

B. Sc. Data Science & Analytics

Syllabus

AFFILIATED COLLEGES

Program Code:***

2024 – 2025 onwards



BHARATHIAR UNIVERSITY

(A State University, Accredited with “A” Grade by NAAC,
Ranked 26th among Indian Universities by MHRD-NIRF,
World Ranking: Times -801-1000, Shanghai -901-1000, URAP - 982)

Coimbatore - 641 046, Tamil Nadu, India

Course Code		Business Data Analytics	L	T	P	C
Core/Elective/Supportive		Elective : I	5	0	0	4
Pre - requisite		None	Syllabus version		2023-24 Onwards	
Course Objectives						
· To introduce the fundamental concepts of Business data analytics and associated methodologies						
Expected Course Outcomes:						
1	Understand and critically apply the concepts and methods of business analytics					K2
2	Demonstration the various methodologies of descriptive statistics					K2
3	Understanding of modeling uncertainty and statistical inference					K2
4	Understanding of analytical frameworks					K2
K1 – Remember K2 – Understand K3 – apply K4- Analyze K5 – evaluate K6- Create						
UNIT I	OVERVIEW OF BUSINESS ANALYTICS					18 hours
Introduction – Drivers for Business Analytics – Applications of Business Analytics: Marketing and Sales, Human Resource, Healthcare, Product Design, Service Design, Customer Service and Support– Skills Required for a Business Analyst–Framework for Business Analytics Life Cycle for Business Analytics Process.						
UNIT II	ESSENTIALS OF BUSINESS ANALYTICS					17 hours
Descriptive Statistics–Using Data–Types of Data–Data Distribution Metrics: Frequency, Mean, Median, Mode, Range, Variance, Standard Deviation, Percentile, Quartile, z-Score, Covariance, Correlation– Data Visualization: Tables,Charts,Line Charts,Bar and Column Chart,Bubble Chart, Heat Map–Data Dashboards.						
UNIT III	MODELING UNCERTAINTY AND STATISTICAL INFERENCE					19 hours
Modeling Uncertainty: Events and Probabilities – Conditional Probability – Random Variables – Discrete Probability Distributions – Continuous Probability Distribution–Statistical Inference: Data Sampling–Selecting a Sample–Point Estimation–Sampling Distributions–Interval Estimation–Hypothesis Testing.						
UNIT IV	ANALYTICS USING HADOOP AND MAP REDUCE FRAMEWORK					19 hours
Introducing Hadoop– RDBMS versus Hadoop – Hadoop Overview – HDFS(Hadoop Distributed File System)–Processing Data with Hadoop–Introduction to Map Reduce–Features of Map Reduce– Algorithms Using Map-Reduce:Matrix- Vector Multiplication, Relational Algebra Operations, Grouping and Aggregation–Extensions to Map Reduce.						
UNIT V	OTHER DATA ANALYTICAL FRAMEWORKS					17 hours
Overview of Application development Languages for Hadoop – Pig Latin – Hive – Hive Query Language (HQL) – Introduction to Pentaho, JAQL–Introduction to Apache: Sqoop, Drill and Spark, Cloud era Impala–Introduction to No SQL Databases– H base and Mongo DB.						
Total Lecture Hours						90 hours

Text Book(s)		
1	VigneshPrajapati,—BigDataAnalyticswithR andHadoop ,PacktPublishing,2013.	
2	UmeshR Hodeghatta, UmeshaNayak,—BusinessAnalyticsUsingR—APracticalApproach , Apress,2017.	
ReferenceBook(s)		
1	AnandRajaraman,JeffreyDavidUllman,—MiningofMassiveDatasets ,Cambridge UniversityPress,2012.	
2	JeffreyD.Camm,JamesJ.Cochran,MichaelJ.Fry,JeffreyW.Ohlmann,DavidR.Anderson,—EssentialsofBusinessAnalytics ,CengageLearning,secondEdition,2016	
3	U.DineshKumar,—BusinessAnalytics:TheScienceofData-DrivenDecisionMaking , Wiley,2017.	
4	A.Ohri,—RforBusinessAnalytics ,Springer,20127.RuiMiguelForte,—Mastering PredictiveAnalyticswithR ,PacktPublication,2015.	
	Related Online Contents (MOOC, SWAYAM,NPTEL, Websites etc)	
1	https://onlinecourses.swayam2.ac.in/aic20_sp06/preview	
2	https://onlinecourses.swayam2.ac.in/arp19_ap79/preview	
Course Designed by :		

