Semester V

SL.NO	Category	Code no.	Course title	Hours per week			Total Contact Hrs/Week	Credit
				L	T	P		
1	Essential Subject-7	ES-501	Introduction to e-Governance	3	0	0	3	3
2	Essential Subject-8	ES-502	Internet of Things(IoT)	2	0	0	2	2
3	Essential Subject-9	ES-503	Data Science	2	0	0	2	2
4	Programme elective course-2	AIPE504/1 AIPE504/2 AIPE504/3	• Distributed Systems • Renewable Energy • Introduction to Embedded System	3	0	0	3	3
5	Programme elective course-3	AIPE505/1 AIPE505/2 AIPE505/3	• Mobile Computing • Software Testing Kotlin Programming	3	0	0	3	3
6	Open elective course-1	OE506/1 OE506/2 OE506/3	• Disaster Management • Environment Pollution& Control • Introduction to Embedded System	3	0	0	3	3
7	Programme Core course-13	AIPC-507	Networking Lab	0	0	2	2	1
8	Programme Core course-14	AIPC-508	Machine Learning Lab	0	0	2	2	1
9	Summer Internship=II(6 weeks) after IV Semeter	AISI509	Summer Internship-II	0	0	0	0	3
10	Major Project	AIPR510	Project part-1	0	0	2	2	1
Total								22

Introduction to e-Governance

Course Code	:	ES-501
Course Title	:	Introduction to e-Governance
Number of Credits	:	3 (L: 3, T: 0, P: 0)
Prerequisites	:	-----
Course Category	:	Essential Subject-7

Course outcomes:

- Exposure to introductory ideas and practices of e-Governance initiatives in India
- Understand and escalate the essence of e-Governance.
- Articulate the policy and social issues facing agencies in implementing e-government initiatives.
- Apply business-case and government IT-management concepts to e-government strategies.
- Develop skills to evaluate government websites and e-services for best practice, principles and standards.

Detailed Course Contents

Module- 1:

Number of Class hours: 6

Learning Outcomes of the module:

- Understand the basic concepts of ICT for development activities (K3)
- Design and implement various e-governance projects using technologies and business models(K4)
- Expose to the e-governance lifecycle(K3)

Detailed content of the module:

- Exposure to emerging trends in ICT for development
- Understanding of design and implementation of e-governance projects
- E-governance lifecycle.

Module- 2:

Number of Class hours: 6

Learning Outcomes of the module:

- Recognize the elements of government process for transparency (K3)
- Analyse the e-governance plans of India(K5)
- Implement the SMART government initiatives (K4)
- Investigate the main components to develop effective and efficient e-government projects.(K3)

Detailed content of the module:

- Need for Government Process Re-engineering (GPR);

Module 3:

No. of Class hours: 6

Learning Outcomes of the module:

- Analyze and compare between development models of e-government services. (K3)
- Distinguish the benefits of implementing e-government services. (K4)
- Evaluate and compare between the technologies and mechanisms to develop e- government services. (K5)
- Recognize the challenges that may hinder the development of e-government services. (K3)

Detailed content of the module:

- Architecture and models of e-Governance, including Public Private Partnership (PPP);
- Need for Innovation and Change Management in e-Governance;
- Critical Success Factors; Major issue including corruption, resistance for change
- E-Security and Cyber laws

Module 4

No. of Class hours: 6

Learning Outcomes of the module:

- Categorize the initiatives of the government to implement e-government services. (K4)
- Frame solutions to various challenges of e-government projects. (K5)
- Find out the best practices of e-governance projects(K5)

Detailed content of the module:

- Focusing on Indian initiatives and their impact on citizens;
- Sharing of case studies to highlight best practices in managing e-Governance projects in Indian context.

Module 5

No. of Class hours: 6

Learning Outcomes of the module:

- Identify and analyse the current practices of the project of e-government services through a case study of India (K5)
- Recognise the main challenges of e-government and the possible mechanisms and technologies to make more developments. (K3)
- Develop mini projects on e-governance projects. (K5)

Detailed content of the module:

- Analyse e-governance sites (CSC, eSeva, etc) as part of Tutorials.

5.3. Analyse e-governance sites (Post Office, Passport Seva Kendra, etc) as part of Tutorials.

- Mini Projects by students in groups-primarily evaluation of various e-governance projects.

Reference Books:

- Managing Transformation –Objectives to Outcomes. J Satyanarayana, Prentice Hall India
- The State, IT and Development. Kenneth Kenniston, RK Bagga and Rohit Raj Mathur, Sage Publications India Pvt Ltd.
- e-Government -The Science of the Possible. J Satyanarayana, Prentice Hall, India 4.http://www.csi-sigegov.org/publications.php
- https://negd.gov.in
- https://www.nisg.org/case-studies-on-e-governance-in-india

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Internet of Things (IoT)

Course Code	:	ES-502
Course Title	:	Internet of Things
Number of Credits	:	2 (L: 2, T: 0, P: 0)
Prerequisites	:	-----
Course Category	:	Essential Subject-8

Course Outcome:

- Understand the concepts of Internet of Things (K3)
- Analyze basic protocols in wireless sensor network (K4)
- Design IoT applications in different domain and be able to analyse their performance(K5)
- Implement basic IoT applications on embedded platform(K5)

Module 1:

No of class hours: 04

Learning Outcomes of the module:

- Illustrate what IoT is and how it works today (K3)
- Recognise the factors that contributed to the emergence of IoT (K4)
- Design and program IoT devices (K4)

Detailed content of the module:

- Introduction to IoT;
- Sensing;
- Actuation

Module 2:

No of class hours: 07

Learning Outcomes of the module:

- Analyse the basics of IoT networking (K4)
- Distinguish and implement various communication protocols(K4)
- Understand the various types of sensor network (K3)

Detailed content of the module:

- Basics of IoT Networking,
- Communication Protocols,

- Sensor networks

Module 3

No of class hours: 7

Learning Outcomes of the module:

- Implement various programming on the Arduino (K4)
- Differentiate between the levels of the IoT stack (K3)
- Familiarise with the key technologies and protocols employed at each layer of the stack(K3)

Detailed content of the module:

- Introduction to Arduino programming
- Integration of Sensors/Actuators to Arduino

Module 4

No of class hours: 7

Learning Outcomes of the module:

- Design and implement the concepts of IoT with Raspberry Pi (K5)
- Perform data analytics and draw conclusions. (K4)
- Perform case study of the various uses of IoT in various sectors of the society(K4)

Detailed content of the module:

- Implementation of IoT with Raspberry Pi;
- Data Handling Analytics
- Case Studies: Agriculture, Healthcare, Activity Monitoring

Module 5

No of class hours: 6

Learning Outcomes of the module:

- Understand the ethical issues in IoT (K3)
- Analyze the implementational environment and identify probable ethical solution to address any issue. (K4)

Detailed content of the module:

Ethics in IoT:

- Characterizing the IoT, Privacy, Control – Disrupting Control, Crowd sourcing;
- Environment – Physical thing, Electronics, Internet service;
- Solutions – The IoT as a part of the solution, cautious optimism, the open IoT definition.

