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

Semester/Year		VII/IV	Program		B.Tech – Internet of Things
Subject Category	DE	Subject Code:	IoT 2071 DE – 4A	Subject Name	Object Oriented Programming

Maximum Marks Allotted						Contact Hours			Total Credits
Theory			Practical		Total Marks				
ES	MS	Assignment/Quiz	ES	LW		L	T	P	
70	20	10	-	-	100	3	1	0	4

Prerequisites:

Fundamentals of Programming Skills

Course Objective:

- Enable students to understand concepts and principles of object oriented programming methodologies using JAVA as a vehicle.
- Also learn software development and problem solving using this JAVA technology.

UNITs	Descriptions	Hrs.
I	Introduction: Procedural Paradigms of programming, Object Oriented Paradigm for programming, Procedural vs. Object Oriented Programming, Principles of OOP, Benefits and applications of OOP. OOP Concepts: Data Abstraction, Encapsulation, Inheritance and Polymorphism. Introduction of Java, Features of Java, Byte Code and Java Virtual Machine, Java Development Kit (JDK). Basics of objects and classes in Java, tokens, keywords, identifiers, variables, data types, and operators in java, Type casting, strict keyword.	8
II	Control Statements — If, else, nested if, if-else ladders, Switch, while, do-while, for, for-each, break, continue. Command Line Argument, Classes and Objects, Encapsulation, Tightly Encapsulated classes, Nested class, Inner class, and Anonymous inner class. Inbuilt classes: Object, String, String Buffer, Array, Vector. Wrapper classes. Data members, member Function, Data Hiding: Visibility modifiers in java.	8
III	Is-A relationship, Has-A relationship, Inheritance in Java, types of inheritance, Super and sub class, Method Signature. Overloading, Constructor Overloading, Method Overloading, this and static keyword, finalize () method, Casting objects, Instance of operator, Overriding, covariant return type. Super, final keyword, overloading vs. overriding. Static control flow, instance control flow.	8
IV	Abstraction: Abstract class, Interface in Java, differences between classes and interfaces. Defining an interface, implementing interface, applying interfaces, variables in interface, extending interfaces. Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages. Coupling, Cohesion.	8
V	Exception Handling: Concepts of Exception handling, types of exceptions, usage of try, catch, throw, throws and finally keywords, Built-in exceptions, creating own exception sub classes. Multithreading: Concepts of Multithreading, differences between process and thread, thread life cycle, creating multiple threads using	8

	Thread class, Runnable interface. Synchronization, threads priorities, inter thread communication, daemon threads, deadlocks, thread groups. Introduction of Java Micro services.	
Total Hours		40

Course Outcomes:

CO-1 Define classes, objects, members of a class and relationships among them needed for a specific program.
CO-2 Write the java application programs using OOPs principles.
CO-3 Write java application on constructors, overloading.
CO-4 Demonstrate package creating and accessing members of a packages.
CO-5 Understand and develop collection frame work and its application programs.

Text Book

1. Naughton & Schildt, "The Complete Reference Java 2", Tata McGraw Hill
2. E Balaguruswamy, "Programming in Java", TMH Publications

Reference Books

1. Deitel "Java-How to Program:" Pearson Education, Asia
2. Horstmann & Cornell, "Core Java 2" (Vol I & II), Sun Microsystems
3. Ivan Bayross, "java 2.0", BPB publications
4. Java Programming for the absolute beginners By Russell, PHI Learning
5. Java Programming by Hari Mohan Pandey, Pearson.

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	1	1	2										1	2
CO-2	2	1	1		1								1	2
CO-3	2	1	2				1						1	2
CO-4	2	1	2											2
CO-5	2	1											1	

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		VII/IV	Program		B.Tech – Internet of Things
Subject Category	DE	Subject Code:	IoT 2071 (DE – 4B)	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			100	3	1	0	4

Prerequisites:

Signals and Systems

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.

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DEPARTMENT OF CS & IT

Semester/Year		VII/IV	Program		B.Tech – Internet of Things
Subject Category	DE	Subject Code:	IoT 2072 DE – 5A	Subject Name	Real Time Operating System

Maximum Marks Allotted						Contact Hours			Total Credits
Theory			Practical		Total Marks				
ES	MS	Assignment/Quiz	ES	LW		L	T	P	
70	20	10	-	-	100	3	1	0	4

Prerequisites:

Operating System

Course Objective:

- The objective of the course is to introduce the principles shared by many real-time operating systems, and their use in the development of embedded multitasking application software.