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L	L	L	L	L	L	L	L	L	L
CO2	M	M	L	L	L	L	L	L	L	L
CO3	S	M	M	L	L	L	L	L	L	L
CO4	S	S	S	L	L	L	L	L	L	L

*S-Strong; M-Medium; L-Low

Course Code		Social Network Analysis	L	T	P	C
Core/Elective/Supportive		Elective : I	6	0	0	4
Pre - requisite		None	Syllabus version		2023-24 Onwards	
Course Objectives						
To explain the methodologies used in social network analysis						
Expected Course Outcomes:						
1	Understand a broad range of network concepts and theories.					K2
2	Appreciate how network analysis can contribute to increasing knowledge about diverse aspects of society.					K2
3	Use a relational approach to answer questions of interest to them (i.e. be able to apply 'network thinking').					K3
4	Analyse social network data using various software packages.					K3
5	Present results from social network analysis, both orally and in writing					K5
K1 – Remember K2 – Understand K3 – apply K4- Analyze K5 – evaluate K6- Create						
UNIT I	Clustering and Classification					19 hours
Supervised Learning – Decision tree - Naïve Bayesian Text Classification - Support Vector Machines - Ensemble of Classifiers – Unsupervised Learning – K-means Clustering – Hierarchical Clustering – Partially Supervised Learning – Markov Models – Probability-Based Clustering – Vector Space Model						
UNIT II	Social Media Mining					18 hours
Data Mining Essentials –Data Mining Algorithms - Web Content Mining –Latent semantic Indexing – Automatic Topic Extraction – Opinion Mining and Sentiment Analysis – Document Sentiment Classification						
UNIT III	Extraction and Mining Communities in Web Social Networks					18 hours
Extracting evolution of Web Community from a Series of Web Archive – Detecting Communities in Social Networks – Definition of Community – Evaluating Communities – Methods for Community Detection & Mining – Applications of Community Mining Algorithms – Tools for Detecting Communities – Social Network Infrastructure and Communities – Decentralized Online Social Networks – Multi-Relational Characterization of Dynamic Social Network Communities						
UNIT IV	Human behavior analysis and privacy issues					18 hours
Understanding and Predicting Human Behavior for Social Communities – Use Data Management, Inference and Distribution – Enabling New Human Experiences – Reality Mining – Context Awareness – Privacy in Online Social Networks – Trust in Online Environment – Trust Models Based on Subjective Logic – Trust Network Analysis – Trust Transitivity Analysis – Combining Trust and Reputation – Trust Derivation Based on Trust Comparisons – Attack Spectrum and Countermeasures						

