Code:	IoT 2064 (DE – 3A)	Subject Name	Cloud Computing for IoT

Maximum Marks Allotted						Contact Hours			Total Credits
Theory			Practical		Total Marks				
ES	MS	Quiz/Assignment	ES	LW		L	T	P	
70	20	10	30	20	150	3	0	2	4

Prerequisites:

Knowledge of Computer network, Internet Technology and ACA.

Course Objective:

- To learn how to use Cloud Services.
- To implement Virtualization
- To implement Task Scheduling algorithms.
- Apply Map-Reduce concept to applications.
- To build Private Cloud.
- Broadly educate to know the impact of engineering on legal and societal issues involved.

UNITs	Descriptions	Hrs.
I	Defining a Cloud, Cloud Types – NIST model, Cloud Cube model, Deployment models (Public , Private, Hybrid and Community Clouds), Service models – Infrastructure as a Service, Platform as a Service, Software as a Service with examples of services/ service providers, Cloud Reference model Characteristics of Cloud Computing – a shift in paradigm Benefits and advantages of Cloud Computing Architecture ,Infrastructure, Platforms, Virtual Appliances, Communication Protocols, Applications, Connecting to the Cloud by Clients Services and Applications by Type IaaS – Basic concept, Workload, partitioning of virtual private server instances, Pods, aggregations, silos PaaS – Basic concept, tools and development environment with examples SaaS - Basic concept .	8
II	Concepts of Abstraction and Virtualization (access, application, CPU, storage), Mobility patterns (P2V, V2V, V2P, P2P, D2C, C2C, C2D, D2D) Load Balancing and Virtualization ,Network resources for load balancing, Advanced load balancing (including Application Delivery Controller and Application Delivery Network), Mention of The Google Cloud as an example of use of load balancing Hypervisors: Virtual machine technology and types, VMware vSphere Machine Imaging (including mention of Open Virtualization Format – OVF).Distinction between SaaS and PaaS (knowledge of Salesforce.com and Force.com), Application development Use of PaaS.	8
III	Application frameworks Use of Google Web Services ,Google Applications Portfolio – Indexed search, Dark Web, Aggregation and	8

	disintermediation, Productivity applications and service, Adwords, Google Analytics, Google Translate, Google Toolkit (including introduction of Google APIs), major features of Google App Engine service. Use of Amazon Web Services Amazon Web Service components and services: Amazon Elastic Cloud, Amazon Simple Storage system, Amazon Elastic Block Store.	
IV	Windows Azure platform: Microsoft's approach, architecture, and main elements, Windows Azure AppFabric, Content Delivery Network, SQL Azure, and Windows Live services, Types of services required in implementation – Consulting, Configuration, Customization and Support Cloud Management. An overview of the features of network management systems and a brief introduction of related products from large cloud vendors, Monitoring of an entire cloud computing deployment stack – an overview with mention of some products, Lifecycle management of cloud services (six stages of lifecycle) .	8
V	Cloud security concerns, Security boundary, Security service boundary Security of data, Brokered cloud storage access, Storage location and tenancy, encryption, and auditing and compliance Identity management. Service Oriented Architecture, message-based transactions, Protocol stack for an SOA architecture, Event-driven SOA, Enterprise Service Bus, Concepts of cloud transactions, functionality mapping, Application attributes, Cloud service attributes, System abstraction and Cloud Bursting, Applications and Cloud APIs, Cloud storage definition – Manned and Unmanned ,Cloud mail services including Google Gmail, Mail2Web, Windows Live Hotmail, Yahoo mail, concepts of Syndication services.	8
Total Hours		40

Course Outcomes:

CO-1: Explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing.
CO-2: Describe importance of virtualization along with their technologies and compare various load balancing algorithm.
CO-3: Describe and analyze the key components of Google and Amazon web service and apply them to solve problems on the cloud.
CO-4: Describe the key components of Microsoft azure platform and cloud management on azure.
CO-5: Explain major security and privacy problems in the cloud and how they are addressed with the security mechanisms

Text Book

1. Cloud Computing – Second Edition by Dr. Kumar Saurabh, Wiley India

Reference Books

1. Cloud Computing Bible by Barrie Sosinsky, Wiley India Pvt. Ltd, 2013
2. Mastering Cloud Computing by Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, McGraw Hill Education (India) Private Limited, 2013
3. Cloud computing: A practical approach, Anthony T. Velte, Tata Mcgraw-Hill
4. Cloud Computing, Miller, Pearson
5. Building applications in cloud: Concept, Patterns and Projects, Moyer, Pearson