UNITs	Descriptions	Hrs.
I	Basics of real-time concepts: Brief history of Real Time Systems, A brief history of Embedded Systems. Terminology: RTOS concepts and definitions, real-time design issues, examples, Hardware Considerations: logic states, CPU, memory, I/O, Architectures, RTOS building blocks, Real-Time Kernel.	8
II	Process management: Concepts, scheduling, IPC, RPC, CPU Scheduling, scheduling criteria, scheduling algorithms Threads: Multi-threading models, threading issues, thread libraries, synchronization Mutex: creating, deleting, prioritizing mutex, mutex internals.	8
III	I/O Resources: Worst-case Execution time, Intermediate I/O, Execution efficiency, I/O Architecture. Memory: Physical hierarchy, Capacity and allocation, Shared Memory, ECC Memory, Flash filesystems.	8
IV	Embedded System Components: Firmware components, RTOS system software mechanisms, Software application components. Debugging Components: Exceptions assert, Checking return codes, Single-step debugging, kernel scheduler traces, Test access ports, Trace ports, Power-On self-test and diagnostics, External test equipment, Application-level debugging.	8
V	Performance Tuning: Basic concepts of drill-down tuning, hardware – supported profiling and tracing, Building performance monitoring into software, Path length, Efficiency, and Call frequency, Fundamental optimizations.	8
Total Hours		40

Course Outcomes:

CO1: To understand the functionality and selection criteria of various operating systems when designing automation systems for technological complexes in real time.

CO2: To know the structure, basic principles of construction and the scope of use of embedded operating systems.

CO3: To be able to program applied tasks for embedded systems and be able to control the processes occurring in real-time systems.

CO4: To have practical skills for solving problems of designing control and monitoring systems for technological complexes in real time based on existing operating systems and programming languages.

CO5: To understand the working of real-time operating systems and real-time database

Text Book

1. Jane W. S. Liu, "Real-time systems", Prentice Hall, 20002.

Reference Books

1. Philips A. Laplante, "Real-Time System Design and Analysis", 3rd Edition, John Wley& Sons, 2004

List/Links of e-learning resource

- https://nptel.ac.in/courses/117105135

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	1	1										1	2
CO-2	2	1	1										1	2
CO-3	1	1	2							1			1	2
CO-4	2	1	1							1				2
CO-5	1	1	1										1	

Recommendation by Board of studies on	
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Semester/Year		VII/IV	Program		B.Tech – Internet of Things
Subject Category	DE	Subject Code:	IoT 2072 DE – 5B	Subject Name	Wireless Networks

Maximum Marks Allotted						Contact Hours			Total Credits
Theory			Practical		Total Marks				
ES	MS	Assignment/Quiz	ES	LW		L	T	P	
70	20	10	-	-	100	3	1	0	4

Prerequisites:

Computer Networks

Course Objective:

- To provide an overview of Wireless Communication networks and its applications in communication engineering.
- Enable students to understand the contribution of Wireless Communication networks to overall technological growth, make them understand related terminology, principles, devices, schemes, concepts, algorithms and different methodologies used in Wireless Communication Networks.

UNITs	Descriptions	Hrs.
I	Introduction of Wireless Networks: Different Generations of Wireless Networks. Characteristics of the Wireless Medium: Radio Propagation Mechanisms, Path Loss Modeling and Signal Coverage, Effect of Multipath and Doppler, Channel Measurement and Modeling Techniques.	8
II	Network Planning: Introduction, Wireless Network Topologies, Cellular Topology, Cell Fundamentals Signal to Interferences Radio Calculations, Network Planning for CDMA Systems. Wireless Network Operations: Mobility Management, Radio Resources and Power Management.	8
III	Multiple Division Techniques: FDMA, TDMA, CDMA, OFDM, SDMA. Comparison of Multiple Division Techniques, Modulation Techniques – AM, FM, FSK, PSK, QPSK, QAM, 16QAM Mobile Data Networks: Introduction, Data Oriented CDPD Network, GPRS, EDGE and High Data Rates, SMS in GSM, Mobile Application Protocols.	8
IV	Introduction to Wireless LAN: Evolution of WLAN, Wireless Home Networking, Technologies for Home Area Network (HAN), Overview of IEEE 802.11, Reference Architecture, PHY and MAC Layer, Wireless ATM, HIPERLAN.	8
V	IEEE 802.15 WPAN, HomeRF, Bluetooth, Interference between Bluetooth and 802.11, Adhoc Networks, Introduction to 2G, 3G, LTE (4G), and 5G networks.	8
Total Hours		40