UNIT V	Visualization And Applications Of Social Networks	17 hours
Visualizing Online Social Networks – Visualizing Social Networks with Matrix-Based Representations – Node- Link Diagrams – Hybrid Representations – Applications – Covert Networks – Community Welfare – Collaboration Networks – Co-Citation Networks.		
UNIT IV	Contemporary Issues	3
Total Lecture Hours		90 Hours
Text Book(s)		
1	Peter Mika, —Social networks and the Semantic Web, Springer, 2007.	
2	BorkoFurht, —Handbook of Social Network Technologies and Applications, Springer, 2010	
ReferenceBook(s)		
1	Bing Liu, —Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data (DataCentric Systems and Applications), Springer; Second Edition, 2011.	
2	Reza Zafarani, Mohammad Ali Abbasi, Huan Liu, Social Media Mining, Cambridge University Press, 2014.	
3	GuandongXu, Yanchun Zhang and Lin Li, —Web Mining and Social Networking Techniques and applications, Springer, 2011	
4	Dion Goh and Schubert Foo, —Social information retrieval systems: emerging technologies and Applications for searching the Web effectively, Idea Group, 2007.	
Related Online Contents (MOOC, SWAYAM,NPTEL, Websites etc)		
1	https://onlinecourses.swayam2.ac.in/aic20_sp06/preview	
2	https://onlinecourses.swayam2.ac.in/arp19_ap79/preview	
Course Designed by :		

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L	L	L	L	L	L	L	L	L	L
CO2	M	L	L	L	L	L	L	L	L	L
CO3	S	M	L	L	L	L	L	L	L	L
CO4	S	M	M	L	L	L	L	L	L	L
CO5	S	S	S	L	L	L	L	L	L	L

*Strong-S, Medium-M, Low-L;

Course Code		Time Series Analysis	L	T	P	C
Core/Elective/Supportive		Elective : I	5	0	0	4
Pre - requisite		None	Syllabus version		2023-24 Onwards	
Course Objectives						
· To introduce the fundamental concepts of Time Series Analysis and associated methodologies						
Expected Course Outcomes:						
1	Understand and critically apply the concepts and methods of business analytics					K2
2	Demonstration the various methodologies of descriptive statistics					K2
3	Understanding of Forecast the trend pattern exhibited by the given data by using various methods					K2
4	Understanding of Neural Network for time-series forecasting					K2
K1 – Remember K2 – Understand K3 – apply K4- Analyze K5 – evaluate K6- Create						
UNIT I	Time Series Analysis					18 hours
Stock Price Prediction - Energy Consumption Forecasting - Website Traffic Prediction - Sales Demand Forecasting – Components of Time Series Analysis - Importance of Time Series Analysis.						
UNIT II	Significance of Time Series Analysis					17 hours
Pattern Recognition - Anomaly Detection - Resource Optimization - Financial Analysis – ARIMA -						
UNIT III	Deep Neural Network-Based Time Series Models					19 hours
Deep Neural Network applications – Anomaly Detection – Recurrent Neural Network – RNN: Long Short-Term Memory – Challenges – Multi-variate Analysis.						
UNIT IV	Time Series Forecasting					19 hours
What is Forecasting – Time series and its forecasting – Forecasting Methodologies – Objective of timeseries?						
UNIT V	Neural Network for Time-Series forecasting					17 hours
Data Issues – Network Design – Model selection and Evaluation – Methodological Issues – Multi-period Forecasting.						
Total Lecture Hours						90 hours

Text Book(s)		
1	“Introductory Time Series with R (Use R!)” Authors: Paul S.P. Cowpertwait and Andrew V. Metcalfe	
2	“The Analysis of Time Series: An Introduction” Author: Chris Chatfield.	
ReferenceBook(s)		
1	"Time Series Analysis Forecasting and Control" by G E P Box and G M Jenkins	
2	"Time Series Analysis: With Applications in R" by Jonathan D Cryer and Kung-Sik Chan	
Related Online Contents (MOOC, SWAYAM,NPTEL, Websites etc)		
1	https://www.slideshare.net/category/data-analytics	
2	https://learn.365datascience.com/courses/time-series-analysis-in-python/what-does-the-course-cover/	
Course Designed by :		

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L	L	L	L	L	L	L	L	L	L
CO2	M	M	L	L	L	L	L	L	L	L
CO3	S	M	M	L	L	L	L	L	L	L
CO4	S	S	S	L	L	L	L	L	L	L