Reference Books:

- https://nptel.ac.in/noc/individual_course.php?id=noc17-cs22
- "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman (CRC Press)
- Internet of Things by Dr. Jeeva Jose, Khanna Publishing House (Edition 2017)
- "Internet of Things: A Hands-on Approach", by ArshdeepBahga and Vijay Madisetti (Universities Press)
- Internet of Things: Architecture and Design Principles, Raj Kamal, McGraw Hill
- Designing the Internet of Things – Adrian McEwen & Hakim Cassimality Wiley India, ISBN: 9788126556861

Data Science

Course Code	:	ES-503
Course Title	:	Data Science
Number of Credits	:	3 (L: 3, T: 0, P: 0)
Prerequisites	:	-----
Course Category	:	Essential Course-9

Course Outcome:

- Explore the data mining concepts to develop programming abilities (K4)
- Demonstrate proficiency with statistical analysis of data. (K5)
- Build and access data-based models (K6)
- Execute statistical analyses with professional statistical software. (K4)

Module 1

No. class hours: 6

Outcomes:

- Recognize the data mining concepts and distinguish the various systems of data mining(K3)
- Integrate data mining systems with data warehouse system(K5)
- Execute innumerable pre-processing of data(K5)
- Apply data cleaning and discretization for multiple processing(K4)

Detailed contents of the Module:

- Introduction Motivation, Importance, Definitions
- Kind of Data, Data Mining Functionalities, Kinds of Patterns, Classification of Data Mining Systems
- Data Mining Task Primitives, Integration of a Data Mining System with A Database or Data Warehouse System
- Major Issues in Data Mining, Types of Data Sets and Attribute Values
- Basic Statistical Descriptions of Data, Data Visualization, Measuring Data Similarity.
- PREPROCESSING: Data Quality, Major Tasks in Data Pre-processing, Data Reduction
- Data Transformation and Data Discretization, Data Cleaning and Data Integration.

Module 2

No. Class hours: 6

Outcomes:

- Realize on-line analytical processing of data warehouse concepts (K3)
- Design various data warehouse for effective processing (K5)
- Implement data computation(K5)

Detailed contents of the Module:

- Data Warehousing and on-line Analytical Processing Data Warehouse basic concepts
- Data Warehouse Modeling - Data Cube and OLAP
- Data Warehouse Design and Usage
- Data Warehouse Implementation
- Data Generalization by Attribute-Oriented Induction, Data Cube Computation.

Module 3

No. Class hours: 6

Outcomes :

- Apply patterns for mining of data (K5)
- Implement various association and correlation on various itemset (K4)
- Recognize association rules for frequent patterns (K3)

Detailed contents of the Module:

- Patterns, Associations and Correlations Mining Frequent Patterns
- Associations and Correlations: Basic Concepts, Efficient and Scalable Frequent Itemset
- Mining Methods, Pattern Evaluation Methods, Applications of frequent pattern and associations.
- Frequent Patterns and Association Mining: A Road Map, Mining Various Kinds of Association Rules
- Constraint-Based Frequent Pattern Mining, Extended Applications of Frequent Patterns.

Module 4

No. Class hours: 6

Outcomes :

- Analyse methodologies to improve classification accuracy (K5)
- Recognize web mining algorithms (k3)
- Implement various clustering and partitioning techniques(K4)

Detailed contents of the Module:

- Classification Basic Concepts, Decision Tree Induction, Bayesian Classification Methods
- Rule-Based Classification, Model Evaluation and Selection
- Techniques to Improve Classification Accuracy: Ensemble Methods, Handling Different Kinds of Cases in Classification
- Classification by Neural Networks, Support Vector Machines, Pattern-Based Classification, Lazy Learners (or Learning from Your Neighbors).

Module 5

No. Class hours: 6

Outcomes:

- Analyse clustering structures and partitioning methods (K5)
- Recognize outlier detection techniques(k3)
- Implement web mining and HITS algorithms(K4)

Detailed contents of the Module:

- Cluster Analysis Basic Concepts of Cluster Analysis, Clustering Structures, Major Clustering Approaches, Partitioning Methods
- Hierarchical Methods, Density-Based Methods, Model-Based Clustering, Why outlier analysis,
- Identifying and handling of outliers, Outlier Detection Techniques.
- WEB MINING: Basic concepts of web mining, different types of web mining,
- PAGE RANK Algorithm, HITS Algorithm

Reference Books:

- Jiawei Han, Micheline Kamber, Jian Pei, Data Mining: Concepts and Techniques, Elsevier
- Margaret H Dunham, Data Mining Introductory and Advanced Topics, Pearson Education
- Amitesh Sinha, Data Warehousing, Thomson Learning, India.
- Xingdong Wu, Vipin Kumar, the Top Ten Algorithms in Data Mining, CRC Press, UK. Course outcomes:

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Networking Lab

Course Code	:	AIPC507
Course Title	:	Networking Lab
Number of Credits	:	1 (L: 0, T: 0, P: 2)
Prerequisites	:	-----
Course Category	:	Programme core course -13

Course outcomes:

- Understanding of computer networks, issues, limitations, options available. (k3)
- Able to configure basic small LAN and connect computers to it. (K4)
- Design various types of networks and compare their performances. (K5)
- Analyse the performances of various network protocols.(K5)

Course Content:

S.No.	Topics for Practice
1.	Showing various types of networking cables and connectors, identifying them clearly.
2.	Looking at specifications of cables and connectors of various companies on Internet, find out differences.
3.	Making patch cords using different types of cables and connectors - crimping, splicing, etc
4.	Demonstration of different type of cable testers, using them for testing patch cords prepared by the students in Lab and standard cables prepared by professionals
5.	Configuring computing devices (PC, Laptop, Mobile, etc) for network, exploring different options and their impact – IP address, gateway, DNS, security options, etc
6.	Showing various networking devices – NICs, Hub, Switch, Router, WiFi access point, etc.
7.	Looking at specifications of various networking devices various companies on Internet, find out differences.
8.	Network simulation tool (e.g. Cisco Packet Tracer)
9.	Setting up a small wired LAN in the Lab
10.	Setting up a small wireless LAN in the Lab

Reference Books:

- Cisco press books on CCNA
- User manual of networking devices available in the lab
- Wiki pages on networking devices

Machine Learning Lab

Course Code	AIPC508
Course Title	Machine Learning Lab
Number of Credits	1
Prerequisites	Machine Learning and Python
Course Category	Programme Core course-14

Course Outcomes:

After the completion of the course Student will be able to

1) Understand the concept of Linear and Logistic regression. (K3)
2) Design Support Vector machine for prediction (K5)
3) Implement the Bayesian Network (K2)
4) Implement of K-nearest neighbour Algorithm. (K2)
5) Configure Image processing techniques using Convolution Neural network. (K3)

Course Content:

Sr.No.	Experiment Name
1	Linear Regression of Single variable
2	Linear Regression of Multiple variable
3	Logistic regression of Binary Data
4	Predict iris flower using Support vector machine
5	Prediction using Random Forest
6	Time series forecasting using deep learning method
7	Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
8	Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.
9	Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.
10	Build a Convolution Neural network for image processing

References / Suggested Learning Resources:

1. E. Alpaydin, “Introduction to Machine Learning”, PHI, 2005.
2. Tom Mitchell, “Machine Learning”, McGraw Hill, 1997
3. Kevin P. Murphy, “Machine Learning, a probabilistic perspective”, The MIT Press Cambridge,
Massachusetts, 2012.