Course Outcomes:

CO1: To understand the functionality and selection criteria of various operating systems when designing automation systems for technological complexes in real time.

CO2: To know the structure, basic principles of construction and the scope of use of embedded operating systems.

CO3: To be able to program applied tasks for embedded systems and be able to control the processes occurring in real-time systems.

CO4: To have practical skills for solving problems of designing control and monitoring systems for

technological complexes in real time based on existing operating systems and programming languages.

CO5: Implement different type of applications for smart phones and mobile devices with latest network strategies

Text Book & Reference Books-

1. Kaveh Pahlavan, Prashant Krishnamurthy, "principles of Wireless Networks", PHI.

1. Qing- An Zeng, Dharma Prakash Agrawal, "Introduction to Wireless and Mobile Systems", CENGAGE Learning.
2. Sumit Kasera, Nishit Narang, A P Priyanka, "2.5 G Mobile Networks: GPRS and EDGE", TMH
3. Dr. Kamilo Feher, "Wireless Digital Communications", PHI.
4. Jochen Schiller, "Mobile Communications", PEARSON.

List/Links of e-learning resource

- https://nptel.ac.in/courses/106105172

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	1	2										1	2
CO-2	2	1	1										1	2
CO-3	1	1	2							1			1	2
CO-4	2	1	2							1				2
CO-5	1	1	2										1	

Recommendation by Board of studies on	
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Semester/Year		VII/IV	Program		B.Tech – Internet of Things				
Subject Category	DE	Subject Code:	IoT 2073 DE – 6A	Subject Name	Foundation of Data Science				
Maximum Marks Allotted						Contact Hours			Total Credits
Theory			Practical		Total Marks				
ES	MS	Assignment/Quiz	ES	LW		L	T	P	
70	20	10			100	3	0	0	3

Prerequisites:

Basic Knowledge of Mathematics

Course Objective:

- To provide the knowledge and expertise to become a proficient data scientist;
- Demonstrate an understanding of statistics and machine learning concepts that are vital for data science;
- Produce Python code to statistically analyze a dataset;
- Critically evaluate data visualizations based on their design and use for communicating stories from data;

UNITs	Descriptions	Hrs.
I	Data Science-What is Data Science, Need for Data Science, Difference between Data Science & Business Intelligence, Data Science Components, Tools for Data Science, Data Science Life cycle, Applications of Data Science, Data Science Ethics. Representation of Data-Types of data, primary, secondary, quantitative and qualitative data. Types of Measurements, nominal, ordinal, discrete and continuous data.	7
II	Presentation of data by tables, construction of frequency distributions for discrete and continuous data. Graphical representation of a frequency distribution by histogram and frequency polygon, cumulative frequency distributions. Data Pre-processing- Knowing Data, Data Cleaning, Data Integration, Data Selection, Data Transformation	7
III	Descriptive Statistics-Arithmetic mean, Median, Mode, Geometric mean, Harmonic mean. Partition values: Quartiles, Deciles and percentiles. Measures of dispersion: Mean deviation, Quartile deviation, Standard deviation, Coefficient of variation. Moments: measures of skewness, Kurtosis	7
IV	Correlation-Scatter plot, Karl Pearson coefficient of correlation, Spearman's rank correlation coefficient, multiple and partial correlations. Regression: Concept of errors, Principles of Least Square, Simple linear regression and its properties. Types of Regressions.	7
V	Basics of Big Data, Problem handling large data, general techniques for handling large data, Basic concept of Machine Learning, training model, validating model, supervised &	7

	unsupervised learning.	
Total Hours		35

Course Outcomes:

CO1: To explain how data is collected, managed and stored for data science.
CO2: To understand the key concepts in data science, including their real-world applications and the toolkit used by data scientists.
CO3: To implement data collection and management scripts using Mongo DB.
CO4: Examine the techniques of Data Visualization.
CO5: Identification of various applications of Data Science.