*S-Strong; M-Medium; L-Low

Course Code		Web Application Security	L	T	P	C
Core/Elective/Supportive		Elective : II	6	0	0	4
Pre - requisite		None	Syllabus version		2023-24 Onwards	
Course Objectives						
• To introduce the concepts of security in web applications • To explain about crime prevention and routine duties in a police station						
Expected Course Outcomes:						
1	Illustrate about the concept of HTML, DHTML, CSS and Java Script					K2
2	Explain the history, characteristics, technologies, concepts, usage in web2.0 and web 3.0					K2
3	Apply the core concepts of web applications to create web pages					K3
4	Apply the concepts of servers side programming					K3
K1 – Remember K2 – Understand K3 – apply K4- Analyze K5 – evaluate K6- Create						
UNIT I	Introduction to web applications					19 hours
Data with URL- HTML - DHTML: Cascading Style Sheets, Common Gateway Interface: Programming CG! Scripts - HTML Forms:- Custom Database Query Scripts - Server Side Includes - Server _security issues.						
UNIT II	Introduction to Scripting Languages					19 hours
XHTML: Introduction, CSS- Scripting languages- Java Script: Control statements, Functions, Arrays, Objects - DOM- Ajax enable rich internet applications.						
UNIT III	Server Side Programming					18 hours
Server side Programming - Active server pages - Java server pages - Java Servlets: Servlet containerExceptions - Sessions and Session Tracking_ - Using Servlet context - Dynamic Content Generation - Servlet Chaining and Communications.						
UNIT IV	HTML 5 & CSS 3					17 hours
HTML review, Feature detection , The HTML5 new Elements, Canvas, Video and audio, Web storage, Geo location, Offline Web pages , Micro data, HTML5 APLS, Migrating from HTML4 to HTML5, CSS3 .						
UNIT V	Web 2.0					17 hours
WEB 2.0- HISTORY, characteristics, technologies, concepts, usage, web2.0 in education, philanthropy, social work. Web 3.0- Theory-and history understanding. basic web artifacts and applications, implementation. MS share point - Share point 2013 overview, share (Put social to work, Share your stuff, Take share point on the go), Discover (find experts, discover answers, find what youare looking for), Manage (cost, risk, time)						
Total Lecture Hours						90 hours

Text Book(s)	
1	Deitel, Deitel and Neita, -Internet and World Wide _Web- How to programll, Pearson Education Asia, 4th Edition, 2009.
2	Elliotte Rusty Herold, -Java Network Programming II, O'Reilly Publications, 3rd Edition, 2004.
ReferenceBook(s)	
1	Jeffy Dwight, Michael Erwin and Robert Nikes -USING CGIII, PH.I Publications, 1997
2	Jason Hunter, William Crawford -Java Servlet Programming O'Reilly Publications, 2nd Edition, 2001.
3	Eric Ladd and Jim O'Donnell, etal, -USING HTML4, XML, and JAVA1.2, Prentice Hall, 2003
4	Jeremy Keith, -Html5 for web designers
Related Online Contents (MOOC, SWAYAM,NPTEL, Websites etc)	
1	https://onlinecourses.swayam2.ac.in/aic20_sp06/preview
2	https://onlinecourses.swayam2.ac.in/arp19_ap79/preview
Course Designed by :	

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L	L	L	L	L	L	L	L	L	L
CO2	M	L	L	L	L	L	L	L	L	L
CO3	S	M	L	L	L	L	L	L	L	L
CO4	S	M	L	L	L	L	L	L	L	L