4. Alex Smola and SVN. Viswanathan, “Introduction to Machine Learning”, Cambridge
University Press, 2008.
5. Introduction to Machine Learning(link is external) | Nils J. Nilsson, Stanford University

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Distributed Systems

Course Code	:	AIPE504/1
Course Title	:	Distributed Systems
Number of Credits	:	3 (L: 3, T: 0, P: 0)
Prerequisites	:	Concept of Operating Systems, Computer Network, JAVA
Course Category	:	Programme Elective Course-2

Course Outcomes:

- To learn the principles, architectures, algorithms and programming models used in distributed systems.
- To examine how existing systems have applied the concepts of distributed systems in designing large systems.
- To design sample distributed systems.

Detailed Course Contents:

Module-1:

No. of Class Hours: 3

Characterization of Distributed Systems: Introduction, Examples of Distributed systems, Resource sharing and web, challenges.

System Models: Introduction, Architectural and Fundamental models.

Module-2:

No. of Class Hours: 6

Time and Global States: Introduction, Clocks, Events and Process states, Synchronizing physical clocks, Logical time and Logical clocks, Global states, Distributed Debugging.

Coordination and Agreement: Introduction, Distributed mutual exclusion, Elections, Multicast Communication, Consensus and Related problems.

Module-3:

No. of Class Hours: 7

Inter Process Communication: Introduction, The API for the internet protocols, External Data Representation and Marshalling, Client-Server Communication, Group Communication, Case Study: IPC in UNIX.

Distributed Objects and Remote Invocation: Introduction, Communication between Distributed Objects, Remote Procedure Call, Events and Notifications, Case study-Java RMI.

Module-4:

No. of Class Hours: 7

Distributed File Systems: Introduction, File service Architecture, Case Study1: Sun Network File System, Case Study 2: The Andrew File System.

Name Services: Introduction, Name Services and the Domain Name System, Directory Services, Case study of the Global Name Service.

Distributed Shared Memory: Introduction Design and Implementation issues, Sequential consistency and Ivy case study, Release consistency and Munin case study, other consistency models.

Module-5:

No. of Class Hours: 7

Transactions and Concurrency Control: Introduction, Transactions, Nested Transactions, Locks, Optimistic concurrency control, Timestamp ordering, Comparison of methods for concurrency control.

Distributed Transactions: Introduction, Flat and Nested Distributed Transactions, Atomic commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery.

REFERENCES:

- Distributed Systems : Principles and paradigms by Andrew S. Tanenbaum, Maarten Van Steen, Second Edition, Published by PHI.
- Distributed Systems : An Algorithm Approach, Sukumar Ghosh, Chapman & Hall/CRC, Published by Taylor &Fransis Group, 2007.
- Distributed Systems : Concepts and Design by George Coulouris, Jean Dollimore, Tim Kindberg, Gordon Blair, Fifth Edition, Published by Pearson

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Cloud Computing

Course Code	AIPE504/2
Course Title	Cloud Computing
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	--
Course Category	Programme Elective Course-2

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

- Realize the need of cloud computing, cloud essentials, benefits, challenges, limitations, usage and applications. (K4)
- Choose appropriate cloud models, cloud application architecture, cloud computing architecture and various infrastructure to model real world-problems (K5)
- Compare the various cloud services and determine the security issues for the users to place the very sensitive data housed on-site (K3)
- Illustrate the concepts of virtualization, virtual cluster and different approaches to cloud computing like Aneka, Autonomic computing engine (K3)

Module- 1: Introduction to Cloud computing

Number of Class hours:6

Learning Outcomes:

- Demonstrate the conceptsof cloud and their evolutions. (K3)
- Investigate various cloud models and architecture. (K4)
- Analyse the various scaling of cloud infrastructure (K3)

Detailed content of the module:

- Evolution of cloud, Essentials, Cloud Computing definition
- Benefits and Challenges, Limitations, Usage and Applications
- Business Models around Cloud Computing, Characteristics, Cloud Adoption.
- Cloud models: Introduction, Collaboration to cloud, Cloud Models
- Cloud Applications and Architecture, Cloud Computing Architecture
- Cloud Infrastructure Models
- Cloud Infrastructure Self Service, Scaling a cloud infrastructure.

Module- 2: Cloud Services

Number of class hours: 6

Learning Outcomes:

- Exemplify the various services in respect to storage and database. (K3)
- Examine the various management scheme and security of services of the cloud. (K4)
- Implement the testing of cloud services and the infrastructure. (K5)

Detailed content of the module:

- Introduction to Services, Storage as a Service, Database as a Service
- Information as Service, Process as a Service, Application as a Service
- Management/Governance as Service, Platform as a Service, Security as a Service
- Testing as Service, Integration as Service, Infrastructure as Service

Module- 3: Software and Service

Number of class hours: 6

Learning Outcomes:

- Identify the aspects of device integration and the providers (K3)
- Exemplify the concepts of various cloud file structures. (K3)
- Differentiate the various features of Hadoop framework (K4)

Detailed content of the module:

- Introduction, Mobile Device Integration
- Providers, Microsoft Online Intuit Quick base
- Cast Iron Cloud, Bungee Connect
- Introduction to Map Reduce, Google File System,
- Hadoop framework, Hadoop Distributed File System

Module- 4: Visualization for Cloud

Number of class hours: 6

Learning Outcomes:

- Identify the notions of virtualization architecture along with their pros and cons.(K3)
- Differentiate the different types of virtualization in clouds. (K4)

- Illustrate virtual desktop infrastructure (K3)

Detailed content of the module:

- Introduction, Pros and Cons of Virtualization
- Virtualization Architecture, Virtualization Machine
- Virtualization in Clusters/Grid Context, Virtual Network
- Types of Virtualization, Virtual Machine Monitor
- Virtual Desktop Infrastructure.

Module- 5: Visualization for Cloud

Number of class hours: 6

Learning Outcomes:

- Identify the types of clouds and their functionalities(K3)
- Integrate private and public clouds (K4)
- Analyse comet cloud architecture and their applications (K4)

Detailed content of the module:

- Cloud Computing: Introduction, Types of clouds, Cloud Comparing Approaches
- Aneka Integration of private and public cloud, Aneka Cloud Platform
- Introduction, Resource Provisioning Service, Aneka Hybrid Cloud Implementation
- Comet Cloud Architecture, Autonomic Behaviour, Comet Cloud
- Overview of Comet Cloud Based Applications, Implementation.

Reference Books: -

- Cloud Computing, M.N RAO, PHI Learning Private Limited, ISBN: 978-81-203-5073-1
- Cloud Computing – A practical approach for learning and implementation Pearson A. Srinivasan, J. Suresh
- Cloud Computing A hands-on-Approach, universities Press ArshdeepBahga and Vijay Madisetti
- Cloud Computing – Concepts, Technology and Architecture Pearson Thomas Erl

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Blockchain Technology

Course Code	AIPE504/3
Course Title	Blockchain Technology
Number of Credits	3 (L: 3, T: 1, P: 0)
Prerequisites	Database Management System
Course Category	Programme Elective Course-2

Course Outcome:-

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

- Explain the blockchain technology and its underlying mechanism
- Explain the work flow behind bitcoin and various consensus mechanism
- Identify major research challenges and technical gaps between theory and practice in crypto currency domain.
- Design own crypto currency and decentralized network.