Text Books

1. "Introducing Data Science" by Davy Cielen, Arno D. B. Meysman, Mohamed Ali, 1st Edition, Manning
Publications Co.
2. "An Introduction to Probability and Statistics" by Rohatgi V.K and Saleh E, 3rd Edition, John Wiley & Sons Inc., New Jersey,
3. "Data Mining Concept & Techniques" by Han & Kember,3rd Edition, The Morgan Kaufmann,

Reference Books

1. Joel Grus, Data Science from Scratch, Shroff Publisher/O'Reilly Publisher Media
2. Annalyn Ng, Kenneth Soo, Num sense Data Science for the Layman, Shroff Publisher Publisher
3. Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk from The Frontline. O'Reilly Publisher.

List/Links of e-learning resource

- https://nptel.ac.in/courses/106106179

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											**2**	**2**
CO-3	2	1	3										**1**	**2**
CO-4	1	2											3	1
CO-5	3	3		2									2	3

Recommendation by Board of studies on	
Approval by Academic council on	
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Semester/Year		VII/IV	Program		B.Tech – Internet of Things
Subject Category	DE	Subject Code:	IoT 2073 OC – 6B	Subject Name	UI/UX

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

Prerequisites:

Knowledge of computer programming with any programming language like C/C++, Java.

Course Objective:

- The aim of the UI/UX course is to provide students with the knowledge of user- centered design, user-cantered methods in design, graphic design on screens, simulation and prototyping techniques.
- Also usability testing methods, interface technologies and user centered design in corporate perspective.

UNITs	Descriptions	Hrs.
I	Introduction to the UI: What is User Interface Design (UI) -The Relationship Between UI and UX, Roles in UI/UX, A Brief Historical Overview of Interface Design, Interface Conventions, Approaches to Screen Based UI, Template vs Content, Formal Elements of Interface Design, Active Elements of Interface Design, Composing the Elements of Interface Design, UI Design Process, Visual Communication design component in Interface Design.	7
II	Introduction to UX: UX Basics- Foundation of UX design, Good and poor design, Understanding Your Users, Designing the Experience Elements of user Experience, Visual Design Principles, Functional Layout, Interaction design.	7
III	Introduction to the Interface, Navigation Design, User Testing, Developing and Releasing Your Design.	7
IV	UI/ UX Design Tools: User Study- Interviews, writing personas: user and device personas, User Context, Building Low Fidelity Wireframe and High-Fidelity Polished Wireframe Using wire framing Tools, Creating the working Prototype using Prototyping tools, Sharing and Exporting Design.	7
V	Information and Data Study: Understanding and collection of data, methods of collecting data, tools for collecting data, analysing data, using data analytics tools like Google analytics for user experience, heat mapping tools.	7
Total Hours		35

Course Outcomes:

CO1: Understand iterative user-centered design of graphical user interfaces.
CO2: Apply the user Interfaces to different devices and requirements.
CO3: Create high quality professional documents and artifacts related to the design process.
CO4: Students are capable of programming using mainstream programming languages, can conduct fine software-engineering practices to implement problem-solving schemes as correct, efficient, and well-structured programs
CO5: Students have the logical, algorithmic, and mathematical capability to model and analyze real-

world problems in different application domains

Text Book &

1. A Project Guide to UX Design: For user experience designers in the field or in the making (2nd. ed.). Russ Unger and Carolyn Chandler. New Riders Publishing, USA, 2012..

Reference Books

1. The Elements of User Experience: User-Centered Design for the Web and Beyond, Second Edition Jesse James Garrett, Pearson Education. 2011
2. The Essential Guide to User Interface Design: An Introduction to GUI Design Principles and Techniques, Third Edition Wilbert O. Galitz , Wiley Publishing, 2007.
3. The UX Book Process and Guidelines for Ensuring a Quality User Experience, Rex Hartson and Pardha S. Pyla, Elsevier, 2012.