*S-Strong; M-Medium; L-Low

Course Code		Software Agents	L	T	P	C
Core/Elective/Supportive		Elective : II	5	0	0	4
Pre - requisite		None	Syllabus version		2023-24 Onwards	
Course Objectives						
• To explain the fundamentals of agents and agent programming paradigms. • To explain about agents and security						
Expected Course Outcomes:						
1	Understanding the fundamentals of agents and agent programming paradigms.					K2
2	Discussing the basics of java agents.					K2
3	Learning the concepts of multivalent systems.					K2
4	Understanding the concepts of intelligent software agents.					K2
5	Understanding the agents and security					K2
K1 – Remember K2 – Understand K3 – apply K4- Analyze K5 – evaluate K6- Create						
UNIT I	AGENTS – OVERVIEW					18 hours
UNIT I Agent Definition – Agent Programming Paradigms – Agent Vs Object – Aglet – Mobile Agents – Agent Frameworks – Agent Reasoning						
UNIT II	JAVA AGENTS					19 hours
UNIT II Processes – Threads – Daemons – Components – Java Beans – ActiveX – Sockets – RPCs – Distributed Computing – Aglets Programming – Jini Architecture – Actors and Agents – Typed and Proactive Messages						
UNIT III	MULTIAGENT SYSTEMS					18 hours
Interaction between Agents – Reactive Agents – Cognitive Agents – Interaction Protocols – Agent Coordination – Agent negotiation – Agent Cooperation – Agent Organization – Self-Interested Agents in Electronic Commerce Applications						
UNIT IV	INTELLIGENT SOFTWARE AGENTS					17 hours
Interface Agents – Agent Communication Languages – Agent Knowledge Representation – Agent Adaptability – Belief Desire Intension – Mobile Agent Applications						
UNIT V	AGENTS AND SECURITY					18 hours
Agent Security Issues – Mobile Agents Security – Protecting Agents against Malicious Hosts – Untrusted Agent – Black Box Security – Authentication for Agents – Security Issues for Aglets						
Total Lecture Hours						90 hours

Text Book(s)		
1	Bigus & Bigus, “Constructing Intelligent agents with Java”, Wiley, 2010.	
2	Bradshaw, “Software Agents”, MIT Press, 2012.	
	ReferenceBook(s)	
1	Russel & Norvig, “Artificial Intelligence a modern approach”, Prentice Hall, 1994.	
2	Richard Murch and Tony Johnson, “Intelligent Software Agents”, Prentice Hall, 2000	
3	Michael Wooldridge, “An Introduction to Multi Agent Systems”, John Wiley, 2002.	
	Related Online Contents (MOOC, SWAYAM,NPTEL, Websites etc)	
1	https://onlinecourses.swayam2.ac.in/aic20_sp06/preview	
2	https://onlinecourses.swayam2.ac.in/arp19_ap79/preview	
Course Designed by :		

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L	L	L	L	L	L	L	L	L	L
CO2	M	L	L	L	L	L	L	L	L	L
CO3	S	M	L	L	L	L	L	L	L	L
CO4	S	M	L	L	L	L	L	L	L	L
CO5	S	M	L	L	L	L	L	L	L	L

*S-Strong; M-Medium; L-Low

Course Code		TITLE OF THE COURSE	L	T	P	C
Elective II		Recommender Systems	5	-	-	4
Pre - requisite		None	Syllabus version		2023-24	

Course Objectives

The main objectives of this course are to:

1. Understand about different types of recommender systems.
2. Understand the evaluation methods for recommender systems
3. Understand about some of the recent developments in this field

Expected Course Outcomes:

On the successful completion of the course, student will be able:

1	Understand the basics of Recommender systems	K2
2	Understand about the different types of recommender systems	K2,K3
3	Analyze ways to evaluate Recommender Systems and provide explanations	K2,K4
4	Understand a few applications of Recommender Systems	K3