Course Content:-

Module- 1: Introduction (6)

Basic of Blockchain Architecture – Challenges – Applications – Block chain Design Principles - The Blockchain Ecosystem - The consensus problem - Asynchronous Byzantine Agreement - AAP protocol and its analysis - Nakamoto Consensus on permission-less, nameless, peer-to-peer network - Abstract Models for BLOCKCHAIN - GARAY model - RLA Model - Proof of Work (PoW) as random oracle - formal treatment of consistency- Proof of Stake (PoS) based Chains - Hybrid models (PoW + PoS).

Module- 2: Cryptographic Fundamentals (6)

Cryptographic basics for crypto currency - a short overview of Hashing, cryptographic algorithm

– SHA 256,signature schemes, encryption schemes and elliptic curve cryptography- Introduction to Hyperledger- Hyperledger framework - Public and Private Ledgers.

Module- 3: Bitcoin (8)

Bitcoin - Wallet - Blocks - Merkley Tree - hardness of mining - transaction verifiability - anonymity - forks - double spending - mathematical analysis of properties of Bit coin. Bitcoin blockchain, the challenges, and solutions.

Module- 4: Ethereum (6)

Ethereum Virtual Machine (EVM) - Wallets for Ethereum - Solidity - Smart Contracts - some attacks on smart contracts. Ethereum and Smart Contracts- The Turing Completeness of Smart Contract Languages and verification challenges- comparing Bitcoin scripting vs. Ethereum Smart Contracts.

Module- 5: Recent Trends on Blockchain **(6)**

Recent Trends- Implementation Challenges- Zero Knowledge proofs and protocols in Block chain - Succinct non interactive argument for Knowledge (SNARK) - pairing on Elliptic curves – Zcash - attacks on Blockchains – such as Sybil attacks, selfish mining, 51% attacks - - advent of algorand, and Sharding based consensus algorit

References/ Suggested Learning Resources:-

- Melanie Swan, "Block Chain: Blueprint for a New Economy", O"Reilly, first edition – 2015.
- Daniel Drescher, "Block Chain Basics", Apress; 1stedition, 2017
- Antonopoulos A.M., Mastering Bitcoin. 2nd ed. O'Reilly Media, 2017.
- Raj K., Foundation of Blockchain: The pathway to cryptocurrency and decentralized blockchain application.1st ed. Packt Publishing Ltd, 2019

• Imran Bashir, "Mastering Block Chain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained", Packt Publishing, first edition – 2012

• Ritesh Modi, "Solidity Programming Essentials: A Beginner's Guide to Build Smart Contracts for Ethereum and Block Chain", Packt Publishing

Mobile Computing

Course Code	:	AIPE505/1
Course Title	:	Mobile Computing
Number of Credits	:	3 (L: 3, T: 0, P: 0)
Prerequisites	:	-----
Course Category	:	Programme Elective Course-3

Course Outcome:

- Recognize the basic concepts of wireless communications. (K3)
- Analyse security, energy efficiency, mobility, scalability in wireless communications. (K4)
- Demonstrate basic skills for cellular network designs. (K3)
- Develop and deploy basic mobile applications(K6)

Module 1:

No. Class hours: 6

Learning Outcomes of the Module:

- Identify the elementary perceptions of mobile applications. (K3)
- Apply Android development tools for application development (K4)
- Create Android Virtual devices (K4)

Detailed contents of the Module:

- A brief history of Mobile, Types of mobile phone generations
- The Mobile Ecosystem, Types of Mobile Applications
- Mobile Information Architecture Android Versions, Features of Android
- Android Architecture, Installing Android SDK Tools, Configuring Android in Eclipse IDE

- Android Development Tools (ADT), Creating Android Virtual Devices (AVD)

Module 2:

No. Class hours: 6

Learning Outcomes of the Module:

- Create android application programs (K4)
- Recognize numerous android application components (K3)
- Explore intent types and linking activities(K4)

Detailed contents of the Module:

- Creating first android application, Anatomy of android application
- Deploying Android app on USB connected Android device
- Android application components, Activity life cycle, understanding activities
- Exploring Intent objects, Intent Types
- Linking activities using intents

Module 3:

No. Class hours: 6

Learning Outcomes of the Module:

- Establish interactions between fragments (K3)
- Implement various types of view (K4)
- Device multiple UI event handling mechanisms (K4)

Detailed contents of the Module:

- Fragments life cycle, Interaction between fragments, Understanding the components of a screen (Layouts)
- Adapting to display orientation, Action Bar
- Views (UI Widgets)-Button, Toast, ToggleButton, CheckBox, RadioButton
- Spinner, WebView, EditText, DatePicker, TimePicker, ListView, ProgressBar
- Analog and Digital clock, Handling UI events,
- List fragment, Dialog fragment

Module 4:

No. Class hours: 6

Learning Outcomes of the Module:

- Implement menu options for popups, images and media players(K4)

- Device alarm managers, SMS, Email and media players(K4)
- Create telephony manager and storing of data persistently (K5)

Detailed contents of the Module:

- Menus-Option, Context, Popup, Images-ImageView, ImageSwitcher, AlertDialog
- Alarm manager, SMS, E-mail, Media Player
- Using camera, recording video
- Handling Telephony Manager, Storing the data persistently-

Data Storage Options: preferences

Module 5:

No. Class hours: 6

Learning Outcomes of the Module:

- Demonstrate storage and content provider through various data structures(K4)
- Device SQLite database operations (K4)
- Create connectivity in SQLite and deploy APK files(K5)

Detailed contents of the Module:

- Internal Storage, External Storage, Content Provider
- The SQLite database, Connecting with SQLite database and

operations-Insert, Delete, Update, Fetch,

- Publishing android applications, Deploying APK files

Reference Books:

- Wei-Meng Lee, Beginning Android 4 Application Development, Wiley Publishing, Inc.
- Pradeep Kothari, "Android Application Development Black Book", DreamTech Press
- James C. Sheusi, "Android Application Development for Java

Programmers", Cengage Learning

- Mark L Murphy, "Beginning Android", Wiley India Pvt Ltd
- Sayed Y Hashimi and Satya Komatineni(2009), "Pro Android", Wiley India Pvt Ltd
- Reto Meier, Professional Android 4 Application Development, Wiley India Pvt Ltd

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Software Testing

Course Code	:	AIPE505/2
Course Title	:	Software Testing
Number of Credits	:	3 (L: 3, T: 0, P: 0)
Prerequisites	:	-----
Course Category	:	Programme Elective Course-3

Course Outcome:

- Inculcate essential software testing knowledge and skills, required to reasonably test a system under development in a systematic manner. (K4)
- Analyse software functional and non-functional testing (K3)
- Devise methods to execute test cases of different types for a sample system(K4)

Module 1:

No. Class hours: 6

Learning Outcomes of the Module:

- Demonstrate fundamental concepts for software testing (K3)
- Analyse software testing life cycle (K4)
- Illustrate various types of tests performed on software for quality measurement(K3)

Detailed contents of the Module:

Basics Introduction to Software Quality basics: Verification and validation

- Quality perspectives, Testing terminology, Software Testing Life Cycle (STLC)
- "V" model of Testing, QA process
- Cost of testing, types of tests,

Module 2

No. Class hours: 6

Learning Outcomes of the Module:

- Analyse test cases and draw conclusions to improve software quality(K4)

- Determine test case scenarios for software requirements (K5)
- Establish user acceptance tests for multiple requirements(K3)

Detailed contents of the Module:

- Writing test cases, Functional Testing
- Non-functional testing, (Performance testing)
- UI testing. Preparing test data, Writing Unit test
- Integration test and User Acceptance Tests
- Preparing test scenarios from Software requirements

Module 3

No. Class hours: 6

Learning Outcomes of the Module:

- Perform test executions of the software(K3)
- Establish test planning and strategies for quality improvement(K5)
- Determine various test coverage and reporting(K4)

Detailed contents of the Module:

- Test Execution and Management test execution
- Test Oracles, test planning
- Test strategy including when to stop testing
- Test-coverage - Traceability matrix, JIRA, Bugzilla and other bug tracking tools
- Test data mining, test reporting.

