

III/IV B.Tech IT Syllabus of Admitted Batch 2020-2024

UG PROGRAM – B.TECH (IT)

W.E.F. Admitted Batch 2020-2021

DEPARTMENT OF INFORMATION TECHNOLOGY



ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES

(UGC AUTONOMOUS)

(Affiliated to Andhra University, Approved by AICTE & Accredited by NBA)

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THIRD YEAR SEMESTER – I												
Code	Course	Category	L	T	P	E	O	Total	Sessional Marks	External Marks	Total Marks	Credits
IT311	Open Elective-1	OE	3	0	0	1	2	6	40	60	100	3
IT312	Computer Networks	PC	3	0	0	1	2	6	40	60	100	3
IT313	Automata theory and compiler design	PC	3	0	0	1	3	7	40	60	100	3
IT314	Professional Elective-1	PE	3	0	0	1	2	6	40	60	100	3
IT315	Artificial Intelligence	PC	2	1	0	1	3	7	40	60	100	3
IT316	QA-1 & VA-1	HS	0	0	3	1	3	7	100	-	100	1.5
IT317	UML and Testing Tools Lab	PC	0	1	3	0	0	4	50	50	100	2.5
IT318	Computer Networks lab	SC	0	0	3	0	1	4	50	50	100	1.5
IT319	Web Technologies Lab	PC	0	1	3	0	3	7	50	50	100	2.5
IT3110	Internship-I	PR	-	-	-	0	2	2	100	-	100	2
TOTAL			14	3	12	6	21	56	550	450	1000	25
THIRD YEAR SEMESTER – II												
Code	Course	Category	L	T	P	E	O	Total	Sessional Marks	External Marks	Total Marks	Credits
IT321	Open Elective - 2	OE	3	0	0	1	2	6	40	60	100	3
IT322	Professional Elective - 2	PE	3	0	0	1	2	6	40	60	100	3
IT323	Professional Elective - 3	PE	3	0	0	1	2	6	40	60	100	3
IT324	Design and Analysis of Algorithms	PC	3	0	0	1	3	7	40	60	100	3
IT325	DesignThinking	HS	3	0	0	1	2	6	40	60	100	3
IT326	QA-2 & Soft Skills	HS	0	0	3	2	3	8	100		100	1.5
IT327	Elective Lab	SC	0	1	3	0	3	7	50	50	100	2.5
IT328	Internet of Things Lab	PC	0	1	3	0	3	7	50	50	100	2.5
IT329	Graphics and Multimedia Lab	PC	0	0	3	0	1	4	50	50	100	1.5
TOTAL			15	2	12	7	21	57	450	450	900	23

YEAR - SEM	III/IV SEM 1	III/IV SEM 2
ELECTIVE-STREAM	Professional Elective - 1	PE-II
Stream 1: Networks	Unix Network Programming	Distributed Operating Systems
Stream 2: Data Engineering	Data Warehousing and Data Mining	Machine Learning
Stream 3: Management	Business Automation	Operation Research
Stream 4: Security & Embedded	Embedded Systems	Internet Of Things
Stream 5: Software Engineering	Management Information Systems	User Experience(Ux)
ELECTIVE-STREAM	PE-III	YEAR - SEM III/IV SEM 2
Stream 1 : Networks	Mobile Adhoc Networks	Elective lab
Stream 2: Data Engineering	Soft Computing	ETL Tools
Stream 3 : Management	Organizational Behaviour	DEVOpps
Stream 4 : Security & Embedded	Cyber Security with web security	ADV.Java
Stream 5 : Software Engineering	Software Testing Methodologies	

SEMESTER-1

COMPUTER NETWORKS

COURSE CODE: IT312

L P T E O
3 0 0 1 2

CREDITS 3

Sessional Marks: 40

End Exam Marks: 60

End Exam: 3Hours

Prerequisite(s): Data communication

Course Objectives

The main emphasis of this course is on the organization and management of local area networks (LANs).

The course objectives include

1. Developing an understanding of computer networking basics.
2. learning about computer network organization and implementation, obtaining a theoretical understanding of computer networks and gaining practical experience in installation, monitoring, and troubleshooting of current LAN systems
3. To develop an understanding of different components of computer networks, various protocols, modern technologies and their applications.
4. Introduce the student to advanced networking concepts, preparing the student for entry Advanced courses in computer networking.

Course Outcomes

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

CO-1: Be able to analyze different architectural standards and design in an Ethernet network

CO-2: Evaluate data communication link considering elementary concepts of data link layer protocols for error detection and correction.

CO-3: Apply various network layer techniques for designing LANs and analyze packet flow on basis of routing protocols.

CO-4: Estimate the congestion control mechanism to improve quality of service in transporting data through different protocols such as TCP, UDP and SCTP.

CO-5: Understand and analyze application layer protocols and internet applications such as WWW, Email and DNS,

Mapping of Course Outcomes with POs and PSOs

COs/POs-PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3				3								3	3
CO2	3	1	1		3				2	1	2	2	3	3
CO3	3	1	3	2	3				2	1	2	2	3	3
CO4	3	2	2	2	3				2	1	2	2	3	3
CO5	3		3		3					1	2	2	3	3

UNIT I: Introduction to networks**8 Hours**

Introduction to networks: Types of networks, LAN Topologies. Wired lans: Ethernet-IEEE standards, standard Ethernet, changes in standard, Fast Ethernet, Gigabit Ethernet. Wireless LANs-IEEE 802.11, Bluetooth.Connecting LANS, Backbone Networks, Virtual LAN-connecting devices, backbone networks, virtual LANs. Wireless WANS: cellular telephone and satellite networks-cellular telephony, satellite networks.

Learning outcomes: At the end of the unit the students are able to

- Independently understand basic computer network technology and design of LANs both wired and wireless in an Ethernet network.
- Identify the different types of network devices and their functions within a network

UNIT II: Data link layer**8 Hours**

Error detection and correction – Introduction, Block Coding, linear block codes, cyclic codes, checksum. Data link control- framing, flow and error control, noiseless channels, noisy channels, HDLC, Point –to- point protocols. Multiple access- Random access, controlled access, channelization.

Learning outcomes: At the end of the unit the students are able to

- Classify and apply appropriate error detection and correction algorithms for integrity of data
- Understand the working of data link layer protocols in providing a shared resource in data transfer

UNIT III: Network layer**10 Hours**

Network layer: Logical addressing –IPv4 Addressing, IPv6 Addressing. Internet protocol: Internetworking, IPv4, IPv6, Transition from IPv4 to IPV6. Address mapping, Error reporting and multicasting- Address mapping, ICMP, IGMP. Delivery, forwarding and routing – Delivery, forwarding, unicast routing protocols, multicast routing protocols

Learning outcomes: At the end of the unit the students are able to

- Understand and building the skills of subnetting and routing mechanisms
- Familiarity with the basic protocols of computer networks, and how they can be used to assist in network design and implementation.
- Classify the routing protocols and analyze how to assign the IP addresses for the given network

UNIT IV: Transport layer**10 Hours**

Process to process delivery: UDP, TCP and SCTP-process to process delivery, user datagram protocol (UDP), TCP, SCTP. Congestion control and quality of service-Data traffic, congestion, congestion control, two examples, quality of service, techniques to improve QoS, integrated services, differentiated services, QoS in switched networks.

Learning outcomes: At the end of the unit the students are able to

- Understand the building principals of end to end communication
- Able to distinguish protocols used in several real time applications and choose appropriate protocol in application design.
- Able to trouble suite congestion issues in a network by providing best QoS.

UNIT V: Application layer**8 Hours**

Domain name system-name space, Domain name space, distribution of name space, DNS in internet, Resolution, DNS messages, types of records, registrars, DDNS. Remote login: Electronic Mail and file transfer-remote logging, electronic mail, file transfer.WWW and HTTP- Architecture, Web documents, HTTP.

Learning outcomes: At the end of the unit the students are able to

- Understand the building principals of several application layer protocols such as DNS, Email and HTTP.
- Able to innumerate the design principals of protocols in designing an application

TEXTBOOK:

1. Data Communications and Networking, Fourth Edition by Behrouza A. Forouzan, TMH.

REFERENCE BOOK:

1. Computer Networks, A.S.Tanenbaum,4th edition, Pearson education.
2. Introduction to Data communications and Networking, W.Tomasi,Pearson education.
3. Data and Computer Communications, G.S.Hura and M.Singhal, CRC Press, Taylor and Francis Group.

CHANGE OF SYLLABUS :

No change from R-19 regulation to R-20 Regulation

1.1.3 of NAAC

Name of the Course	Course Code	Year of Introduction	Activities/Content with a direct bearing on Employability/ Entrepreneurship/ Skill development	Mapping with Employability/ Skill development/ Enterprenuership
COMPUTER NETWORKS	IT312	2019	Wireless WANS: cellular telephone and satellite networks-cellular telephony, satellite networks. unicast routing protocols, multicast routing protocols. Domain name system, Remote login, WWW and HTTP- Architecture, Web documents, HTTP.	Employability

AUTOMATA THEORY AND COMPILER DESIGN

COURSE CODE: IT313

L T P E O

3 0 0 1 3

CREDITS: 3

Sessional Marks :40

End Exam Marks : 60

End Exam : 3 Hours

PREREQUISITES:

1. Course on “Computer Organization and architecture”
2. A course on “Computer Programming and Data Structures”

COURSE OBJECTIVES:

1. To provide introduction to some of the central ideas of theoretical computer science from the perspective of formal languages.
2. To introduce the fundamental concepts of formal languages, grammars and automata theory.
3. Classify machines by their power to recognize languages.
4. Employ finite state machines to solve problems in computing.
5. To understand deterministic and non-deterministic machines.
6. Introduce the major concepts of language translation and compiler design and impart the knowledge of practical skills necessary for constructing a compiler.
7. Topics include phases of compiler, parsing, code optimization techniques, intermediate code generation, code generation.