K1 – Remember K2 – Understand K3 – apply K4- Analyze K5 – evaluate K6- Create

UNIT I	Collaborative recommendation	17 hours
Introduction to basic concepts behind recommender systems-Recent developments Collaborative recommendation: User-based and item-based nearest neighbour recommendations – Ratings- Further model-based and preprocessing based approaches- Recent practical approaches and systems		
UNIT II	Content-based and Knowledge-based recommendation	18 hours
Content-based recommendation: Content representation and content similarity-Similaritybased retrieval. Knowledge based recommendation: Knowledge representation and reasoning, Constraint based recommenders, Case based recommenders		
UNIT III	Hybrid recommendation and explanations	18 hours
Hybrid recommendation : Opportunities for hybridisation-monolithic, parallelized and pipelined hybridization designs Explanations in recommender systems: Explanations in constraint-based, case-based and collaborative filtering recommenders		
UNIT IV	Evaluating Recommender System and case study	18 hours
General properties of evaluation research- Popular evaluation designs-Evaluation on historical datasets – Alternate evaluation designs Case study- Personalised game recommendation on the mobile internet		

UNIT V	Recent developments	19hours
Online consumer decision making: Context, primacy/recency and further effects - Personality and social psychology Recommender systems and the next generation Web: Trust-aware recommender systems-Folksonomies-Ontological filtering-Extracting semantics from the web		
Total Lecture Hours		90 Hours
Text Book(s)		
1	Jannach and Zanker, Recommender Systems: An Introduction, Cambridge University Press, 2012.	
2	Aggarwal, Recommender Systems: The Textbook, Springer Publications, 2016.	
ReferenceBook(s)		
1	Ricci F., Rokach L., Shapira D., Kantor B.P., Recommender Systems Handbook, Springer(2011), 1st ed	
2	Manouselis N., Drachsler H., Verbert K., Duval E., Recommender Systems For Learning, Springer (2013), 1st ed.	
Related Online Contents (MOOC, SWAYAM,NPTEL, Websites etc)		
1	https://www.coursera.org/specializations/recommender-systems	
Course Designed by :		

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	L	L	L	L	L	L	L	L	L
CO2	M	L	L	L	L	L	L	L	L	L
CO3	S	M	L	L	L	L	L	L	L	L
CO4	S	S	M	L	L	L	L	L	L	L

*Strong-S, Medium-M, Low-L;

Course Code		Ethical Hacking	L	T	P	C
Core/Elective/Supportive		Elective : III	6	0	0	4
Pre - requisite		None	Syllabus version		2023-24 Onwards	
Course Objectives						
• To introduce the concepts of security and various kinds of attacks • To explain about system hacking and penetration testing						
Expected Course Outcomes:						
1	Explain the importance of security and various types of attacks					K2
2	Understand the concepts of scanning and system hacking					K2
3	Explain about penetration testing and its methodology					K2
4	Identify the various programming languages used by security professional					K4
K1 – Remember K2 – Understand K3 – apply K4- Analyze K5 – evaluate K6- Create						
UNIT I	Introduction To Hacking					19 hours
Introduction to Hacking – Importance of Security – Elements of Security – Phases of an Attack – Types of Hacker Attacks – Hacktivism – Vulnerability Research – Introduction to Foot printing – Information Gathering Methodology – Foot printing Tools –DNS Information Tools-Meta Search Engines.						
UNIT II	Scanning And Enumeration					19 hours
Introduction to Scanning – Objectives – Scanning Methodology – Tools – Introduction to Enumeration – Enumeration Techniques and Procedure.						
UNIT III	System Hacking					18 hours
Introduction – Cracking Passwords – Password Cracking Websites – Password Guessing –Password Cracking Tools – Password Cracking Countermeasures - Keyloggers and Spyware.						
UNIT IV	Programming For Security Professionals					17 hours
General properties of evaluation research- Popular evaluation designs-Evaluation on historical datasets – Alternate evaluation designs Case study- Personalised game recommendation on the mobile internet						
UNIT V	Penetration Testing					18 hours
Introduction – Security Assessments – Types of Penetration Testing- Phases of Penetration Testing– Tools – Choosing Different Types of Pen-Test Tools.						
Total Lecture Hours						90 hours