Module 4

No. Class hours: 6

Learning Outcomes of the Module:

- Perform performance test cases for different types of test (load, stress, benchmarking, etc.) (K5)
- Analyse automated test for User interface (K4)
- Demonstrate in writing-executing test scripts for a sample system (K4)

Detailed contents of the Module:

- Test Automation, Why automation
- When not to automate, Writing simple automated test cases
- Learn and practice any one automated testing framework like Selenium
- Other quality Assurance Quality and Defect management - Code reviews,

- Quality tools, Change management, version control

Module 5

No. Class hours: 6

Learning Outcomes of the Module:

- Illustrate the need for tools and the types. (K5)
- Analyse testing process management tools. (K4)
- Demonstrate the use of tools in testing process (K4)

Detailed contents of the Module:

- Need for Tools, Classification of Tools, Functional / Regression Testing Tools
- Performance / Load Testing Tools, Testing Process Management Tools, Benefits of Tools
- Risks Associated with the Tools, does your Organization Need Tools, Selecting Tools,
- Introducing the tools in the Testing Process

Reference Books/Resources:

- Software Engineering – A Practitioner's Approach, 7th Edition, Roger Pressman.
- Bugzilla (https://www.bugzilla.org/)
- JIRA (https://www.atlassian.com/software/jira)

Kotlin Programming

Course Code	AIPE505/3
Course Title	Kotlin Programming
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	ES 204 and PC CS 307
Course Category	Program Elective(PE) Course-3

Course Outcome:

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

- Use the basic concepts of App Development with Kotlin Programming Language
- Apply operators and arrays in Kotlin Programming Language.
- Apply Inheritance, Interface and Extensions in kotlin

- Explain the working of Android Studio on PC and run using emulator

Course Content:

Module 1: Fundamental concepts of Kotlin Programming Language (8)

Kotlin Programming:Advantages and Disadvantages, Architecture; Kotlin Hello World - Your First Kotlin Program; How to declare a variable in Kotlin; Difference Between var and val;Kotlin Basic Types: Number Type, Short, Int, Long, Double, Float, Char, Boolean; Kotlin Strings; IDE, Kotlin syntax, Main Parameter, Kotlin comments: Single Line, Multi Line; Kotlin Operators: Arithmetic Operators; Strings; Kotlin Boolean: Ranges, Functions

Module 2: Kotlin Type Conversion, Basic Input/ Output and Arrays (8)

Kotlin Type Conversion; Conversion from Larger to Smaller Type; Kotlin Comments: Traditional comment, End of Line Comment; Kotlin Basic Input/Output; Difference Between println() and print(); Print Variables and Literals; Kotlin Input: Print String Entered By the User, Getting Integer Input from the User; Arrays: Access the elements, Change an element, Length Size, Loop through Array; Kotlin Class & Object: Nested Class, Inner Class, Anonymous Inner Class, Type Aliases; Kotlin Constructors: Primary Constructor, Initializer Blocks

Module 3: Kotlin Inheritance, Interface, Visibility Control and Extension (6)

Kotlin Inheritance: Overriding Methods, Overriding Properties, derived Class Initialization Order, Calling the superclass Implementation, overridingrules; Kotlin Interface: Implementing Interfaces, Properties in Interface, Interface Inheritance, Resolving Overriding Conflicts, Kotlin Visibility Control: Private, Protected, Internal, Public; Kotlin Extension: Extension Functions

Module 4: Introduction to Android and Android Architecture (5)

Introduction to Android - What is Android; Popular Android Application Categories; Features of Android; Popular Android Apps; Android Architecture: Android Platform Architecture Divisi

Module 5: Kotlin Project using Android Studio (5)

Creating First Project in Android Studio using Kotlin; Step to install Kotlin Plugin for Windows Users; Running the Emulator on your Android Device.

References / Suggested Learning Resources

- Programming Kotlin by Venkat Subramaniam.
- Kotlin Programming Cookbook by Anand Shekhar Roy and Rashi Kanupuria
- Kotlin for Android Developers by Antonio Leiva.
- Kotlin Blueprints by Ashish Belagali, Hardik Trivedi, Akshay Chordia.
- Mastering High Performance with Kotlin by Igor Kucherenko.

DISASTER MANAGEMENT

Course Code	**OE506/1**
Course Title	DISASTER MANAGEMENT
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	NIL
Course Category	Open elective course-1

Course outcomes:

After competing this course, student will be able to:

CO 1. Identify the various types of natural and man-made disasters.(K1)

CO 2. Predict pre- and post-disaster management for some of the disasters.(K3)

CO 3. Categorize the various information and organizations in disaster management in India.(K4)

CO 4. Demonstrate the technological tools and their role in disaster management.(K3)

C0 5. Discover the various aspects of Science and Technology for Disaster Management. (K3)

Detailed Course Content

Module – 1:

Understanding Disaster

Number of Class hours: 08

Learning Outcomes:

1. Define the Concepts and definitions of Disaster, Hazard, Vulnerability, Risk, Capacity(K1)
2. Identifying the Disaster and Development(K1)
3. Describe disaster management.(K1)

Detailed content of the unit:

1.1 the Concepts and definitions of Disaster, Hazard, Vulnerability, Risk, Capacity

1.2 Identifying the Disaster and Development

1.3 Indicate the disaster management

Module– 2:

Types, Trends, Causes, Consequences and Control of Disasters

Number of Class hours: 08

Learning Outcomes:

1. Define the Geological Disasters (earthquakes, landslides, tsunami,

mining)(K1)

2. Describe the Hydro-Meteorological Disasters (floods, cyclones,

lightning, thunder-storms, hail storms, avalanches, droughts, cold

and heat waves)(K1)

3. Classify Biological Disasters (epidemics, pest attacks, forest

fire);(K2)

4. Identify the Technological & Manmade Disasters(K2)

5. Discover the Global Disaster Trends – Emerging Risks of Disasters

– Climate Change and Urban Disasters.(K3)

Detailed content of the unit:

2.1 Geological Disasters (earthquakes, landslides, tsunami, mining);

2.2 Hydro-Meteorological Disasters (floods, cyclones, lightning, thunder-storms,

hail storms, avalanches, droughts, cold and heat waves)