COURSE OUTCOMES:

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

CO-1: Able to employ finite state machines, context free grammars for modeling and solving computing problems.

CO-2: Demonstrate the knowledge of patterns, tokens & regular expressions for lexical analysis.

CO-3: Design and implement Top down and Bottom-Up parsers.

CO-4: Analyze techniques to do intermediate code generation and optimization in order to improve the performance.

Mapping of Course Outcomes with POs and PSOs

COs/POs-PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	3	2	0	1	0	1	1	1	0	2	2	2
CO2	2	3	3	2	2	1	0	1	1	1	0	2	2	2
CO3	2	3	3	2	2	1	0	1	1	1	0	2	2	2
CO4	2	2	3	2	2	1	0	1	1	1	0	2	2	2

UNIT-I

12 Lectures

Introduction to Finite Automata: Alphabets, Strings, Languages, Deterministic and Non-Deterministic Finite Automata, Finite Automata with ϵ -moves, Mealy and Moore Machines.

Regular Expressions: Finite Automata and Regular Expressions, Closure Properties of Regular Sets, Pumping Lemma for Regular Sets, Algebraic Laws for Regular Expressions, Conversion of Finite Automata to Regular Expressions.

Learning outcomes: At the end of this unit, the students will be able to

1. Construct finite automata using Regular languages and expressions based on Chomsky hierarchy. Convert Non deterministic finite automata to Deterministic finite automata using Transition diagram or transition table.
2. Convert NFA with ϵ to NFA without ϵ for a given Transition diagram or table of finite automata. Convert Moore Machine to Mealy machine for a given machine vice versa.
3. For a given language predict the grammar is regular or not using pumping lemma.

UNIT-II

12 Lectures

Context-Free Grammars: Definition of Context-Free Grammars, Derivations Using a Grammar, Left most and Right most Derivations, the Language of a Grammar, Sentential Forms, Parse Tree, Ambiguity in Grammars and Languages, closure properties of CFL's.

Push Down Automata: Definition of the Push down Automaton, the Languages of a PDA, Equivalence of PDA's and CFG's, Acceptance by final state, Acceptance by empty stack,

Turing Machines: Introduction to Turing Machine, Formal Description, Instantaneous description.

Learning outcomes: At the end of this unit, the students will be able to

1. Derive Left most derivation tree and Right most derivation tree for a context free language Using production parameters.
2. for a given context free grammar or language, construct push down automata.
3. Construct Turing machine for a given unrestricted grammars.

UNIT-III

10 Lectures

Introduction to compiler: The structure of a compiler, the science of building a compiler, Lexical Analysis, Role of Lexical Analysis, Lexical Analysis Vs Parsing.

Parsing: Parsing, role of parser, elimination of left recursion, left factoring, eliminating ambiguity from dangling-else grammar, classes of parsing, top down parsing - backtracking, recursive descent parsing, predictive parsers, LL(1) grammars.

Learning outcomes: At the end of this unit, the students will be able to

1. Illustrate compilation process for an expression through phases of compiler.
2. Identify tokens for a given source code.
3. Construct regular expressions for the given tokens and design the transition diagram.
4. Construct LL (1) grammar for the given context free grammar $G = (V, T, P, S)$ by using top down parsing approach and for the given grammar Predict the grammar is LL (1) or not.

UNIT-IV

12 Lectures

Syntax Analysis: Bottom-Up Parsing, Introduction to LR Parsing: Simple LR, More Powerful LR Parsers Using Ambiguous Grammars.

Semantic analysis: SDT, Postfix notation, parsing tree, Intermediate code, three address Code, Quadruples, Triples, symbol tables.

Learning outcomes: At the end of this unit, the students will be able to

- Construct Operator precedence parser and shift reduce parser for the given context free grammar.
- Construct LR parsing tables for the given context free grammar $G = (V, T, P, S)$ by using bottom up parsing approach and for the given grammar Predict the grammar is SLR (1) or not.
- For the given statements, construct three address codes and implement quadruples, triples, indirect triples.
- Define data structures in the compiler construction such as abstract syntax trees, symbol tables, and stack machines.

UNIT-V

10 Lectures

Code Optimization: Organization of code optimizer, basic blocks and flow graphs, optimization of basic blocks, the principal sources of optimization, the directed acyclic graph (DAG) representation of basic block, global data flow analysis.

Code Generation: Machine dependent code generation, object code forms, the target machine, a simple code generator, register allocation and assignment, peephole optimization.

Learning outcomes: At the end of this unit, the students will be able to

1. Analyze the program and minimize the code by using optimizing techniques and apply DAG for the optimized code.
2. Construct Directed Acyclic Graph (DAG) for the given three address code $x=y \text{ op } z$.

TEXTBOOKS:

1. Introduction to Automata Theory, Languages, and Computation, John E.Hopcroft, Rajeev Motwani, Jeffrey D.Ullman, 3rdEdition, Pearson Education.**UNIT-1 & 2**
2. Compilers: Principles, Techniques and Tools, Alfred V. Aho, Monica S.Lam, Ravi Sethi, Jeffrey D.Ullman, 2ndEdition,**UNIT-3,4 & 5**

REFERENCES:

1. Theory of Computer Science–Automata languages and computation, Mishraand Chandra shekaran, 2ndedition,PHI.
2. Introduction to Languages and The Theory of Computation, John C Martin, TMH.
3. Introduction to Computer Theory, Daniel I.A. Cohen, John Wiley.
4. Kenneth. C. Louden, Compiler Construction, Vikas Pub. House

CHANGE OF SYLLABUS

No change from R19 to R20

Previous Unit No(R15)	Current Unit No (R19 & R20)	Changes Incorporated
FLAT&CD(Two different Subjects)	AT&CD(Single Subject)	No change of syllabus. 50% from FLAT and 50% from CD is combined to one subject AT&CD
Overall change: 0%		

1.1.3 of NAAC

Name of the Course	Course Code	Year of Introduction	Activities/Content with a direct bearing on Employability/ Entrepreneurship/ Skill development	Mapping with Employability/ Skill development/ Enterprenuership
AT&CD	IT313	2019	Regular Expressions, Context-Free Grammars, Push Down Automata and Turing Machine Lexical Analyzer, Parsers, Intermediate code Generator, Code Optimization and Code Generator	Employability

UNIX NETWORK PROGRAMMING

(Professional Elective -1)

COURSE CODE: IT314 A

L T P E O

3 0 0 1 2

CREDITS: 3

Sessional Marks: 40

End Exam Marks: 60

End Exam: 3 Hours

PREREQUISITE(S):

C programming, Basics of Unix systems, Basics of computer networks

COURSE OBJECTIVES

1. Students will gain the understanding of inter process communication and implementation of different forms of IPC in client-server environment
2. Students will gain the understanding of core network programming by using sockets and transport layer protocols like TCP and UDP
3. Develop skills in network programming techniques.
4. Apply the client server model in networking applications.

COURSE OUTCOMES

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

CO-1: Understand the fundamental concepts of UNIX systems in implementing its IPC.

CO-2: Explain the client-server paradigm and socket structures.

CO-3: Know the underlying mechanisms to program client-server model.

CO-4: Get familiar with the variety of interfaces and frameworks for network applications

CO-5: Apply the applications of sockets and demonstrate skill to design simple applications

Mapping of Course Outcomes with POs and PSOs

COs/POs-PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2			2			1			2	1	3	2
CO2	3	2			3			1			2	2	3	2
CO3	3	2			3			1			2	2	3	2
CO4	3	3			1			1			2	2	3	2
CO5	3	2			3			2			2	2	3	2

UNIT-I Overview of system programming & Inter process communication.

(Text book-I) 9 Lectures

Unix History; Fundamental Concepts; System Programming Concepts; Unix File I/O; Standard I/O Library;fcntl; ioctl; Unix Processes; Program Execution; Error Handling; Unix Signals.

Unix IPC: Pipes, FIFOs, System V Message queues , System V Semaphores, System V Shared Memory, Memory mapping

Learning outcomes: At the end of this unit, the students will be able to

- Familiarize with basic fundamentals of UNIX systems
- make use of various solutions to perform inter-process communications

UNIT-II Socket Programming (Text book-II)**9 Lectures**

Overview of Transport Layer Protocols: TCP, UDP; Client- server architectures; Sockets, Sockaddr structure; TCP and UDP Socket API; TCP client-server examples; UDP examples; Socket Options; Domain name conversion API; IPv6 differences; IPv4-IPv6- compatibility; Choice: TCP or UDP?; Adding reliability to UDP applications;(Text book-I)

Learning outcomes: At the end of this unit, the students will be able to

- understand the key protocols which support the Internet
- demonstrate advanced knowledge of programming for network communications
- have a detailed knowledge of the TCP/UDP Sockets

UNIT-III UNIX I/O models & Domain Protocols (Text book-II)**8 Lectures**

Non-Blocking I/O; I/O multiplexing; Signal driven I/O; Asynchronous I/O (POSIX API); Client and server design with select() call; shutdown(); Advanced I/O API; Addressing; Socket pair; Descriptor passing; User credentials; Credential passing; Daemon processes; inetd super server, syslogd.