List/Links of e-learning resource

- https://onlinecourses.nptel.ac.in/noc21_ar05/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	1	1				1							1	2
CO-2	1	1	1										1	2
CO-3	1	1	1							1				1
CO-4				1	1			1						1
CO-5	1	1	1										1	1

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Semester/Year		VII/III	Program		B.Tech – Internet of Things
Subject Category	OC	Subject Code:	IoT 2074 OC – 3A	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			100	3	0	0	3

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.	7
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.	7
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.	7
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	7
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.	7
Total Hours		35

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

Recommendation by Board of studies on	
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Compiled and designed by	
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		VII/IV	Program		B.Tech – Internet of Things
Subject Category	OC	Subject Code:	IoT 2074 OC – 3B	Subject Name	Digital Image Processing

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

Prerequisites:

Knowledge of Computer Programming Language and MATLAB

Course Objective:

- To study the image fundamentals and mathematical transforms necessary for image processing.
- To study the image enhancement techniques
- To study image restoration procedures
- To study the image compression procedures.

UNITs	Descriptions	Hrs.
I	Digital Image Fundamentals: A simple image model, Sampling and Quantization. Relationship between pixels, Imaging geometry, Image acquisition systems, Different types of digital images.	7
II	Image Transformations Introduction to Fourier transforms, Discrete Fourier transforms, Fast Fourier transform, Walsh transformation, Hadmord transformation, Discrete Cosine Transformation.	7
III	Image Enhancement Filters in spatial and frequency domains, Histogram based processing. Image subtraction, Averaging, Image smoothing, Nedion filtering, Low pass filtering, Image sharpening by High pass filtering.	7
IV	Image Encoding and Segmentation Encoding: Mapping, Quantizer, Coder. Error free compression, Lossy Compression schemes. JPEG Compression standard. Detection of discontinuation by point detection, Line detection, edge detection, Edge linking and boundary detection, Local analysis, Global processing via Hough transforms and graph theoretic techniques.	7
V	Mathematical Morphology Binary, Dilation, crosses, Opening and closing, Simple methods of representation, Signatures, Boundary segments, Skeleton of a region, Polynomial approximation.	7
Total Hours		35

Course Outcomes:

CO1: Ability to apply principles and techniques of digital image processing in applications related to design and analysis of digital imaging systems.
CO2: Ability to analyze and implement image processing algorithms to real problems.
CO3: Gaining of hands-on experience in using software tools for processing digital images.
CO4: Interpret image segmentation and representation techniques.
CO5: Apply Mathematical Morphology using Polynomial approximation.

Text Book

1. Rafael C Gonzalez, Richard E Woods 3rd Edition, Digital Image Processing Pearson.

Reference Books

1. Sonka, Digital Image Processing & Computer Vision, Cengage Learning.
2. Jayaraman, Digital Image Processing, TMH.

3. Pratt, Digital Image Processing, Wiley India.
4. Annadurai, Fundamentals of Digital Image Processing,Pearson Education.

List/Links of e-learning resource

- https://nptel.ac.in/courses/117105135

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	1	1										1	1
CO-2	2	2	1	1									2	1
CO-3	2	2	1	1									2	1
CO-4	2	2	1	1									2	1
CO-5	1	1	1										1	1

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	
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DEPARTMENT OF CS & IT

Semester/Year		VII/IV	Program		B.Tech – Internet of Things
Subject Category	OC	Subject Code:	IoT 2075 OC – 4A	Subject Name	Deep Learning

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

Prerequisites:

Basic knowledge of computers, its components and programming skills

Course Objective:

- To introduce the fundamentals of deep learning and the main research activities in this field.
- To learn architectures and optimization methods for deep neural network training.