2.3 Biological Disasters (epidemics, pest attacks, forest fire)

2.4 Technological Disasters (chemical, industrial, radiological, nuclear)

2.5 Manmade Disasters (building collapse, rural and urban fire, road and rail

accidents, nuclear, radiological, chemi- cals and biological disasters)

2.6 Global Disaster Trends – Emerging Risks of Disasters – Climate Change and

Urban Disasters

Module- 3:

Disaster Management Cycle and Framework

Number of Class hours: 08

Learning Outcomes:

1. Analyze the Disaster Management Cycle – Paradigm Shift in Disaster Management.

Pre-Disaster – Risk Assessment and Analysis, Risk Mapping, zonation and Micro

zonation(K4)

2. Identify the Prevention and Mitigation of Disasters, Early Warning System;

Preparedness, Capacity Development(K4)

3. Recognize the awareness During Disaster – Evacuation – Disaster Communication –

Search and Rescue – Emergency Operation Centre – Incident Command System(K1)

4. Discover the Relief and Rehabilitation –Post-disaster–

DamageandNeedsAssessment,RestorationofCriticalInfrastructure–Early

Recovery – Reconstruction and Redevelopment;(K3)

5. Discuss about IDNDR, Yokohama Strategy, Hyogo Frame- work ofAction(K2)

Detailed content of the unit:

3.1 Disaster Management Cycle – Paradigm Shift in Disaster Management.

Pre-Disaster – Risk Assessment and Analysis, Risk Mapping, zonation and

Micro zonation,

3.2 Prevention and Mitigation of Disasters, Early Warning System;

Preparedness, Capacity Development; Awareness.

3.3 During Disaster – Evacuation – Disaster Communication – Search and

Rescue

3.4 Emergency Operation Centre – Incident Command System – Relief and

Rehabilitation –

3.5 Post-disaster–

DamageandNeedsAssessment,RestorationofCriticalInfrastructure–Early

Recovery – Reconstruction and Redevelopment;

3.6 IDNDR, Yokohama Strategy, Hyogo Frame- work ofAction.

Module– 4:

Disaster Management in India

Number of Class hours: 08

Learning Outcomes:

1. Describe the Disaster Profile of India – Mega Disasters of India and Lessons

Learnt.(K1)

2. Discover the Disaster Management Act 2005 – Institutional and Financial Mechanism(K3)

3. Identify the National Policy on Disaster Management ,National Guidelines and Plan Son Disaster Management ;Role of Government (local,stateandnationa l),Non-Government and Inter Governmental Agencies.(K2)

Detailed content of the unit:

4.1 Disaster Profile of India – Mega Disasters of India and Lessons Learnt.

4.2 Disaster Management Act 2005 – Institutional and Financial Mechanism,

4.3 NationalPolicyonDisasterManagement,NationalGuidelinesandPlansonDisaster Management;

4.4 Role of Government (local ,stateandnational),NonGovernment andInterGovernmentalAgencies.

Module– 5:

Applications of Science and Technology for Disaster Management

Number of Class hours: 08

Learning Outcomes:

1. Define the Geo-informatics in Disaster Management(K1)

2. Identify the Disaster Communication System(K2)

3. Discuss the Land Use Planning and Development Regulations, Disaster Safe(K2) Designs and Constructions, Structural and Non Structural Mitigation of Disasters

4. Discover the S&T Institutions for Disaster Management in India(K3)

Detailed content of the unit:

5.1 Geo-informatics in Disaster Management (RS, GIS, GPS and RS).

5.2 Disaster Communication System (Early Warning and Its Dissemination).

5.3 Land Use Planning and Development Regulations,

5.4 Disaster Safe Designs and Constructions,

5.5 Structural and Non Structural Mitigation of Disasters

5.6 S&T Institutions for Disaster Management in India

References

1. Publications of National Disaster Management Authority (NDMA) on Various Templates

and Guidelines for Disaster Management

2. Bhandani,R.K.,Anoverviewonnatural&man-madedisastersandtheirreduction,CSIR,

New Delhi

3. Srivastava, H. N., and Gupta G. D., Management of Natural Disasters in developing

countries, Daya Publishers, Delhi

4. Alexander, David, Natural Disasters, Kluwer Academic London

5. Ghosh, G. K., Disaster Management, A P H Publishing Corporation

6. Murthy, D. B. N., Disaster Management: Text & Case Studies, Deep & Deep Pvt .Ltd

Renewable Energy System

Course Code	OE506/2
Course Title	Renewable Energy System
Number of Credits	3 (L: 0, T: 0, P: 0)
Prerequisites	NIL
Course Category	

Course outcomes:

After completion of this course students will be able to:

a) Maintain the optimised working of solar PV powerplants.(K3)

b) Gain knowledge about working principle of windpower plants..(K1)

c) Maintain the optimised working of mini and micro hydropower plants..(K3)

d) To understand the role of Geo-thermal energy and ocean energy in the Energy

Generation (K2)

e) Get the utilization of Biogas plants .(K3)

Course contents:

Module – 1:

Solar Energy

Number of class hours: 6Hours

Suggestive Learning Outcomes:

Students will be able to:

a) Describe the Fundamentals of Solar Photo Voltaic Conversion process.

b) Understand the function of different parts of a solar power plant.

c) Explain the working of Solar PV Power Generation systems.

d) Know the applications of Solar PV.

Detailed content of the unit: -

Solar Map of India: Global solar power radiation, Solar PV

Concentrated Solar Power (CSP) plants, construction and working of: Power Tower,

Parabolic Trough, Parabolic Dish, Fresnel Reflectors.

Solar Photovoltaic (PV) power plant: components layout, construction, working.

Rooftop solar PV power system.

Solar PV Applications

Module – 2:

Wind Energy

Number of class hours: 10Hours

Suggestive Learning Outcomes:

Students will be able to:

a) Know the Basic principles of wind energy conversion.

b) Know the application of Wind Energy.

c) Explain the working of different types of small wind turbine.

Detailed content of the unit: -

Scope for Wind energy in India, Basic principles of wind energy conversion

Site selection considerations, Basic components of wind energy conversion system,

Application of Wind Energy, Solar wind hybrid system

Horizontal axis small wind turbine: direct drive type, components and working

Horizontal axis small wind turbine: geared type, components and working

Vertical axis small wind turbine: direct drive and geared, components and working.

Module – 3:

Large and Micro-Hydro Power Plants

Number of Class hours: 8 hours

Suggestive Learning Outcome:

Students would be able to

1. Know the Energy conversion process of hydro power plant.

2. Know the Safe Practices for hydro power plants

3. Understand different types of turbine used in hydro power plants.

Detailed content of the unit: -

Selection of site for hydroelectric plant.

Classification of hydro power plant: High, medium and low head.

Construction and working different types of hydro power plant:

a. High head – Pelton turbine

b. Medium head – Francis turbine

c. Low head – Kaplan turbine.

Different types of microhydro turbines for different heads: Pelton ,Francis and Kaplan turbines.

Locations of these different types of large and micro-hydro power plants in

Tripura.

Module–4:

Geo-Thermal and Ocean Energy

Number of class hours: 8Hours

Suggestive Learning Outcomes:

Students will be able to:

a) Know the sites of Geothermal Energy in India.

b) Know the Resources of geothermal energy.

c) Understand the Principle of OTEC system.

d) Understand the Principle of Tidal Power.

e) Know the Classification of Tidal Power Plants.

f) Know the Electricity generation from Waves.