Learning outcomes: At the end of this unit, the students will be able to

- demonstrate advanced knowledge of programming for network communications
- make use of different types of I/O such as non-blocking I/O and event driven I/O
- create applications using several client server credentials which can result in effective communication

UNIT-IV Client-server Design Alternatives(Text book-II)**8 Lectures**

Overview of Pthreads; Pthreads Synchronization; Non-blocking I/O; Non-blocking connect; Client alternative designs; Performance analysis; preforking models; Prethreading models; Performance analysis; Case study: Apache; The C10K problem; Event- driven architectures; Concurrency models for UDP servers.

Learning outcomes: At the end of this unit, the students will be able to

- understand several alternative models in an Unix network programming environment
- analyze specific system design using case studies

UNIT-V Multicasting & Raw sockets, Data link access(Text book-II)**8 Lectures**

Broadcasting: concepts & implementation; Multicasting: addresses; concepts, implementation; Broadcasting & multicasting in IPv6; Socket creation; input, output; ping: design & implementation; trace route: design & implementation; UDP asynchronous errors;

Learning outcomes: At the end of this unit, the students will be able to

- learn advanced programming techniques such as IPv6 Socket Programming, Broadcasting, Multicasting
- apply knowledge of Unix/Linux operating systems to build robust client and server software for this environment;

TEXT BOOKS:

1. W.R.Stevens, UNIX Network Programming, Interprocess Communication, Vol II Pearson Education, 2nd Edition.
2. W. R. Stevens, UNIX Network Programming, Vol I, Networking APIs: Sockets and XTI, Pearson Education, 3rd Edition.

REFERENCES:

1. The Linux Programming Interface: Linux and UNIX System Programming Handbook by Michael Kerrisk, No Starch Press © 2010
(<http://library.books24x7.com/toc.aspx?bookid=41558>)
2. W.R. Stevens, Advanced Programming in the UNIX Environment, Pearson Education, 2008.

CHANGE OF SYLLABUS

No change of syllabus from R-19 to R-20

1.1.3 of NAAC

Name of the Course	Course Code	Year of Introduction	Activities/Content with a direct bearing on Employability/ Entrepreneurship/ Skill development	Mapping with Employability/ Skill development/ Enterpreneurship
Unix Network Programming	IT322	2019-20	Unix Processes; Program Execution; Error Handling; Unix Signals. Unix IPC: Pipes, FIFOs, System V Message queues , System V Semaphores, System V Shared Memory, Memory mapping, Prethreading models; Performance analysis; Case study: Apache; The C10K problem; Event-driven architectures; Concurrency models for UDP servers.	Skill development

DATA WAREHOUSING & DATA MINING

(Professional Elective-I)

COURSE CODE: IT314 B

L T P E O

3 0 0 1 2

CREDITS 3

Sessional Marks: 40

End Exam Marks: 60

End Exam: 3Hours

Prerequisite(s): DBMS

Course Objectives

1. To introduce the basic concepts of Data Warehouse and Data Mining techniques.
2. Examine the types of the data to be mined and apply pre-processing methods on raw data.
3. Discover interesting patterns, analyse supervised and unsupervised models and estimate the accuracy of the algorithms.

Course Outcomes

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

CO-1: Apply critical operations involved in modeling and designing data warehouses.

CO-2: Evaluate at a quality and implement well-known data mining techniques for obtaining interesting knowledge from data.

CO-3: Reflect on advantages and disadvantages of data mining solutions to solve real life problems.

CO-4: Evaluate the models, their usefulness and usability towards research and innovation.

Mapping of Course Outcomes with POs and PSOs

COs/POs-PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	1	3	1	1	1	2	1		1	3	2
CO2	2	3	3	3	3	2	1	1	2	1		1	3	2
CO3	1	3	3	3	3	2	1	1	2	1		1	3	2
CO4	3	3	3	3	3	2	2	1	2	1		2	3	2

UNIT-I Data warehouse

9 Lectures

Introduction to Data warehouse, Difference between operational databases systems and data warehouses, Data warehouse Characteristics, Data warehouse Architecture and its Components, Extraction-Transformation-Loading, Logical (Multi-Dimensional), Data Modeling, Schema Design, Star and Snow-Flake Schema, Fact Constellation, Fact Table, Fully Addictive, Semi-Addictive, Non-Addictive Measures; Fact-Less-Facts, Dimension Table Characteristics; OLAP Cube, OLAP Operations, OLAP Server Architecture-ROLAP, MOLAP and HOLAP.

Learning outcomes: At the end of this unit, the students will be able to

- Perform ETL operations.
- Design the data warehouse.
- Apply OLAP operations

UNIT-II Introduction to Data Mining

9 Lectures

Fundamentals of data mining: Data Mining Functionalities, 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.

Data Preprocessing: Need for Preprocessing the Data, Data Cleaning, Data Integration & Transformation, Data Reduction, Discretization and Concept Hierarchy Generation. Applications and Trends in Data mining

Learning outcomes: At the end of this unit, the students will be able to

- Classify data mining systems and identify the major issues in data mining.
- Apply pre-processing steps.
- Characterize real world applications of data mining.

UNIT-III Association Rules

9 Lectures

Problem Definition, Frequent Item Set Generation, The APRIORI Principle, Support and Confidence Measures, Association Rule Generation; APRIORI Algorithm, The Partition Algorithms, FP-Growth Algorithms, Compact Representation of Frequent Item Set- Maximal Frequent Item Set, Closed Frequent Item Set.

Learning outcomes: At the end of this unit, the students will be able to

- Apply Apriori & FP growth algorithm to generate association rules.
- Represent frequent item sets in a compact way.

UNIT-IV Classification

9 Lectures

Problem Definition, General Approaches to solving a classification problem, Evaluation of Classifiers, Classification techniques, Decision Trees-Decision tree Construction, Methods for Expressing attribute test conditions, Measures for Selecting the Best Split, Algorithm for Decision tree Induction; Naive-Bayes Classifier, Bayesian Belief Networks; K-Nearest Neighbour classification-Algorithm and Characteristics, Prediction: Accuracy and Error measures, Evaluating the accuracy of a classifier or a predictor, Ensemble methods.

Learning outcomes: At the end of this unit, the students will be able to

- Apply classification algorithms such as decision trees, Naïve bayes classifier, Bayesian belief networks and KNN for prediction.
- Analyse classifiers using classification metrics.
- Know the importance of ensemble methods.

UNIT-V Clustering

9 Lectures

Clustering Overview, A Categorization of Major Clustering Methods, partitioning methods, hierarchical methods, partitioning clustering-k-means algorithm, Hierarchical clustering-agglomerative methods and divisive methods, Basic Agglomerative Hierarchical Clustering Algorithm, Key Issues in Hierarchical Clustering, Strengths and Weakness, Outlier Detection.

Learning outcomes: At the end of this unit, the students will be able to

- Categorize clustering techniques.
- Apply basic clustering methods to cluster the data.
- Identify outliers in the given data.

TEXTBOOKS

1. Data Mining-Concepts and Techniques- Jiawei Han, Micheline Kamber, JianPei, Morgan Kaufmann Publishers, Elsevier, 3Edition, 2012.

REFERENCES

1. Data Mining Techniques, Arun K Pujari, 3rd Edition, Universities Press.
2. Data Ware Housing Fundamentals, Pualraj Ponnaiah, Wiley Student Edition.
3. The Data Ware House Life Cycle Toolkit-Ralph Kimball, Wiley Student Edition.
4. Data Mining, Vikaram Pudi, P Radha Krishna, Oxford University.

CHANGE OF SYLLABUS

Unit No	Changes Incorporated
Unit-2 Introduction to Data Mining	<u>Topics included</u> <ul style="list-style-type: none">• Applications and Trends in Data mining 1% concepts pertaining to applications and trends are included

1.1.3 of NAAC

Name of the Course	Course Code	Year of Introduction	Activities/Content with a direct bearing on Employability/ Entrepreneurship/ Skill development	Mapping with Employability/Skill development/ Entrepreneurship
Data Warehousing and Data Mining	IT314(B)	R20	APRIOIRI Algorithm, K-Nearest Neighbour classification algorithm, FP-Growth Algorithms, Compact Representation of Frequent Item Set.	Employability

BUSINESS AUTOMATION

(Professional Elective-I)

COURSE CODE: IT314 C

L T P E O

3 0 0 1 2

CREDITS 3

Sessional Marks: 40

End Exam Marks: 60

End Exam: 3 Hours

PREREQUISITE(S): NIL

COURSE OBJECTIVES

1. There are a number of methodologies and strategies for automating business processes, such as paradigm shifts, re-engineering, process redesign, and continuous improvement.
2. In all of them, the objective is to define a new way of performing the processes in the company, aligning their execution with both the strategic objectives and goals of the organization, as well as delivering more value to the final customer, guaranteeing the complete service of their needs.