List/Links of e-learning resource

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

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end

semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	2	1	2										1	2
CO-2	3	2	2	1									2	1
CO-3	3	2	2	1									2	1
CO-4	3	2	2	1									2	1
CO-5	2	2	1										1	2

Suggestive list of experiments:

1. Creating a Warehouse Application in SalesForce.com.
2. Creating an Application in SalesForce.com using Apex programming Language.
3. Implementation of SOAP Web services in C#/JAVA Applications.
4. Implementation of Para-Virtualization using VM Ware‘s Workstation/ Oracle‘s Virtual Box and Guest O.S.
5. Installation and Configuration of Hadoop.
6. Create an application (Ex: Word Count) using Hadoop Map/Reduce.
7. Case Study: PAAS(Facebook, Google App Engine)
8. Case Study: Amazon Web Services.
9. Install Virtualbox/VMware Workstation with different flavours of linux or windows OS on top of windows7 or 8.
10. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
11. Install Google App Engine. Create hello world app and other simple web applications using python/java.
12. Use GAE launcher to launch the web applications.
13. Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.
14. Find a procedure to transfer the files from one virtual machine to another virtual machine.
15. Find a procedure to launch virtual machine using try stack (Online Open stack Demo Version)
16. Install Hadoop single node cluster and run simple applications like word count.

Recommendation by Board of studies on	
Approval by Academic council on	
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Subject handled by department	Department of CS & IT

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
(Engineering College), VIDISHA M.P.
(An Autonomous Institute Affiliated to RGPV Bhopal)
DEPARTMENT OF CS & IT

Semester/Year		VI/III	Program		B.Tech – Internet of Things
Subject Category	DE	Subject Code:	IoT 2064 (DE – 3B)	Subject Name	Digital Signal Processing

Maximum Marks Allotted						Contact Hours			Total Credits
Theory			Practical		Total Marks				
ES	MS	Quiz/Assignment	ES	LW		L	T	P	
70	20	10	30	20	150	3	0	2	4

Prerequisites:

Signals and System

Course Objective:

- The subject aims to introduce the basic principles, methods, and applications of digital signal processing.
- To explore its algorithmic, computational, and programming aspects.
- The focus is also on establishing a mathematical formalism for analyzing, modeling, and simulating electrical systems in the time and frequency domains.

UNITs	Descriptions	Hrs.
I	**The Discrete Fourier Transform:** Introduction to DSP**,** Discrete Fourier series, Discrete Time Fourier Transform (DTFT), Discrete Fourier Transform (DFT), Properties of DFT, Circular convolution, linear convolution using the DFT.	8
II	**Computation of the Discrete Fourier Transform**: Goertzel algorithm, FFT algorithm: Decimation in time (DIT), FFT algorithm: Decimation in frequency (DIF), N-radix computations of FFT, Comparison of DIT and DIF algorithms, Computational advantages of FFT Algorithms	8
III	**FIR filter Design**: Introduction to Digital filters, Types of digital filters: FIR and IIR filters, FIR filter design: Window method, FIR filter design: Frequency Sampling method, FIR filter design: Optimal filter design method, Realization structures for FIR filters and Finite word length effects in FIR filters.	8
IV	**IIR filter Design:** Comparison of IIR and FIR digital filters, IIR filter specifications, IIR filter design method: Impulse Invariant method, IIR filter design method: Bilinear Transformation method, IIR filter design method: Matched Z-Transform method, Realization structures for IIR filters, Finite word length effects in IIR filters.	8
V	**Discrete Random Signals & Power Spectrum Estimation**: Introduction to discrete time random process, Spectrum representations of infinite energy signals, Response of linear system to random signals, Introduction to spectrum estimation, Estimates of the auto covariance, power spectrum, Estimates of cross covariance and cross spectrum.	8

Total Hours	40

Course Outcomes:

CO1: Understand the fundamentals of DFT.
CO2: Apply the concepts of DFT.
CO3: Design and analysis of FIR filters.
CO4: Design and Analysis of IIR filters.
CO5: Understanding the concept of random signals and its analysis.

Text Book & Reference Books-

1. Digital Signal Processing: Salivahanan, Vallavraj, Gnanapriya, TMH

1. Digital Signal Processing: Principles, Algorithms and Applications: Prokais, Manolakis, Pearson.
2. Discrete Time Signal Processing: Oppenheim, Schafer, Buck, Pearson
3. Digital Signal Processing: A. Nagoor Kani, McGraw Hill.

Digital Signal Processing: P. Ramesh Babu, Scitech.