Detailed content of the unit: -

Geothermal Energy: Introduction, Geothermal sites in India Capacity and Potential,

Resources of geothermal energy.

Ocean Thermal Energy: Ocean Thermal Energy Conversion (OTEC), Principle of

OTEC system, Methods of OTEC power generation.

Tidal power plants: Basic Principle of Tidal Power, Components of Tidal Power

Plant, Classification of Tidal Power Plants.

Electricity generation from Waves.

Module– 5:

Biomass Energy

Number of class hours: 8Hours

Suggestive Learning Outcomes:

Students will be able to:

a) Describe the properties of fuel used in Biomass-based Power Plants.

b) Know the Bio-mass Conversion Technologies.

c) Know the types of biogas plants.

d) Describe the layout of different types of Biomass-based Power Plants.

Detailed content of the unit: -

Properties of solid fuel for biomass power plants: bagasse, wood chips, rice husk,

municipal waste.

Properties of liquid and gaseous fuel for biomass power plants: Jatropha, bio-diesel

gobar gas.

Layout of a Bio-chemical based (e.g. biogas) power plant:

Layout of a Thermo-chemical based (e.g. Municipal waste) power plant

Layout of a Agro-chemical based (e.g. bio-diesel) power plant

References:

2. Deambi,Suneel:FromSunlighttoElectricity:apracticalhandbookonsolarphotovoltaicap

plica- tion; TERI, New DelhiISBN:9788179935736

3. DavidM.Buchla,ThomasE.Kissell,ThomasL.FloydRenewableEnergySystems,PearsonEdu- cation New Delhi , ISBN:9789332586826,

4. Rachel, Sthuthi; Earnest, Joshua – Wind Power Technologies, PHI Learning, New

Delhi, ISBN: 978-93-88028-49- 3; E-book978-93-88028-50-9

5. Khoiyangbam, R S Navindu; Gupta and Sushil Kumar; Biogas Technology: Towards Sustainable Development; TERI, New Delhi; ISBN:9788179934043

6. Gipe, Paul: Wind Energy Basics, Chelsea Green Publishing Co; ISBN:978-1603580304

7. Wizelius, Tore &Earnest, Joshua -PHI Learning, New Delhi, ISBN: 978-8120351660

8. Kothari, D.P. et al: Renewable Energy Sources and Emerging Technologies, PHI Learning, New Delhi, ISBN:-978-81-203-4470-9

9. Bhadra,S.N.,Kastha,D.,Banerjee,S,WindElectricalSystemsinstallation;OxfordUnive rsityPress, New Delhi, ISBN: 9780195670936.

10. O.P. Gupta, Energy Technology, Khanna Publishing House, New Delhi (ISBN:978-9386173-683

Introduction to Embedded Systems

Course Code	OE506/3
Course Title	**Introduction to Embedded Systems**
Number of Credits	3 (L: 0, T: 0, P: 0)
Prerequisites	NIL
Course Category	OE

Course Outcome:-

On completion of the syllabus, the Students will be able to:-

C.O.1: Illustrate the concept of Embedded systems and RTOS. (K2)

C.O.2: Demonstrate the internal architecture of 8051 microcontroller (K2)

C.O.3:Develop basic embedded c codes for - Boolean and bitwise operations (K3)

C.O.4: Demonstrate embedded c codes for branching and looping operations (K2)

C.O.5: Summarize the real-life applications of the Arduino communication modules (K2)

Course Content:

Module 1-

Introduction to Embedded systems

No. of Lectures: 6

Suggested Learning Outcomes:

1. Illustrate the concept of Embedded systems.

2. Classify the types of Embedded System.

3. Outline the characteristics of Embedded system

4. Understand the concept of Real time systems and its types.

5. Compare between RTOS and General purpose OS

Content

Introduction to embedded systems. Features of embedded systems. Characteristics of

Embedded Systems. Classification of embedded systems. Examples of embedded

systems. Architecture of embedded system.

Real time systems, examples of real time systems. Types of real time systems.

Introduction to RTOS, difference between RTOS and General purpose OS. Need for

RTOS in embedded systems. Kernel and its functions.

Course Code ECOE-508

Course Title: Introduction to Embedded Systems

Number of credits 3 (L: 3, T: 0, P: 0)

Prerequisites NIL

Course Category OE

Module 2–

Microcontroller fundamentals

No. of lectures:6

Suggested Learning Outcomes: The students on completion of Module II shall be able to:

1. Illustrate the basic block diagram of 8051 microcontroller

2. Explain the registers in 8051 microcontroller

3. Demonstrate memory organization in 8051 microcontroller

4. Illustrate the operation of SFRs and IO ports

Content

Block Diagram of 8051, PSW and Flag Bits, 8051 Register Banks and Stack, Internal Memory

Organization of 8051, IO Port Usage in 8051, Types of Special Function Registers and their uses in

8051, Pins Of 8051.

Module 3 –

Embedded C basics operators for Arduino

No. of lectures:6

Suggested Learning Outcomes: The students on completion of Module II shall be able to:

5. Illustrate the Arduino IDE

6. Explain the serial port communication

7. Develop embedded c codes for Boolean operation

8. Develop embedded c codes for pointer access operation

9. Demonstrate embedded c codes for bitwise operation

Content

Familiarizing with the Arduino IDE. Sketch designing for Arduino. Communication interface

using serial port. Basic understanding of the code with boolean operations, pointer access

operations, bitwise operations, compounded operations.

Module 4 –

Embedded C control structure blocks

No. of lectures: 6

Suggested Learning Outcomes: The students on completion of Module III shall be able to:

1. Develop codes for loop

2. Experiment with codes for while loop

3. Experiment with codes for do-while loop

4. Develop codes for conditional branching operations

Content

Looping mechanism – for, do and while loops. The branching operations based on conditions

expression

Module 5-

Communication with Arduino and Applications

No. of lectures: 6

Suggested Learning Outcomes: The students on completion of Module V shall be able to:

1. Classify the different communication modules of Arduino.

2. Summarize the real-life applications of the communication modules of Arduino.

3. Outline the various communication interfaces.

Content

Different communication modules available with their real-life application, Communication

interface. Case study.

SUGGESTED LEARNING RESOURCES:

1. Arduino Projects For Dummies (For Dummies Series),KennedyGeorge;Davis Bernard;

PrasannaSRM,Wiley (5 July 2013).ISBN : 978-1118551479

2. “The 8051 Microcontroller”, Kenneth J. Ayala, 3rd Edition, Thomson/Cengage Learning.

3. Make: Getting Started WithArduino - The Open SourceElectronicsPrototypingPlatform

Massimo Banziand Michael ShilohShroff/Maker Media; Third edition (27December 2014)

ISBN : 978-9351109075

4. Real Time Operating System-Rajib Mall

SUGGESTED SOFTWARE/LEARNING WEBSITES:

1. https://www.arduino.cc/reference/en/

2. https://learn.adafruit.com/category/learn-arduino

Summer Internship-II

Course Code	AISI509
Course Title	Summer Internship-II
Number of Credits	3 (L: 0, T: 0, P: 0)
Prerequisites	Fundamental and basic practical skills of discipline/programme
Course Category	Internship

Internships may be full-time or part-time; they are full-time in the summer vacation and part- time during the academic session.