COURSE OUTCOMES

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

CO-1: Analyse the performance of existing processes and identify process improvement opportunities/strategies, Life cycle of Business process.

CO-2: Create a BPM implementation strategy and implementation plan for an organization. Explain the role of Information Technology and other resources in BPM.

CO-3: Synthesize the principles Automation and Business intelligence, Importance of communication in Business Process.

CO-4: Analyse processes of reengineering and implementing HRIS in Business Automation.

Mapping of Course Outcomes with POs and PSOs

COs/POs- PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1	1	1		1	1			2	1	1	1
CO2	1	1	1	1	1		1	1	2		2	1	1	1
CO3	1	1	1	1	1		1	1		3	2	1	1	1
CO4	1	1	1	1	1		1	1			2	1	1	1

UNIT-I

9 Lectures

Understanding Business Process Automation: Business process automation, BPA vs BPM, Agile process automation, Development of automation market, Supply chain optimization, existing BPA tools, Business benefits from BPA, Evolution of BPA.

Learning outcomes: At the end of this unit, the students will be able to

- Differentiate BPM and BPA.
- Know the evolution of BPA.

UNIT-II

9 Lectures

Automation in Business process Lifecycle Management: Business process Management, Business process lifecycle, Design and analysis of Business process, Business process execution.

Learning outcomes: At the end of this unit, the students will be able to

- Classify phases in Business process lifecycle management
- Apply Business process execution.

UNIT-III

9 Lectures

Automation and Business Intelligence: Introduction, History of Business intelligence, The need for intelligence, BI Environment and Architecture, ETL, Data warehouse, Data Mart, OLAP, Data Mining, Benefits of BI, ROI on BI.

Learning outcomes: At the end of this unit, the students will be able to

- Know the need for Business intelligence.
- Understand the architecture of BI environment.

UNIT-IV

9 Lectures

Technology Enabled Business communication: Introduction, Using Telephones to Business advantages, Development of Markets using mobile phones, Effect of automation in Business communication.

Learning outcomes: At the end of this unit, the students will be able to

- Know the technology used in Business markets.
- Understand the effect of automation in business communication.

UNIT-V

9 Lectures

Process Automation in HR and Payroll: Introduction, Understanding the need for HRIS, Evolution of HRIS, Process reengineering through Automation, Trends in HRIS, Developing HRIS, Project execution, project closure, Implementing HRIS.

Learning outcomes: At the end of this unit, the students will be able to

- Know the need for HRIS.
- Identify the trends in HRIS

TEXT BOOKS

1. Sanjay Mohapatra, Business Process Automation - PHI learning 2009., ISBN-978-81-203-3927-9.

REFERENCES

1. John Jeston, Business process management 4th edition
2. Marlon dumas, Fundamentals of Business process management- 2nd Edition.

CHANGE OF SYLLABUS

No changes from R-19 to R-20

1.1.3 of NAAC

Name of the Course	Course Code	Year of Introduction	Activities/Content with a direct bearing on Employability/ Entrepreneurship/ Skill development	Mapping with Employability/Skill development/Enterprenuership
Business Automation	IT314	R19	Business process lifecycle management	Entrepreneurship

EMBEDDED SYSTEMS

(Professional Elective - I)

COURSE CODE: IT314 D

L T P E O

3 0 012

CREDITS 3

Sessional Marks: 40

End Exam Marks:60

End Exam: 3

Prerequisite(s): Knowledge in Computer organization, Micro Processor and Operating System.

COURSE OBJECTIVES

The Focus of the Course is the

1. Understand embedded system and its applications.
2. What is core embedded systems and its components
3. Introduction to Architecture of 8051 and also about registers, PSW and memory.
4. Outline of RTOS and RTOS Environment
5. Build embedded software using different software tools.

COURSE OUTCOMES:

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

CO 1: Identify the need of embedded system and its components

CO 2: Demonstrate the architecture of 8051 microcontroller

CO 3: Classify RTOS and its tasks

CO 4: Elaborating different Embedded software development tools.

Mapping of Course Outcomes with POs and PSOs

COs/POs- PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	0	0	0	0	0	0	0	0	0	1	1
CO2	0	0	1	0	2	0	0	0	0	0	0	0	1	1
CO3	0	0	1	0	1	0	0	0	0	0	0	0	1	1
CO4	0	0	1	0	1	0	0	0	0	0	0	0	1	1

UNIT I: Introduction to Embedded systems

8 Lectures

What is an embedded system Vs. General computing system, history, classification, major application areas, and purpose of embedded systems.

Learning Outcomes: At the end of this unit students will be able to

- Describe the importance of Embedded system and its classification.
- Compare and contrast the embedded system and general computing system.

UNIT II

8 Lectures

Core of embedded system, memory, sensors and actuators, communication interface, embedded firmware, other system components, PCB and passive components. **Embedded System - Applications & domain specific** – washing machine- Application specific Embedded system, Automotive – domain specific

Learning Outcomes: At the end of this unit students will be able to

- List the core of embedded system.
- Compare RISC and CISC processors
- Demonstrate on sensors and actuators.
- Applications of Embedded system

UNIT III : Micro Processor and micro-Controller

12 Lectures

Introduction, microprocessor, microcontroller, and comparison, **8051 Architecture:** 8051 micro control hardware, Program counter and data pointer, A and B CPU registers, flags and PSW, Internal memory, stack and stack pointer, Special function registers, Input output ports, pins and circuits.

Learning Outcomes: At the end of this unit students will be able to

- Microprocessor vs micro controller.
- Understand the architecture of 8051 and pin diagram
- Demonstration of various registers and IO ports

Unit IV: Introduction to RTOS

12 Lectures

Tasks and tasks states, tasks and data, semaphores and shared data More OS Services: Message queues, Mailboxes and pipes, Timer functions, events, memory management, Interrupt routines in an RTOS Environment.

Learning Outcomes: At the end of this unit students will be able to

- Know the importance of RTOS.
- List issues in real-time system scenario.
- Summarize various inter process communications.

Unit V: Embedded software Development Tools:

8 Lectures

Host and target machines, Linkers/Locators for embedded software, getting embedded software in to target system.

Learning Outcomes: At the end of this unit students will be able to

- Demonstrate various embedded system development and debugging tools.
- Distinguish linkers and locators.

TEXT BOOK:

1. Introduction to embedded systems Shibu. K.V, TMH, 2009. **UNIT – 1 & 2**
2. Kenneth J. Ayala, The 8051 Microcontroller, 3/e, Thomson, 2004. **UNIT – 3**
3. David E Simon, An Embedded Software Primer, Pearson Education, 2001. **UNIT – 4&5**

REFERENCES:

1. Ayala & Gadre: The 8051 Microcontroller & Embedded Systems using Assembly and C, CENGAGE
2. Embedded Systems, Rajkamal, TMH, 2009.
3. The 8051 Microcontroller and Embedded Systems, Mazidi, Mazidi, Pearson.

CHANGE OF SYLLABUS

ES subject is the new course in R19 SEM 2 Regulation and same was carried in R20 SEM-1.

1.1.3 of NAAC

Name of the Course	Course Code	Year of Introduction	Activities/Content with a direct bearing on Employability/ Entrepreneurship/ Skill development	Mapping with Employability/ Skill development/ Entrepreneurship
Embedded System	IT 322	R19	Embedded System - Applications & domain specific – washing machine- Application specific Embedded system, Automotive – domain specific.	Employability
			Host and target machines, Linkers/Locators for embedded software,	Skill Development

MANAGEMENT INFORMATION SYSTEMS

(Professional Elective-I)

COURSE CODE: IT314 E

L T P E O

3 0 0 1 2

CREDITS 3

Sessional Marks: 40

End Exam Marks: 60

End Exam: 3 Hours

Prerequisite(s): Fundamentals of computer and databases.

Course Objectives

1. The focus of the course is the To describe the role of information technology and decision support systems in business and record the current issues with those of the firm to solve business problems.
2. To introduce the fundamental principles of computer-based information systems analysis and design and develop an understanding of the principles and techniques used.
3. To enable students, understand the various knowledge representation methods and different expert system structures as strategic weapons to counter the threats to business and make business more competitive.
4. To enable the students to use information to assess the impact of the Internet and Internet technology on electronic commerce and electronic business and understand the specific threats and vulnerabilities of computer systems.

Course Outcomes

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

CO-1: Analyse Information systems – Decision Support system, Knowledge Management System, Executive support system.

CO-2: Analyse information technology resources and software development methodologies.

CO-3: Assess latest business initiatives such as E-Business, E-Governance and cloud computing emerging in the field of information technology.

CO-4: Determine the concepts related to security and ethical challenges and Management challenges.

Mapping of Course Outcomes with POs and PSOs

COs/POs-PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	1	1	1	2	1	1	1	2	1	2	1
CO2	2	2	2	3	3	1	2	1	1	1	2	2	2	2
CO3	2	2	1	2	1	1	1	1	1	1	2	2	2	2
CO4	2	2	2	2	2	1	2	1	1	1	2	2	2	2

UNIT-I Foundation concepts

9 Lectures

Foundation concepts: Foundations of Information Systems in Business- The Real World of Information Systems, The Fundamental Roles of IS in Business, Trends in Information Systems, Types of Information Systems. Competing with Information Technology- Fundamentals of Strategic Advantage, Strategic IT, Competitive Strategy Concepts.