List/Links of e-learning resource

- https://nptel.ac.in/courses/117102060

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	2	2	2										1	2
CO-2	3	2	2	2									2	1
CO-3	3	2	2	2									2	1
CO-4	3	2	2	2									2	1
CO-5	2	2	1	1									1	2

Suggestive list of experiments:

1. a)Generation of linear convolution without using built infunction and the function conv in MATLAB
   b) Generation of circular convolution without using built in function in MATLAB
2. Compute the Discrete Fourier Transform and IDFT with and without FFT and IFFT in MATLAB Implementation of Linear convolution using DFT (Overlap-add and Overlap-Save methods)
3. Implementation of Decimation-in-time radix-2 FFT algorithm
4. Implementation of Decimation-in-frequency radix-2 FFT algorithm
5. Implementation of IIR digital filter using Butterworth method and bilinear transformation
6. Implementation of IIR digital filter using Chebyshev (Type I and II) method
7. Implementation of FIR digital filter using window (Rectangular, Hamming, Hanning, Bartlett) methods
8. Implementation of FIR digital filter using frequency sampling method
9. Implementation of optimum equiripple FIR digital filter using window methods
10. DTMF Tone Generation and Detection Using Goertzel Algorithm
11. Implementation of sampling rate conversion by decimation, interpolation and a rational factor using MATLAB

a. Implementation of DFT
b. Sine wave generation using lookup table with values generated from MATLAB

12. IIR and FIR Filter Implementation using DSP Kits.

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	
Subject handled by department	Department of CS & IT

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DEPARTMENT OF CS & IT

Semester/Year		VI/III	Program		B.Tech – Internet of Things
Subject Category	OC	Subject Code:	IoT 2065 (OC – 2A)	Subject Name	Artificial intelligence for IoT

Maximum Marks Allotted						Contact Hours			Total Credits
Theory			Practical		Total Marks				
ES	MS	Quiz/Assignment	ES	LW		L	T	P	
70	20	10	-	-	100	3	0	0	3

Prerequisites:

Basic Knowledge of algorithms

Course Objective:

- Identify problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem.
- Review of classical problem solving: search and forward and backward chaining.
- Formalize a given problem in the language/framework of different AI methods (e.g., as a search problem, as a constraint satisfaction problem, as a planning problem etc.

UNITs	Descriptions	Hrs.
I	The AI Problems, The Underlying Assumption, AI Techniques, Level of the Model, Criteria for Success, Some general references, one Final Word. Problems and State Space Search, Defining Problems as a State Space Search, Production Systems, Production Characteristics, Production System Characteristics, and issues in the design of Search Programs, additional problems. Generate-and-Test, Hill Climbing, Best-First Search, Problem Reduction, Constraint Satisfaction, Means-Ends Analysis.	7
II	Representations and Mappings, Approaches to Knowledge Representation. Using Predicate Logic, Representation Simple Facts in Logic, Representing instance and is a Relationships, Computable Functions and Predicates, Resolution. Representing Knowledge Using Rules Procedural versus Declarative Knowledge, Logic Programming, Forward versus Backward Reasoning.	7
III	Introduction to Non-monotonic Reasoning, Logics for Non-monotonic Reasoning. Statistical Reasoning, Probability and Bay's Theorem, Certainty Factors and Rule-Base Systems, Bayesian Networks, Dempster-Shafer Theory, Fuzzy Logic. Weak Slot-And-Filler Structure, Semantic Nets, Frames. Game Playing: Overview, Example Domain the Blocks World, Components of a Planning System, Goal Stack Planning.	7
IV	Nonlinear Planning Using Constraint Posting, Hierarchical Planning, Reactive Systems, Other Planning Techniques. Natural Language Processing introduction, Syntactic Processing, Semantic Analysis, Discourse and Pragmatic Processing. Connectionist Models introduction: Hopfield Network, Learning in Neural Networks, Application of Neural Networks, Recurrent Networks, Distributed Representations, Connectionist AI and Symbolic AI.	7
V	Developments Process, knowledge Acquisition. Introduction to Prolog, Syntax and Numeric Function, Basic List Manipulation Functions in Prolog, Functions, Predicates and Conditional, input, output and Local Variables, iteration and Recursion, Property Lists and Arrays, LISP and	7

	other AI Programming Languages.	
Total Hours		35

Course Outcomes:

CO-1: Describe various searching methods and reasoning in AI.

CO-2: Uses of Knowledge Representation Techniques.

CO-3: Analysis the concepts of reasoning and planning.