Sl. no.	Schedule	Duration	Activities	Credits	Hours of Work
1	Summer Vacation after 4th Semester	6 Weeks	Industrial/Govt./NGO/MSME/ Rural Internship/Innovation / Entrepreneurship ##	3	120 Hours

(##During the summer vacation after 4th Semester, students are ready for industrial experience. Therefore, they may choose to

undergo Internship /Innovation /Entrepreneurship related activities. Students may choose either to work on innovation or entrepreneurial activities resulting in start-up or undergo internship with industry/ NGO's/ Government organizations/ Micro/ Small/ Medium enterprises to make themselves ready for the industry. In case a student want to pursue his/her family business and don't want to undergo internship, a declaration by a parent may be submitted directly to the TPO.)

Course Outcome: -

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

C.O.1: Describe a better understanding of the engineering / technological workplace(K2).

C.O.2: Develop and demonstrate workplace competencies necessary for professional and academic success (K2).

C.O.3: Classify career preferences and professional goals (K3).

C.O.4: Develop preliminary portfolio including work samples from the internship (K2). C.O.5: Increase competitiveness for full-time engineering employment / start-up (K3).

Course Content:-

Internships are educational and career development opportunities, providing practical experience in a field or discipline. The Summer Internship-II is a student centric activity that would expose Technical students to the industrial environment, which cannot be simulated in the classroom and hence creating competent professionals for the industry. They are structured, short-term, supervised placements often focused around particular tasks or projects with defined timescales. An internship may be compensated, non-compensated or some time may be paid. The internship has to be meaningful and mutually beneficial to the intern and the organization. It is important that the objectives and the activities of the internship program are clearly defined and understood. Following are the intended objectives of internship training:

- Will expose Technical students to the industrial environment, which cannot be simulated in the classroom

and hence creating competent professionals for the industry.

- Provide possible opportunities to learn, understand and sharpen the real time technical / managerial skills required at the job.
- Exposure to the current technological developments relevant to the subject area of training.
- Experience gained from the 'Industrial Internship' in classroom will be used in classroom discussions.
- Create conditions conducive to quest for knowledge and its applicability on the job.
- Learn to apply the Technical knowledge in real industrial situations.
- Gain experience in writing Technical reports/projects.
- Expose students to the engineer's responsibilities and ethics.
- Familiarize with various materials, processes, products and their applications along with relevant aspects of quality control.
- Promote academic, professional and/or personal development.
- Expose the students to future employers.
- Understand the social, economic and administrative considerations that influence the working environment of industrial organizations
- Understand the psychology of the workers and their habits, attitudes and approach to problem solving.

Overall compilation of Internship Activities / Credit Framework:

Major Head of Activity	**Credit**	**Schedule**	**Total Duration**	**Sub Activity Head**	**Proposed Document as Evidence**	**Evaluated by**	**Performance appraisal/ Maximum points/ activity**
				Participation in innovation related	Certificate	Faculty Me	Satisfactory/ Good/

Innovation / IPR / Entrepreneurship	3	Summer Vacation after 4th Semester	6 Weeks	completions for eg. Hackathons etc.		ntor	Excellent
				Development of new product/ Business Plan/ registration of start-up	Certificate	Programme Head	Satisfactory/ Good/ Excellent
				Participation in all the activities of Institute's Innovation Council for eg: IPR workshop/ Leadership Talks/ Idea/ Design/ Innovation/ Business Completion/ Technical Expos	Certificate	President/ Convener of ICC	Satisfactory/ Good/ Excellent

				etc.			
				Work experience at family business	Declaration by Parent	TPO	Satisfactory/ Good / Excellent
Internship	3	Summer Vacation after 4th Semester	6 Weeks	(Internship with Industry / Govt. / NGO/ PSU/ Any Micro/ Small/ Medium enterprise/ Online Internship	Evaluating Report	Faculty Mentor / TPO/ Industry supervisor	Satisfactory/ Good/ Excellent
Rural Internship	3	Summer Vacation after 4th Semester	6 Weeks	Long Term goals under rural Internship	Evaluating Report	Faculty Mentor/ TPO/ NSS/ NCC head	Satisfactory/ Good/ Excellent

STUDENT'S DIARY/ DAILY LOG

The main purpose of writing daily diary is to cultivate the habit of documenting and to encourage the students to search for details. It develops the students' thought process and reasoning

abilities. The students should record in the daily training diary the day-to-day account of the observations, impressions, information gathered and suggestions given, if any. It should contain the sketches & drawings related to the observations made by the students.

The daily training diary should be signed at the end of each day by the supervisor/ in charge of the section where the student has been working. The diary should also be shown to the Faculty Mentor visiting the industry from time to time and get ratified on the day of his visit.

Student's Diary and Internship Report should be submitted by the students along with attendance record and an evaluation sheet duly signed and stamped by the industry to the Institute immediately after the completion of the training. It will be evaluated on the basis of the following criteria:

- Regularity in maintenance of the diary.
- Adequacy & quality of information recorded.
- Drawings, sketches and data recorded.
- Thought process and recording techniques used.
- Organization of the information.

INTERNSHIP REPORT

After completion of Internship, the student should prepare a comprehensive report to indicate what he has observed and learnt in the training period. The student may contact Industrial Supervisor/ Faculty Mentor/TPO for assigning special topics and problems and should prepare the final report on the assigned topics. Daily diary will also help to a great extent in writing the industrial report since much of the information has already been incorporated by the student into the daily diary. The training report should be signed by the Internship Supervisor, TPO and Faculty Mentor. The Internship report will be evaluated on the basis of following criteria:

- Originality.
- Adequacy and purposeful write-up.
- Organization, format, drawings, sketches, style, language etc.
- Variety and relevance of learning experience.
- Practical applications, relationships with basic theory and concepts taught in the course.

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Major Project (Part- I)

Course Code	AIPR510
Course Title	Major Project (Part-I)
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	Nil
Course Category	Project Work (PR)

Course Outcome:-

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

C.O. 1: Demonstrate a sound technical knowledge of their selected project topic and the knowledge, skills and attitudes of a professional engineer (K2).

C.O. 2: Develop the skill of working in a Team (K3).

C.O. 3: Design engineering solutions to complex problems utilising a systems approach (K6).

C.O. 4: Design the solution of an engineering project involving latest tools and techniques (K6).

C.O. 5: Develop the skill of effective communication with engineers and the community at large in written an oral forms. (K3)

Course Content:-

The major project topic should be selected / chosen to ensure the satisfaction of the urgent need to establish a direct link between education, national development and productivity and thus reduce the gap between the world of work and the world of study. The course should have the following-

- Develop sound knowledge about the domain of the project work.
- Perform detailed study about various components of a project.
- Learn to be an important member of a team for successful execution of a project work.
- Study about methodologies and professional way of documentation and communication related to project work.
- Develop idea about problem formulation, finding the solution of a complex engineering problem.
- Develop project report as per the suggested format to communicate the findings of the project work.
- Acquire the skill of effective oral communication to the fellow engineers and people in the society at large.
- Knowledge of how to organize, scope, plan, do and act within a project thesis.
- Familiarity with specific tools (i.e. hardware equipment and software) relevant to the project selected.
- Demonstrate the implementation of a major project work.

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