Learning outcomes: At the end of this unit, the students will be able to

- Understand IS in Business.
- Analyse Competitive Strategy Concepts.

UNIT-II Information Technologies

9Lectures

Information Technologies: Computer Software- Business Application Software, Software Suites and Integrated Packages, Web Browsers, Electronic Mail, Instant Messaging, and Weblogs. **Data Resource Management-** Database Management, Database Structures, Types of Databases. **Telecommunications and Networks-** Telecommunications Alternatives, Types of Telecommunications Networks, Wireless Technologies.

Learning outcomes: At the end of this unit, the students will be able to

- Identify the different resources in data resource management.
- Analyse Different wireless technologies.

UNIT-III Business Applications

9Lectures

Business Applications: e-Business Systems- Cross-Functional Enterprise Applications, Enterprise Application Integration, Enterprise Collaboration Systems. **e-Commerce Systems-** e-Commerce Fundamentals, e-Commerce Applications and Issues. **Supporting Decision Making-** Information, Decisions, and Management Information Quality, Decision Support Trends, Decision Support Systems

Learning outcomes: At the end of this unit, the students will be able to

- Analyse e-Business system.
- Apply decision support system in business.

UNIT-IV Development Process

9Lectures

Development Process: Developing Business/IT Strategies- Planning Fundamentals, Implementation Challenges. **Developing Business/IT Solutions-** The Systems Development Life Cycle, Starting the Systems Development Process, Systems Analysis, Systems Design.

Learning outcomes: At the end of this unit, the students will be able to

- Know the importance of Developing Business.
- Analyse IT solutions in Business.

UNIT-V Management Challenges

9Lectures

Management Challenges: Security and Ethical Challenges- Security, Ethical, and Societal Challenges of IT, Security Management of Information Technology. **Enterprise and Global Management of Information Technology-** Managing Information Technology, Managing Global IT.

Learning outcomes: At the end of this unit, the students will be able to

- Categorize Security, Social and Ethical challenges of IT.\
- Analyse the Global management of IT.

TEXT BOOKS

1. James O Brien, Management Information Systems - Managing Information Technology in the E-business enterprise, Tata McGraw Hill, 2010.

REFERENCES

1. Frederick Gallegor, Sandra Senft, Daniel P. Manson and Carol Gonzales, Information Technology Control and Audit, Auerbach Publications, 4th edition, 2012.
2. Gordon Davis, Management Information System: Conceptual Foundations, Structure and Development, Tata McGraw Hill, 7th edition, 2006.
3. Haag, Cummings and McCubbrey, Management Information Systems for the Information Age, McGraw Hill, 2012.

CHANGE OF SYLLABUS

No changes from R-19 to R-20

1.1.3 of NAAC

Name of the Course	Course Code	Year of Introduction	Activities/Content with a direct bearing on Employability/ Entrepreneurship/ Skill development	Mapping with Employability/Skill development/Enterpreneurship
Management Information Systems	IT314	2022-23	E-Commerce Systems Developing Business	Entrepreneurship

ARTIFICIALINTELLIGENCE

Course Code IT315

L T P E O

2 1 0 1 3

CREDITS 3

Sessional Marks: 40

End Exam Marks: 60

End Exam: 3 Hours

PREREQUISITE(S):

- Overview on Programming languages
- Knowledge on Mathematics

COURSEOBJECTIVES

1. To have a basic proficiency in a traditional AI language including an ability to write simple to intermediate programs and an ability to understand code written in that language
2. To have an understanding of the basic issues of knowledge representation and blind and heuristic search, as well as an understanding of other topics such as minimax, resolution, etc. that play an important role in AI programs
3. To have a basic understanding of some of the more advanced topics of AI such as learning, natural language processing, agents and robotics, expert systems, and planning

COURSEOUTCOMES

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

CO-1: Outline problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem

CO-2: Apply the language/framework of different AI methods for a given problem

CO-3: Implement basic AI algorithms- standard search algorithms or dynamic programming

CO-4: Solve problems with uncertain information using probabilistic approaches.

Mapping of Course Outcomes with POs and PSOs

COs/POs-PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	1	1	1	1	1				1	3	2
CO2	3	3	2	1	1	1	1	1				1	3	2
CO3	3	3	2	1	1	1	1	1				1	3	2
CO4	3	3	1	1	1	1	1	1				1	3	2

UNIT I

9 Lectures

Introduction to artificial intelligence: Introduction, history, intelligent systems, foundations of AI, applications, tic-tac-toe game playing, development of AI languages, current trends in AI.

Learning outcomes: At the end of the unit, the students will be able to

- Gain perspective of AI and its foundations
- Solve problems such as tic-tac-toe game playing

Unit II

9 Lectures

Problem solving- state-space search and control strategies: Introduction, general problem solving, characteristics of problem, exhaustive searches, heuristic search techniques, iterative- deepening a*, constraint satisfaction.

Problem reduction and game playing: Introduction, problem reduction, game playing, alpha beta pruning, two-player perfect information games.

Learning outcomes: At the end of the unit, the students will be able to

- Identify the type of search strategy (blind/heuristic/adversarial) that is more appropriate to address a particular problem and implement the selected strategy
- Reduce problems and apply pruning techniques

UNIT III

9 Lectures

Logic concepts: Introduction, propositional calculus, propositional logic, natural deduction system, axiomatic system, semantic tableau system in propositional logic, resolution refutation in propositional logic, predicate logic.

Learning outcomes: At the end of the unit, the students will be able to

- Solve problems using propositional logic, predicate calculus, and other axiomatic systems.
- Develop new facts from existing knowledge base using resolution and refutation.

UNIT IV

9 Lectures

Knowledge representation: Introduction, approaches to knowledge representation, knowledge representation using semantic network, extended semantic networks for KR, knowledge representation using frames.

Advanced knowledge representation techniques: Introduction, conceptual dependency theory, script structure, CYC theory, case grammars, semantic web

Learning outcomes: At the end of the unit, the students will be able to

- Identify the role of knowledge representation, problem solving and learning in intelligent systems.
- Formulate knowledge representations in the form of logic expressions.

UNIT V

9 Lectures

Expert system and applications: Introduction, phases in building expert systems, expert system versus traditional systems, rule-based expert systems, truth maintenance systems.

Uncertainty measure: Probability theory: Introduction, probability theory, Bayesian belief networks, certainty factor theory, Dempster-Shafer theory

Learning outcomes: At the end of the unit, the students will be able to

- Differentiate traditional systems, Rule-based and Expert Systems.
- Measure uncertainty using probabilistic concepts.

TEXT BOOKS

1. Artificial Intelligence- SarojKaushik, CENGAGE Learning

REFERENCE BOOKS

1. Artificial intelligence, A modern Approach , 2nd Edition, Stuart Russel, Peter Norvig, PEA
2. Artificial intelligence, structures and Strategies for Complex problem solving, George.F.Lugar, 5th edition, PEA
3. Artificial Intelligence- Deepak Khemani, TMH, 2013
4. Introduction to Artificial Intelligence, Patterson, PHI

E-Resources:

1. <https://nptel.ac.in>
2. <http://aima.cs.berkeley.edu/>

Change of syllabus as compared to R-19 regulations

Previous Unit No	Current Unit No	Changes Incorporated
Unit-1	Unit-1 / Unit-2	The current syllabus is spread over 2 units and the following new topic is added in Unit-2. <ul style="list-style-type: none">• Problem reduction and game playing
Unit-2	Unit-3	The current syllabus of Unit-2 is now part of Unit-3 without any changes.
Unit-3	Unit-4	The current syllabus of Unit-3 is now part of Unit-4 without any changes.
Unit-4	Unit-5	The current syllabus of Unit-4 is now part of Unit-5 without any changes. The existing Unit-5 is removed from the syllabus.
Overall change: 20%		

1.1.3 of NAAC

Name of the Course	Course Code	Year of Introduction	Activities/Content with a direct bearing on Employability/ Entrepreneurship/ Skill development	Mapping with Employability/Skill development/ Entrepreneurship
Artificial Intelligence	IT315	R19	General Problem Solving Problem reduction Knowledge representation using semantic network Phases in building expert systems	Employability

UML AND TESTING TOOLS LAB

COURSE CODE: IT317

L T P E O

0 1 3 0 0

CREDITS 2.5

Sessional Marks: 50

End Exam Marks: 50

End Exam:3 Hours

PREREQUISITE: Object oriented concepts, C++ programming, Fundamentals of Software Engineering

COURSE OBJECTIVES:

1. Learn the basics of OO analysis and design skills
2. Be exposed to the UML design diagrams
3. Learn to map design to code
4. Be familiar with the various testing technique
5. To learn how to write software testing documents, and communicate with engineers in various forms. To gain the techniques and skills on how to use modern software testing tools to support software testing projects

COURSE OUTCOMES:

After completion of this course, a student will be able to:

CO1: Design and implement projects using OO concepts

CO2: Use the UML analysis and design diagrams

CO3: Execute how to do performance testing using testing tools including Win runner and JMeter respectively

Mapping of Course Outcomes with POs and PSOs

COs/POs- PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	2	3	3	2	1	-	3	3	3	2	2	2
CO2	2	2	3	3	3	2	1	-	3	3	3	2	2	3
CO3	3	2	3	3	3	2	1	-	3	3	3	2	2	3