CO-4: Illustrate the concept of NLP and NN

CO-5: Apply and evaluate AI Techniques using prolog and lisp**.**

Text Book & Reference Books-

1. Artificial Intelligence -By Elaine Rich And Kevin Knight (2nd Edition) Tata Mcgraw-Hill

1. Introduction to Prolog Programming By Carl Townsend.
2. "PROLOG Programming For Artificial Intelligence" -By Ivan Bratko(Addison-Wesley)
3. "Programming with PROLOG" —By Klocksin and Mellish.
4. "Artificial Intelligence" (Fifth Edition) -By George F Luger, Pearson Education.
5. "Artificial Intelligence" (Second Edition}-By Stuart Russell and Peter Norvig, Pearson Education.
6. Artificial Intelligence Application Programming, Tim Jones, Wiley India.
7. "Artificial Intelligence And Expert Systems " -By D.W Patterson

List/Links of e-learning resource

- https://nptel.ac.in/courses/106102220

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	2	1	2										1	2
CO-2	2	2	2	1									2	1
CO-3	2	1	2	1									2	1
CO-4	2	1	2	1									2	1
CO-5	2	2	1										1	2

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Approval by Academic council on	
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Subject handled by department	Department of CS & IT

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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DEPARTMENT OF CS & IT

Semester/Year		VI/III	Program		B.Tech – Internet of Things
Subject Category	OC	Subject Code:	IoT 2065 (OC – 2B)	Subject Name	Advanced Computer Architecture

Maximum Marks Allotted						Contact Hours			Total Credits
Theory			Practical		Total Marks				
ES	MS	Quiz/Assignment	ES	LW		L	T	P	
70	20	10	-	-	100	3	0	0	3

Prerequisites:

Course Objective:

- Learn to Models of Computer Architectures.
- Be aware of Systematic and Parallel models
- Be familiar with the microinstruction Level Programming

UNITs	Descriptions	Hrs.
I	Introduction to parallelism, Parallel Computer Models, Parallel computer Architecture and Classification. State of Computing, Multiprocessors and Multicomputer, Multi vector and SIMD Computers, PRAM and VLSI Models, Architectural Development, Conditions of Parallelism, Program partition and scheduling, Flow mechanism, System Interconnection Architectures. Principles of scalable Performance Metrics and Measures, Parallel Processing Applications, Speedup performance laws, Scalability Analysis and Approaches.	**6**
II	Processors and Memory Hierarchy, Advanced processing Technology, Superscalar and Vector Processors, Memory Hierarchy, Virtual Memory, Bus ,Cache and Shared Memory organizations, Sequential and Weak consistency Models, Basic concepts of pipelining, data hazards, control hazards, and structural hazards; Techniques for overcoming or reducing the effects of various hazards. Pipelining and Superscalar Techniques. Linear and Nonlinear pipeline processors, Instruction Pipeline Design, Scalar and Arithmetic pipeline Design.	8
III	Parallel and Scalable computers, Multiprocessors System Interconnects, Cache coherence and Synchronization Mechanism, Three Generations of Multicomputer, Message Passing Mechanisms. Multi Vector and SIMD computers Compound Vector Processing, SIMD computer Organizations. Scalable, Multithreaded And Dataflow Architectures, Latency Hiding, Principles of Multithreading, Fine Grain Multicomputers, Dataflow and Hybrid Computers.	8
IV	Parallel Models, Language and compilers, Parallel programming models, Parallel Languages and compiler, Data Arrays, Code Optimization and Scheduling, Loop Parallelization and Pipelining. Parallel programming Environments, Synchronization –Principles	10

	and applications, Shared Variable, programming environment-Message passing, Mapping and Multicomputers.	
V	Instruction level pipelining, Design Issues, Models, Compiler detected instruction Level parallelism, operand forwarding, reorder buffer, Limitation in Exploiting Instruction Level parallelism. Structured parallelism versus Instruction level parallelism, Function Library for Parallel programming. Data flow Computers, Reduction computer architectures, Systolic Architectures.	8
Total Hours		40

Course Outcomes:

CO-1: Describe the organization of computer-based systems and how a range of design choices are influenced by applications

CO-2: Compare and contrast between processor architectures and system-level design processes.

CO-3: Design the components and operation of a memory hierarchy and the range of performance issues influencing it.

CO-4: Apply the operation of current generation parallel computer systems, including multiprocessor and multicore systems.

CO-5: Apply the different concepts of parallelism and solve related problems.

Text Book

1. Kai Hwang, Advanced Computer Architecture: Parallelism, Scalability, Programmability, McGraw-Hill.

Reference Books

1. John L. Hennessy and David A. Patterson, Computer Architecture: A Quantitative Approach, Morgan Kaufmann.

List/Links of e-learning resource

- https://archive.nptel.ac.in/courses/106/103/106103206/

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	2	1	2										1	1
CO-2	2	2	2	1									2	1
CO-3	2	2	2	1									2	1
CO-4	2	2	2	1									2	1
CO-5	2	2	1										1	1

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