UNITs	Descriptions	Hrs.
I	History of Deep Learning, McCulloch Pitts Neuron, Multilayer Perceptrons (MLPs), Representation Power of MLPs, Sigmoid Neurons, Feed Forward Neural Networks, Back propagation.	7
II	Activation functions and parameters: Gradient Descent (GD), Momentum Based GD, Nesterov Accelerated GD, Stochastic GD, Principal Component Analysis and its interpretations, Singular Value Decomposition, Parameters v/s Hyper-parameters.	7
III	Auto-encoders & Regularization: Auto encoders and relation to PCA, Regularization in auto encoders, Denoising auto encoders, Sparse auto encoders, Regularization: Bias Variance Tradeoff, L2 regularization, Early stopping, Dataset augmentation, Encoder Decoder Models, Attention Mechanism, Attention over images, Batch Normalization.	7
IV	Deep Learning Models Introduction to CNNs, Architecture, Convolution/pooling layers, CNN Applications, LeNet, AlexNet, ZF-Net, VGGNet, GoogLeNet, ResNet. Introduction to RNNs, Back propagation through time (BPTT), Vanishing and Exploding Gradients, Truncated BPTT, GRU, LSTMs.	7
V	Deep Learning Applications Image Processing, Natural Language Processing, Speech recognition, Video Analytics.	7
Total Hours		35

Course Outcomes:

CO 1: Understand the fundamentals of deep learning and the main research activities in this field.
CO 2: Remember architectures and optimization methods for deep neural network training.
CO 3: Implement, apply and test relevant learning algorithms in TensorFlow.
CO 4: Critically evaluate the method's applicability in new contexts and construct new applications.
CO 5: Able to carry out design and implementation of deep learning models for signal/image processing application

Text Book

1. Ian Goodfellow, YoshuaBengio, Aaron Courville. Deep Learning, the MIT press, 2016

Reference Books

1. Bengio, Yoshua. " Learning deep architectures for AI." Foundations and trends in Machine Learning 2.1, Now Publishers, 2009
2. Deep Learning, Rajiv Chopra, Khanna Book Publishing, Delhi 2020.

List/Links of e-learning resource

- https://nptel.ac.in/courses/106106184

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	1	2			1							1	2
CO-2	1	2	1					1					1	2
CO-3	1		3		3		1			1		1	1	1
CO-4	2		1					1						2
CO-5	1	1	1										1	1

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
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DEPARTMENT OF CS & IT

Semester/Year		VII/IV	Program		B.Tech – Internet of Things
Subject Category	OC	Subject Code:	IoT 2075 OC – 4B	Subject Name	Cyber Security

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

Prerequisites:

Course Objective:

- The course aims at providing students with concepts of computer security, cryptography, digital money, secure protocols, detection and other security techniques.

UNITs	Descriptions	Hrs.
I	Cyber Security Concepts: Essential Terminologies: CIA, Risks, Breaches, Threats, Attacks, Exploits. Information Gathering (Social Engineering, Foot Printing & Scanning). Open Source/ Free/ Trial Tools: nmap, zenmap, Port Scanners, Network scanners.	7
II	Introduction to Cryptography, Symmetric key Cryptography, Asymmetric key Cryptography, Message Authentication, Digital Signatures, Applications of Cryptography. Overview of Firewalls-Types of Firewalls, User Management, VPN Security, Security Protocols: - security at the Application Layer- PGP and S/MIME, Security at Transport Layer- SSL and TLS, Security at Network Layer-IPSec.	7
III	Introduction to System Security, Server Security, OS Security, Physical Security, Introduction to Networks, Network packet Sniffing, Network Design Simulation. DOS/ DDOS attacks. Asset Management and Audits, Vulnerabilities and Attacks. Intrusion detection and Prevention Techniques, Host based Intrusion prevention Systems, Security Information Management, Network Session Analysis, System Integrity Validation.	7
IV	Internet Security, Cloud Computing &Security, Social Network sites security, Cyber Security Vulnerabilities-Overview, vulnerabilities in software, System administration, Complex Network Architectures, Open Access to Organizational Data, Weak Authentication, Authorization, Unprotected Broadband communications, Poor Cyber Security Awareness..	7
V	Security in Evolving Technology: Biometrics, Mobile Computing and Hardening on android and ios, IOT Security, Web server configuration and Security. Introduction, Basic security for HTTP Applications and Services, Basic Security for Web Services like SOAP, REST etc., Identity Management and Web Services, Authorization Patterns, Security Considerations, Challenges.	7
Total Hours		35

Course Outcomes:

CO1: Understand, appreciate, employ, design and implement appropriate security technologies and policies to protect computers and digital information.