LIST OF EXPERIMENTS

1. Write down the problem statement for a suggested system of relevance. (CO1)
2. Do requirement analysis and develop Software Requirement Specification Sheet (SRS) for suggested system. (CO1)
3. To perform the user's view analysis for the suggested system: Use case diagram. (CO2)
4. To draw the structural view diagram for the system: Class diagram, object diagram (CO2)
5. To draw the behavioral view diagram : State-chart diagram, Activity diagram (CO2)
6. To perform the behavioral view diagram for the suggested system : Sequence diagram, Collaboration diagram (CO2)
7. To perform the implementation view diagram: Component diagram for the system(CO2)
8. To perform the environmental view diagram: Deployment diagram for the system.(CO2)
9. To perform various testing using the testing tool unit testing, integration testing for a sample code of the suggested system. (CO2)

10. Take ATM system and study its system specifications and report various bugs. (CO3)
11. Write the test cases for banking application (CO3)
12. Study of testing tool (e.g. win runner) (CO3)
13. Study of web testing tool (e.g. selenium) (CO3)
14. Take a mini project and execute it during SDLC create the various UML diagrams required designing and all testing documents like test plan, TCD etc. (CO3)

SUGGESTED DOMAINS FOR MINI-PROJECT:

- a. Student Result Management System
- b. Library management system
- c. Inventory control system
- d. Accounting system
- e. Fast food billing system
- f. Bank loan system
- g. Blood bank system
- h. Railway reservation system
- i. Automatic teller machine
- j. Video library management system
- k. Hotel management system
- l. Hostel management system
- m. E-ticking
- n. Share online trading
- o. Hostel management system
- p. Resource management system
- q. Court case management system

LAB EQUIPMENTS

SUGGESTED SOFTWARE TOOLS:

- Rational Suite (or) Argo UML (or) equivalent, Eclipse IDE and Junit
- SOFTWARE TOOLS
- Rational Suite
- Open Source Alternatives: ArgoUML, Visual Paradigm
- Eclipse IDE and JUnit, Bugzilla
- PCs 30

REFERENCE BOOKS:

1. Grady Booch, the UML user guide.
2. K.K. Aggarwal & Yogesh Singh, —Software Engineering, New Age International, 2005
3. Pankaj Jalote, —An Integrated Approach to Software Engineering, Second Edition

CHANGE OF SYLLABUS

Previous Unit No(R19)	Current Unit No (R20)	Changes Incorporated
Experiment 2	Experiment-2 Data flow diagrams	<u>Topics Ignored</u> Data Flow diagrams Structured flow chart 5% concepts relevant to data warehouse are removed
Experiments 16-19	Testing tools	<u>Topics Ignored</u> Bug Tracking tool Test management tool Open source testing tool Manual Facebook testing which is beyond the syllabus 20% concepts relevant to data warehouse are removed
<u>Overall change: 25%</u>		

1.1.3 of NAAC

Name of the Course	Course Code	Year of Introduction	Activities/Content with a direct bearing on Employability/ Entrepreneurship/ Skill development	Mapping with Employability/ Skill development/ Entrepreneurship
Uml and testing tools lab	IT317	2021-22	Various testing techniques: Unit Testing and Integration Testing and Testing tools: Selenium and win runner	Employability

COMPUTER NETWORKS LAB

COURSE CODEIT318

L P T E O
0 0 3 0 1

CREDITS 1.5

Sessional Marks: 50

End Exam Marks: 50

End Exam: 3Hours

PREREQUISITE(S): Computer Networks Concepts.

COURSE OBJECTIVES:

1. The objective of this lab is to introduce students to the design issues that arise in building and using networks and to give students hands on experience with building and using network services.
2. The practical issues to be stressed include design and installation of LAN, network operating system, setting up a network system such as users and their permissions and rights, groups and domains, adding workstations and sharing of resources across the network

COURSE OUTCOMES:

After completion of this course, a student will be able to:

CO-1: Understand and identify the various network infrastructure and command needed for network design and troubleshooting.

CO-2: Understand the building components of network design.

CO-3: Allow the student to gain expertise in some specific areas of networking such as the design and maintenance of individual networks.

Mapping of Course Outcomes with POs and PSOs

COs/POs- PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3				3								3	3
CO2	3				3								3	3
CO3	3				3								3	3

NETWORKING LAB EXPERIMENTS

List of Experiments

I. STUDY EXPERIMENTS: (2 weeks duration)

This study experiments helps the learners to understand certain network components like Hubs, switches, routers, wireless access modems, transmission medium (coaxial cables, twisted pair cables, optical fiber) and several networking components

1. Study of specifications of latest desktops and laptops	CO1
2. Familiarization with Networking Components and devices: LAN Adapters, Hubs, Switches, routers etc.	CO1
3. Familiarization with Transmission media and Tools: Co axial cable, UTP Cable, Crimping tool, Connectors etc.	CO1
4. Study of various LAN topologies and their creation using network devices, cables and computers	CO2
5. Study of Client Server Architecture	CO2
6. To study LAN using bus, tree, star topology	CO2
7. To study pc to pc communication using parallel port	CO2
8. To study fiber optics communication	CO2
9. To study wireless communication	CO2

II. HANDS ON EXPERIMENTS (6 weeks duration)

This set of experiments helps the learners in gaining expertise in developing and maintaining a certain network which includes setting up a LAN network and maintaining it, configuring routers, switches and firewalls using a certain Hardware components.

1. preparing straight and cross cables.	CO2
2. Study of network commands and network configuration commands	CO2
3. Implementation of file and printer sharing	CO2
4. Designing and implementing Class A, B, and C Networks	CO2
5. Subnet planning and its implementation.	CO2
6. To configure the IP address for a computer connected to LAN and to configure network parameters of a web browser for the same computer.	CO2
7. To configure WLAN	CO3
8. To install and configure wireless access points	CO2
9. To configure hub/switch and router	CO1
10. Configuring Network Neighborhood.	CO2

III. PROGRAMMING EXPERIMENTS (6 weeks duration)

This set of programming experiments helps the learners in simulating different routing protocols, network topologies and several layered protocols using simulators like NS2 and packet tracing software's

1. Configure a network topology using packet tracing software	CO3
2. Configure a network using Distance vector routing protocol using packet tracer software	CO3

3. Static and dynamic routing using packet tracer software	CO3
4. DHCP, DNS, HTTP configuration using packet tracer software	CO3
5. Configure a Network with Virtual LANS	CO3

REFERENCE BOOKS:

1. CCNA Study guide

CHANGE OF SYLLABUS:

No change of syllabus from R-19 to R-20 regulation

1.1.3 of NAAC

Name of the Course	Course Code	Year of Introduction	Activities/Content with a direct bearing on Employability/ Entrepreneurship/ Skill development	Mapping with Employability/ Skill development/ Entrepreneurship
Computer Networks Lab	IT318	2019-20	Preparing straight and cross cables, Designing and implementing Class A, B, and C Networks, Designing and implementing Class A, B, and C Networks, To configure the IP address for a computer connected to LAN and to configure network parameters of a web browser for the same computer, Configuring Network Neighborhood, Configure a Network with Virtual LANS	Employability

WEB TECHNOLOGIES LAB

COURSE CODE: IT319

L T P E O

0 1 3 0 3

CREDITS 2.5

Sessional Marks: 50

End Exam Marks: 50

End Exam: 3 Hours

PREREQUISITE(S): Basic Knowledge on core Java Concepts.

COURSE OBJECTIVES:

1. Develop web applications using HTML, DHTML, XML and JavaScript.
2. Develop web applications by connecting to the database to validate Credentials and to get the results.
3. Gain the skills and project-based experience needed for entry into web designing and development careers.

COURSE OUTCOMES:

After completion of this course student will be able to:

CO-1: Design web applications using Technologies like HTML, JavaScript, PHP, Django and content management system (CMS).

CO-2: Apply CSS in Designing Web pages.

CO-3: Validate the credentials and get the results by Connecting to Databases.

Mapping of Course Outcomes with POs and PSOs

COs/POs-PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3				3	3	1	2	3	
CO2	3		3		3				1			1	3	
CO3	3	3	3		3				1			2	3	

UNIT-1:

Introduction to Web Design: Introduction to hypertext markup language (HTML) , creating web pages, lists, hyperlinks, tables, web forms, inserting images, frames, hosting options and domain name registration. Customized Features: Cascading style sheet (CSS) for text formatting and other manipulations.

Learning outcomes: At the end of this unit the Students will be able to

- Get Familiarize with basics of the Internet Programming.
- Design web applications using HTML, DHTML and CSS.

UNIT-2:

JavaScript: Introduction to JavaScript, variables, constants, Data types, operations, Loops, Arrays, Functions, Strings & String methods, JS Forms, Forms API.

Bootstrap: Bootstrap Buttons, Button Groups, list groups, Images, Tables, Alerts, Forms, Inputs.

Learning outcomes: At the end of this unit the students will be able to

- Get Familiarize with Java Scripting to process data using Arrays, Strings and functions.
- Design front-end framework for modern websites and web apps using Bootstrap.

UNIT-3:

PHP Programming: Introduction to PHP, variables, data types, Strings, numbers, constants, operations, PHP conditional events and Loops, functions, Arrays, PHP Forms.