Text Book(s)	
1	EC-Council, –Ethical Hacking and Countermeasures: Attack Phases , Cengage Learning,2010.
2	Jon Erickson, –Hacking, 2nd Edition: The Art of Exploitation , No Starch Press Inc., 2008.
3	Michael T. Simpson, Kent Backman, James E. Corley, –Hands-On Ethical Hacking andNetwork Defense , Cengage Learning, 2013.
ReferenceBook(s)	
1	Patrick Engebretson, –The Basics of Hacking and Penetration Testing – Ethical Hackingand Penetration Testing Made Easy , Second Edition, Elsevier, 2013.
2	RafayBoloach, –Ethical Hacking and Penetration Testing Guide , CRC Press, 2014
Related Online Contents (MOOC, SWAYAM,NPTEL, Websites etc)	
1	https://onlinecourses.swayam2.ac.in/aic20_sp06/preview
2	https://onlinecourses.swayam2.ac.in/arp19_ap79/preview
Course Designed by :	

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L	L	L	L	L	L	L	L	L	L
CO2	M	L	L	L	L	L	L	L	L	L
CO3	S	M	L	L	L	L	L	L	L	L
CO4	S	M	L	L	L	L	L	L	L	L

*S-Strong; M-Medium; L-Low

Course Code		Open Source Software	L	T	P	C
Core/Elective/Supportive		Elective : III	5	0	0	4
Pre - requisite		None	Syllabus version		2023-24 Onwards	
Course Objectives - To explain the need and importance of open source software - To introduce the various open source softwares like Linux, MySql, PHP and Python						
Expected Course Outcomes:						
1	Explain about the need and importance of open source software					K2
2	Demonstrate the concepts of open source software					K2
3	Apply the programming constructs of MYSql, PHP, Python and PERL to create Programs					K3
4	Develop small programs using open source software's					K3
K1 – Remember K2 – Understand K3 – apply K4- Analyze K5 – evaluate K6- Create						
UNIT I	Introduction to open sources					18 hours
Introduction to open sources–Need of open sources–advantages of open sources–application of open sources. Open source operating systems: LINUX: Introduction – general overview –Kernel mode and user mode –process – advanced concepts –scheduling – personalities – cloning – signals – development with Linux.						
UNIT II	MySQL					19 hours
MySQL: Introduction–setting up account–starting, terminating and writing your own SQL programs record selection Technology – working with strings – Date and Time – sorting Query results – generating summary –working with meta data –using sequences – MySQL and Web.						
UNIT III	PHP					18 hours
PHP: Introduction–programming in web environment–variables- constants–data types –operators – statements – functions – arrays – OOP – string manipulations and regular expression – file handling and data storage – PHP and SQL database – PHP and LDAP – PHP connectivity – sending and receiving E-mails – debugging and error handling – security –templates						
UNIT IV	Python					18 hours
Syntax and style–python objects–numbers–sequences–strings–lists and tuples – dictionaries – conditional loops –files – input and output – errors and exceptions – functions – modules – classes and OOP – execution environment						
UNIT V	Pearl					17 hours
Pearl overview–pearl parsing rules–variables and data–statements and control structures – subroutines -, packages and modules – working with files– data manipulation.						
Total Lecture Hours						90 hours

Text Book(s)		
1	The Linux Kernel Book, Remy Card, Eric and Frank Mevel, Wiley Publications 2003	
2	MySQL Bible, Steve Suchring, John Wiley 2002.	
	ReferenceBook(s)	
1	Programming PHP, RasmusLerdorf and Levin Tatroe, O_Reilly, 2002	
2	Core Python Programming, Wesley J. Chun, Prentice Hall, 2001	
3	Perl: The Complete Reference, 2 ndEdn, Martin C. Brown, TMH , 2009	
4	MySQL: The Complete Reference, 2 ndEdn, VikramVaswani, TMH, 2009	
	Related Online Contents (MOOC, SWAYAM,NPTEL, Websites etc)	
1	https://onlinecourses.swayam2.ac.in/aic20_sp06/preview	
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Course Designed by :		