CO2: Identify & Evaluate Information Security threats and vulnerabilities in Information Systems

and apply security measures to real time scenarios.
CO3: Identify common trade-offs and compromises that are made in the design and development process of Information Systems
CO4: Demonstrate the use of standards and cyber laws to enhance information security in the development process and infrastructure protection.
CO5: Design and develop a security architecture for an organization.

Text Book

1. William Stallings, "Cryptography and Network Security", Pearson Education/PHI, 2006.

Reference Books

1. V.K. Jain, "Cryptography and Network Security", Khanna Publishing House.
2. Gupta Sarika, "Information and Cyber Security", Khanna Publishing House, Delhi.
3. Atul Kahate, "Cryptography and Network Security", McGraw Hill.
4. V.K. Pachghare, "Cryptography and Information Security", PHI Learning

List/Links of e-learning resource

- https://nptel.ac.in/courses/106106129

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				1							1	2
CO-2	1	1	1										1	2
CO-3	1	2	1			2		2		1				1
CO-4		1	2					1						2
CO-5	1	1	1										1	1

Suggestive list of experiments:

Recommendation by Board of studies on	
Approval by Academic council on	
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DEPARTMENT OF CS & IT

Semester/Year		VII/IV	Program		B.Tech – Internet of Things
Subject Category	DLC	Subject Code:	IoT 2076	Subject Name	Android Programming

Maximum Marks Allotted						Contact Hours			Total Credits
Theory			Practical		Total Marks				
ES	MS	Assignment/Quiz	ES	LW		L	T	P	
-	-	-	30	20	50	0	0	2	1

Prerequisites:

Building an Android app comes down to two major skills/languages: Java and Android.

Course Objective:

- Explain different techniques for developing applications for mobile devices.
- Understand the Android OS architecture.
- Understand the operation of the application, application lifecycle, configuration files, intents, and activities, services & Receivers.
- Install and use appropriate tools for Android development, including IDE, device emulator, and profiling tools.

UNITs	Descriptions	Hrs.
I	Introduction to Android, A little Background about mobile technologies , Overview of Android - An Open Platform for Mobile development, Open Handset Alliance Developing for Android: First Android Application, setup Android Development Environment. Android development Framework - Android-SDK, Eclipse Emulators, Creating & setting up custom Android emulator Android Project Framework.	7
II	Android Activities and UI Design, Understanding Intent, Activity, Activity Lifecycle and Manifest, Creating Application and new Activities, Expressions and Flow control, Android Manifest Simple UI - Layouts and Layout properties, Fundamental Android UI Design, introducing Layouts, Creating new Layouts, Drawable Resources, Resolution and density independence (px ,dip, dp, sip, sp) XML Introduction to GUI objects viz. Push Button, Text / Labels, Edit Text, Toggle Button, Weight Sum Padding, Layout Weight.	7
III	Advanced UI Programming , Event driven Programming in Android(Text Edit, Button clicked etc.),Creating a splash screen, Event driven Programming in Android, Android Activity Lifecycle, Creating threads for gaming requirement, Understanding the Exception handler, Toast, Menu, Dialog, List and Adapters, Custom Vs. System Menus Creating and Using Handset menu Button (Hardware), Android Themes, Dialog, create an Alter Dialog, Toast in Android, List & Adapters, Manifest.xml File Update.	7
IV	Multimedia Programming using Android, Multimedia audio formats - Creating and Playing, Multimedia audio formats - Kill / Releasing (Memory Management),e audio in any application video playback with an event, Database - SQLite, SQLiteOpenHelper and creating a database, Opening and closing a database, Working with cursors Inserts, updates, and deletes, Location Based Services and Google Maps, Using Location Based Services, Working with Google Maps.	7

V	Notifications Notification Manager, Pending Intent Notifications (Show and Cancel), custom made Web browser, WebView object in XML, Methods for associated with 'Go', 'Back', 'Forward' etc. Android Development using other Tools, Other ways to Develop Android Applications, Graphics / Game development using, Installation of .apk, install .apk into your Android Mobile.	7
Total Hours		35

Course Outcomes:

CO1: Ability to identify key challenges in managing information and analyze different storage networking technologies and virtualization.

CO2: Ability to understand components and the implementation of NAS.