Learning outcomes: At the end of this unit the students will be able to

- Develop Static websites or Dynamic websites or Web applications using PHP.
- Manage dynamic content, databases, session tracking using PHP.

UNIT-4:

Django: Installing Django, Basics of Dynamic Web Pages, Django Template System, Interacting with Database: Models, Form Processing.

Learning outcomes: At the end of this unit the students will be able to

- Familiarize with Python web framework-Django.
- Develop web applications using Django to interact with Databases.

UNIT-5:

Content management system (CMS): Introduction to CMS, Installing Joomla and Drupal, CMS Admin (Basics), Site Organization, Creating & Editing Articles, Menus & Modules, Creating Attractive Web Pages with Templates.

Learning outcomes: At the end of this unit the students will be able to

- Manage and edit web content, like images and text on the website using WYSIWYG editor (What You See Is What You Get).

TEXT BOOKS:

1. Web Programming: building internet applications, Chris Bates 2nd edition, Wiley 2002
2. JavaScript: The Definitive Guide, David Flanagan, 7th Edition, O'Reilly
3. PHP: The Complete Reference Paperback, Steven Holzner, McGraw Hill, 2007.
4. Learning PHP, MySQL, JavaScript, CSS & HTML5, Robin Nixon, O'Reilly, 3rd Edition, 2014.

ONLINE RESOURCES:

1. Web framework for Python Django by Suvash Sedhain (online edition: Link- <https://www.programmer-books.com/wp-content/uploads/2018/08/Django-Book-Web-framework-for-Python.pdf>).
2. <https://www.w3schools.com/bootstrap4>
3. <https://www.javatpoint.com/joomla>

LIST OF PROGRAMS:

Sl. No	PROGRAM	CO
1	Week-1-HTML: Program to illustrate body and pre tags.	1
2	Program to illustrate text Font tag.	1
3	Program to illustrate comment, h1...h6, and div tag.	1
4	Program to illustrate text formatting tags.	1
5	Program to illustrate Order List tag.	1
6	Program to illustrate Unorder List tag.	1
7	Program to illustrate Img tag.	1
8	Program to illustrate Hyper Link tag (Anchor tag).	1
9	Program to illustrate Table tag.	1
10	Program to illustrate Frame tag.	1
11	Program to illustrate Form tag.	1
12	WEEK-2: Create a complete registration web page using HTML.	1
13	Week-3- CSS: Program to illustrate CSS (cascading style sheet).	2
14	Program to Apply Different background colours for each line using css.	2
15	Program to Apply different colours for text using css.	2
16	To design login, registration page for online cart like Amazon using html, css.	2
17	Design login and registration page for online job portal using html and css.	2
18	To Write a Program to illustrate Embedded Multimedia.	2
19	Case Study: Create web pages: 1.cart page 2.catalogue page using html and css.	
20	Week-4: Program on Java Script to Perform All Arithmetic Operations.	1
21	Program on Java Script to Check Whether Given Number Is Prime Or Not.	1
22	Design HTML page including JavaScript that accepts given set of integer numbers and display them in descending order.	1
23	Program To Illustrate Subroutine.	1
24	Program on Java Script to Illustrate Different In-Built String Functions.	1
25	Case Study: Design html form which contains all types of input fields & validate fields using java script.	3
26	BOOTSTRAP: Week-5: Apply bootstrap for Login form and tables.	1
27	Apply bootstrap for Images, links, buttons, list.	1
28	Week-6 PHP: Design php page to store registration & retrieve login details into/from database.	3
29	Design php page to check whether a number is prime or not.	1
30	Design php page to calculate matrix multiplication.	1
31	Design a web page using sessions where the count increments each time.	1
32	Week-7: Deploy login page and display hello world using sample php script.	1

Sl. No	PROGRAM	CO
33	Design a php page to get name and age values using \$_GET or \$_POST.	1
34	Using php Associative arrays display a web page which shows: O/P: Salary of ramesh:50000 Salary of suresh:60000 Salary of rajesh:40000	1
35	Create a form which contains customer id, name, email, phone number using php insert above values into customer table and create php report.	1
36	DJANGO: Week-8: i) Run Html login page using django.	1
	ii) Design a Welcome web page using django.	1
37	Week-9: Using django create a customer table through models.py, views.py and urls.py finally display customer details on webpage.	1
38	Week-10: Write procedure for ZOOMLA INSTALLATION and Design one webpage using ZOOMLA.	1
39	Week-11: Write procedure for DRUPAL INSTALLATION and Design one web page using DRUPAL.	1
40	Week-12: CASE STUDY.	1

CHANGE OF SYLLABUS

No Change in R20 Regulation same as R19 Regulation

Name of the Course	Course Code	Year of Introduction	Activities/Content with a direct bearing on Employability/ Entrepreneurship/ Skill development	Mapping with Employability/ Skill development/ Entrepreneurship
Web Technologies Lab	IT319	R15	Creating web pages, JS Forms, Forms API, PHP Forms, CMS Admin (Basics), Site Organization, Creating & Editing Articles, Menus & Modules, Creating Attractive Web Pages with Templates.	Skill Development

SEMESTER-2

DISTRIBUTED OPERATING SYSTEMS

PROFESSIONAL ELECTIVE-2

COURSE CODE: IT322 A

L T P E O

3 0 0 1 2

CREDITS 3

Sessional Marks: 40

End Exam Marks: 60

End Exam: 3 Hours

PREREQUISITE(S): Operating Systems, Computer Networks

COURSE OBJECTIVES:

1. To introduce the foundations of Distributed Systems.
2. Introduce the idea of peer-to-peer services and distributed file system.
3. Examine in detail the system level and support required for distributed system.
4. Discover the issues involved in studying distributed process and resource management.

COURSE OUTCOMES:

CO-1: Apply the critical operations involved in designing and establishing the communication in distributed systems.

CO-2: Examine the models used to implement a consistent distributed Shared Memory system which also handles clock synchronization and deadlocks.

CO-3: Evaluate the methods of Process and Resource Management to balance and share the load in distributed system.

CO-4: Make use of distributed File System and Naming mechanisms for accessing, sharing and naming the files in distributed systems and its related applications.

Mapping of Course Outcomes with POs and PSOs

COs/POs-PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1			1	1	1	1		1	2	3	2
CO2	2	3	2	1		1	1	1	1	1	1	2	3	2
CO3	3	2	1	1		1	1	1	1	1	1	2	3	2
CO4	2	2	2	3		1	1	1	1	1	1	2	3	2

UNIT-I Fundamentals and Computer networks

10 Lectures

Fundamentals: Distributed computing system, evolution, models, popularity, Distributed operating system, design issues, introduction to DCE. Computer networks: Introduction, Types, Protocols for Distributed Systems, Internetworking, ATM Technology.

Learning Outcomes: At the end of this unit, the students will be able to

- Understand the fundamentals used in designing a distributed system.

Observe the network fundamentals used in designing a distributed system

UNIT- II Message passing and Remote procedure call**11 Lectures**

Message passing: Introduction, features, issues in IPC, synchronization, Buffering, multi datagram messages, encoding and decoding, process addressing, failure handling, group communication.

Remote procedure call: Introduction, RPC model, Transparency of RPC, Implementation, Stub generation, RPC messages, server management, parameter-passing semantics, call semantics, communication protocols, complicated RPC's, Client-Server Binding, exception handling, security, some special types of RPCs, RPC in heterogeneous environments, lightweight RPC

Learning Outcomes: At the end of this unit, the students will be able to

- Identify the message passing takes place in distributed systems.
- Analyze the working of RPC in distributed systems.

UNIT- III Distributed Shared memory and Synchronization**12 Lectures**

Distributed Shared memory: Introduction, general architecture, design and implementation issues, granularity, structure of shared memory space, consistency models, replacement strategy, thrashing, other approaches to DSM, Heterogeneous DSM, Advantages.

Synchronization: Introduction, Clock Synchronization, Event ordering, Mutual Exclusion, Deadlock, Election Algorithms

Learning Outcomes: At the end of this unit, the students will be able to

- Design a consistent and distributed shared memory model.
- Experiment with clock synchronization and handling deadlocks in distributed systems

UNIT- IV Resource management and Process Management**10 Lectures**

Resource management: Introduction, Desirable Features of a good global scheduling algorithm, Task assignment approach, load-balancing approach, load-sharing approach.

Process Management: Introduction, process migration, Threads.

Learning Outcomes: At the end of this unit, the students will be able to

- Examine the different load-balancing, load-sharing approaches.
- Organize processes and threads.

UNIT- V Distributed file systems and Naming**12 Lectures**

Distributed file systems: Introduction, features, file models, Accessing models, sharing models, file- caching schemes, file Replication, Fault tolerance, Atomic transactions, design principles. Naming: Introduction, features, fundamental terminologies, system-oriented names, object- locating mechanisms, human-oriented names, name caches, naming and security.

Learning Outcomes: At the end of this unit, the students will be able to

- **Design a distributed file system.**

Make use of different naming mechanisms.