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L	L	L	L	L	L	L	L	L	L
CO2	M	L	L	L	L	L	L	L	L	L
CO3	S	M	L	L	L	L	L	L	L	L
CO4	S	S	L	L	L	L	L	L	L	L

*S-Strong; M-Medium; L-Low

Course Code		Internet of Things (IoT)	L	T	P	C
Core/Elective/Supportive		Elective : III	6	0	0	4
Pre - requisite		None	Syllabus version		2023-24 Onwards	
Course Objectives						
• To introduce the concepts of security and various kinds of attacks • To explain about system hacking and penetration testing						
Expected Course Outcomes:						
1	Explain the definition and usage of the term —Internet of Things in different contexts					K2
2	Understand the key components that make up an IoT system					K2
3	Differentiate between the levels of the IoT stack and be familiar with the key technologies and protocols employed at each layer of the stack					K3
4	Apply the knowledge and skills acquired during the course to build and test a complete, working IoT system involving prototyping, programming and data analysis					K3
5	Discover where the IoT concept fits within the broader ICT industry and possible future trends					K4
K1 – Remember K2 – Understand K3 – apply K4- Analyze K5 – evaluate K6- Create						
UNIT I	Introduction to IoT					19 hours
Introduction – Definition and Characteristics of IoT, Physical Design of IoT; Things in IOT, Logical Design of IoT; IoT Functional Blocks, IoT Communication APIs, IoT Enabling Technologies; WSN, Cloud Computing, Big Data Analysis, Communication Protocols, Embedded Systems						
UNIT II	IoT Hardware					18 hours
IoT Hardware, Devices and Platforms – Basics of Arduino Hardware, The Arduino IDE, Basic Arduino Programming, Basics of Raspberry pi; Introduction to Raspberry pi, Programming with Raspberry pi, IoT Platforms, IoT Sensors and actuators						
UNIT III	IoT Protocols					18 hours
IoT Protocols – IoT Data link Protocols, Network Layer Routing Protocols, Network Layer Encapsulation Protocols, Session Layer Protocols, IoT Security Protocols, Service Discovery Protocols, Infrastructure Protocols.						
UNIT IV	IoT Programming					18 hours
IoT Programming – Arduino Programming: Serial Communications – Getting Input from Sensors, Visual, Physical and Audio Outputs, Remotely Controlling External Devices, Wireless Communication						
UNIT V	Domain Specific IoT					17 hours
Domain Specific IoT – Home automation, smart cities, Smart Environment, IoT in Energy, Logistics, Agriculture, industry and Health & Life style sensors, Case Studies: A Case Study of Internet of Things Using Wireless Sensor Networks and Smart Phone						
Total Lecture Hours						90 hours

Text Book(s)	
1	Vijay Madiseti and ArshdeepBahga, –Internet of Things (A Hands-on-Approach)), 1st Edition, VPT, 2014.
ReferenceBook(s)	
1	Margolis, Michael. –ArduinoCookbook: Receipestobegin, Expand and Enhance Your Projects . O’Reilly Media Inc.2011.
2	Monk, Simon. Raspberry Pi Cookbook: Software and hardware problems and Solutions. O’Reilly Media,Inc. 2016.
Related Online Contents (MOOC, SWAYAM,NPTEL, Websites etc)	
1	https://onlinecourses.swayam2.ac.in/aic20_sp06/preview
2	https://onlinecourses.swayam2.ac.in/arp19_ap79/preview
Course Designed by :	

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	L	L	L	L	L	L	L	L	L
CO2	M	L	L	L	L	L	L	L	L	L
CO3	S	M	L	L	L	L	L	L	L	L
CO4	S	M	L	L	L	L	L	L	L	L
CO5	S	M	L	L	L	L	L	L	L	L

*S-Strong; M-Medium; L-Low