CO3: To understand CAS architecture and types of archives and forms of virtualization.

CO4: To monitor the storage infrastructure and management activities.

CO5: Ability to design and develop an application using Database.

Text Book & Reference Books-

1. Android Developer Tools Essentials by Mike Wolfson - O'Reilly Media Publication

1. Learn Java for Android Development, 2nd Edition - Jeff Friesen- Apress Publications
2. OpenGL ES 2 for Android - Kevin Brothaler - The Pragmatic Programmers.

List/Links of e-learning resource

- https://onlinecourses.swayam2.ac.in/nou21_ge41/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	1	1				1							1	2
CO-2	1	1	1				1						1	2
CO-3	1	1	1							1				1
CO-4		2		1	1			1						1
CO-5	1	1	1										1	1

Suggestive list of experiments:

1. Introduction to Android Operating System
2. Program for First Android Application.
3. Program for building a simple user interface using a XML for UI layout.
4. Program for developing an Android Application using a linear layout.
5. Program for developing an Android Application using a Relative layout.
6. Program for developing an Android Application using a Table layout.
7. Program for developing an Android Application using a Absolute layout.
8. Program for developing an Android Application using a Frame layout.
9. Developing an android application using Relative layout to display Date and time.
10. Study of android lifecycle and demonstration of it.
11. Study of intents and types of intents
12. Study of list views and adapters
13. Study of dialog interfaces in android
14. Study of Sensors in android
15. Study of Services in android
16. Study of touch in android

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

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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DEPARTMENT OF CS & IT

Semester/Year		VIII/IV	Program		B.Tech – Internet of Things
Subject Category	DLC	Subject Code:	IoT 2078	Subject Name	Minor Project Prelim

Maximum Marks Allotted						Contact Hours			Total Credits
Theory			Practical		Total Marks				
ES	MS	Assignment/Quiz	ES	LW		L	T	P	
			100	50	150	-	-	4	2

Prerequisites:

Course Objective:

UNITs	Descriptions	Hrs.
Procedure:	a) Each defined project needs to be from Industry/Research organization/Govt.organization/socio-technical issues. b) Project identification should be based on Analysis carried out by the students after completion of B.E Semester 6th Examination but before starting of the 7th Semester. c) Problem definition for the project needs to be submitted by every student in the first week of the 7th Semester to his/her college. d) Each definition will be evaluated based on merit in the beginning of the 7th semester itself by the College. **Facilitation:** You may contact your Major Project In charge co-ordinator/Faculty /Department Head for skillful Analysis .	**40**
Guidelines:	1. The project work will be in-house industry project, where student need to implement project related to any domain of industry like education, legal, manufacturing, design, pharmaceutical, Ecommerce, etc. 2. Students are required to get approval of project definition from the department. 3. After approval of project definition students are required to report their project work weekly to respective internal guide. 4. Maximum 4 students can allow working in particular project group. 5. The students are required to identify their project within two weeks of the commencement of the classes and they are required to follow all the rules and instructions issued by department. 6. Each student or student group would work under the guidance of the Faculty from the College. In case any problem/other issue arises for the smooth progress of Inter Departmental project work discovery/Practical Training, it should be immediately brought to the notice of the major project in charge coordinators/Faculty. 7. The students are required to submit Project synopsis Pre-report to their Head of the Department with the remarks of guide in their College during Eighth week of the semester	
Total Hours		40

Course Outcomes:

On successful completion of the project student should be able to:

CO1: Identify the problem domain correctly and to represent problem using mathematical structures and logics.

CO2: Analyze possible solution strategies and investigate problem domain and design feasible solutions for it.

CO3: Make use of cutting edge tools and technologies to derive solutions for the problems and carried a detailed studied about the feasibility and societal impact of solutions

CO4: Acknowledges the previous work and support required in the solution. Justify the role of individual in project work. Demonstrate leadership skills in team work.

CO5: Present and communicate the importance of solutions of problem domain. Conduct and accomplish all the subtasks for project completion in time and cost effective manner and conclude the project work with possible scopes.

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	3	3	2										2	2
CO-2	2			2		1	2			1			2	
CO-3			3		3	2	3						2	2
CO-4									3				1	
CO-5					2					3	3	3		2

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