TEXT BOOKS

1. Pradeep K Sinha, "Distributed Operating Systems: Concepts and Design", Prentice Hall of India, 2007

REFERENCE BOOKS

1. Tanenbaum A.S., Van Steen M., "Distributed Systems: Principles and Paradigms", Pearson Education, 2007.
2. Liu M.L., "Distributed Computing, Principles and Applications", Pearson Education, 2004.
3. Nancy A Lynch, "Distributed Algorithms", Morgan Kaufman Publishers, USA, 2003

CHANGE OF SYLLABUS

(R19) Syllabus	(R20) Syllabus
1. In (R19) DOS subject code is IT323(A) and CREDITS:3 2. In R19 DOS subject is in 3 rd year sem-2.	1. In (R20) DOS subject code is IT322 and CREDITS:3 2. In R19 DOS subject is in 3 rd year sem-2. Syllabus content is not changed.

Note: This course is related to Employability/Skill development.

1.1.3 of NAAC

Name of the Course	Course Code	Year of Introduction	Activities/Content with a direct bearing on Employability/ Entrepreneurship/ Skill development	Mapping with Employability/ Skill development/ Entrepreneurship
Distributed Operating Systems	R15-IT325 (A) R19-IT323(A)	2015-2016	Design issues, Internetworking, group communication, Implementation, Client-Server Binding, structure of shared memory space, consistency models, Mutual Exclusion, Deadlock, Election Algorithms, load-balancing approach, load-sharing approach, file- caching schemes and system-oriented names, human-oriented names and naming and security.	Employability

MACHINE LEARNING

(Professional Elective – II)

COURSE CODE: IT322 B

L T P E O

3 0 0 1 2

CREDITS 3

Sessional Marks: 40

End Exam Marks: 60

End Exam: 3 Hours

Prerequisite(s): Probability, Linear Algebra, Programming Languages

COURSE OBJECTIVES:

1. To give basic knowledge about the machine learning models and theory that forms the foundation of machine learning.
2. Identify and apply the appropriate Machine learning technique to classification, tree models, rule models, probabilistic models and ensemble techniques.

COURSE OUTCOMES:

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

CO-1: Illustrate the steps to handle binary, multiclass classification algorithms with an application.

CO-2: Analyze the data and predict decisions using tree, rule and linear classifier models.

CO-3: Classify the data by using distance-based and probabilistic models.

CO-4: Explore the feature transformations and ensemble techniques.

Mapping of Course Outcomes with POs and PSOs

COs/POs-PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2				1		1	1	1		1	3	2
CO2	2	3	2					1	1	1		1	3	2
CO3	3	2						1	1	1		1	3	2
CO4	2	3	3		2	2	2	1	1	1		1	3	2

UNIT-I

9 Lectures

The ingredients of machine learning: Tasks: the problems that can be solved with machine learning

Models: the output of machine learning, Features: the workhorses of machine learning, Binary classification, and related tasks: Classification, Scoring and ranking, Class probability estimation.

Learning outcomes: At the end of this unit, the students will be able to

- Understand features and tasks can be performed by machine learning
- Describe and Differentiate supervised and unsupervised learning

UNIT II

9 Lectures

Handling more than two classes, Regression, Unsupervised and descriptive learning **Concept learning:** The hypothesis space, Paths through the hypothesis space, beyond conjunctive concepts, Learnability

Learning outcomes: At the end of this unit, the students will be able to

- Define complete and consistent hypotheses
- Understand the notion of regression and concept learning

UNIT III

9 Lectures

Tree models: Decision trees, Ranking and probability estimation trees, Tree learning as variance reduction

Rule models: Learning ordered rule lists, Learning unordered rule sets, Descriptive rule learning, First-order rule learning

Linear models: The least-squares method, The perceptron, Support vector machines, Obtaining probabilities from linear classifiers, Going beyond linearity with kernel methods

Learning outcomes: At the end of this unit, the students will be able to

- Explain tree models
- Implement linear models

UNIT IV

9 Lectures

Distance-based models: Neighbours and exemplars, Nearest-neighbour classification, Distance-based clustering, Hierarchical clustering, From kernels to distances

Probabilistic models: The normal distribution and its geometric interpretations, Probabilistic models for categorical data, Discriminative learning by optimizing conditional likelihood, Probabilistic models with hidden variables, Compression-based models

Learning outcomes: At the end of this unit, the students will be able to

- Describe neighbourhood classifier models
- Explain distributions and probabilistic models

UNIT V

9 Lectures

Features: Kinds of feature, Feature transformations, Feature construction and selection

Model ensembles: Bagging and random forests, Boosting, Mapping the ensemble landscape

Learning outcomes: At the end of this unit, the students will be able to

- Describe Features
- Explain various ensembling models.

TEXT BOOKS

1. Flach, P. (2012). Machine learning: the art and science of algorithms that make sense of data, Cambridge University Press.

REFERENCE BOOKS

1. Ethem Alpaydin, Introduction to machine Learning, 2nd ed, PHI
2. Baldi, P. and Brunak, S. (2002). Bioinformatics: A Machine Learning Approach. Cambridge, MA: MIT Press
3. Kearns, M. and Vazirani, U. (1994). Computational Learning Theory. Cambridge, MA:MIT Press.
4. Tom M.Mitchell (1997), Machine Learning, MGH

CHANGE OF SYLLABUS

No Change of Syllabus

1.1.3 of NAAC

Name of the Course	Course Code	Year of Introduction	Activities/Content with a direct bearing on Employability/ Entrepreneurship/ Skill development	Mapping with Employability/Skill development/Entrepreneurship
Machine Learning	IT322	R-20	Decision trees , least-squares method, The perceptron, Support vector machines,	Skill development

OPERATION RESEARCH
(Professional Elective-II)

COURSE CODE IT322 C

L T P E O
3 0 0 1 2

CREDITS 3

Sessional Marks : 40

End Exam Marks: 60

End Exam: 3 Hours

Prerequisite(s): Mathematics

COURSE OBJECTIVE:

1. The course is intended to identify and develop operational research models, understand the mathematical tools to solve optimisation problems, and develop a report that describes the model, the solving techniques and analyse the results.

COURSE OUTCOMES:

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

CO-1: Apply linear programming model and assignment model to domain specific situations

CO-2: Analyze the various methods under transportation model and apply the model for testing the closeness of their results to optimal results

CO-3: Apply the concepts of PERT and CPM for decision making and optimally managing projects. Analyse the inventory and queuing theories and apply them in domain specific situations.

CO-4: Analyze the various replacement and sequencing models and apply them for arriving at optimal decisions

Mapping of Course Outcomes with POs and PSOs

COs/POs- PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	1	1	1	1	1	1	1	1	1	1	2	2
CO2	1	3	2	1	1	1	1	1	1	1	1	1	3	2
CO3	1	2	1	1	1	1	1	1	1	1	3	1	3	2
CO4	1	1	1	1	1	1	1	1	1	1	3	1	3	2

UNIT-I

9 Lectures

Overview of operations Research: OR models – OR Techniques Linear Programming: Introduction – Graphical solution; Graphical sensitivity analysis – The standard form of linear programming problems – Basic feasible solutions - unrestricted variables – simplex algorithm – artificial variables – Big M and two phase method – Degeneracy - alternative optima – unbounded solutions – infeasible solutions. Dual problems- Relation between primal and dual problems – Dual simplex method

Learning outcomes: At the end of this unit, the students will be able to

- Formulate real-world problems as a linear programming model and describe the theoretical workings of the graphical and simplex method, demonstrate the solution process by hand and solver.
- Explain the relationship between a linear program and its dual.

UNIT-II

9 Lectures

Assignment problem – Hungarian Method.

Transportation model – starting solutions. North West corner Rule - lowest cost method – Vogels approximation method

Learning outcomes: At the end of this unit, the students will be able to

- Formulate specialized linear programming problems, namely transportation and assignment problems
- Describe theoretical workings of the solution methods for transportation and assignment problems, demonstrate solution processes by hand and solver

UNIT-III

9 Lectures

Inventory Models: Static EOQ Models – Dynamic EOQ models.

Game theory: Two person Zero Sum Games – Mixed strategy games and their Algorithms

Learning outcomes: At the end of this unit, the students will be able to

- Apply the knowledge of game theory concepts to articulate real-world decision situations for identifying, analyzing, and practicing strategic decisions to counter the consequences.
- Demonstrate solution methods including graphs and linear programming to analyze and solve the Two-person, zero-sum games.

UNIT-IV

9 Lectures

Integer Programming: Branch and Bound Algorithms cutting plan algorithm.

Dynamic Programming: Recursive nature of dynamic programming – Forward and Backward Recursion

Learning Outcomes: At the end of this unit, the students will be able to

- Identify and Apply the knowledge of Branch and Bound Algorithms for integer Programming
- Understand and Apply Forward and Backward Recursion for optimal Decisions.

UNIT-V

9 Lectures

Network models – Basic Concepts – Construction of Networks – Project Network – CPM and PERT

Learning outcomes: At the end of this unit, the students will be able to

- PERT and CPM for decision making and optimally managing projects

TEXT BOOKS

1. S.D.Shrama, Operation Research, KedarNath Ram Nath Publishers, 2015.
2. Handy A. Taha, Operations Research An introduction, 10th edition, 2017.

REFERENCES

1. Hira D S and Gupta P K, Operations Research, S.Chand& Sons, 2007.
2. Panneerselvan. R., Operation Research, Prentice Hall of India Pvt Ltd. 2006.
3. KantiSwarup, Gupta P.K., and Manmohan, Operations Research, S.Chand& sons, 2004.

CHANGE OF SYLLABUS

No changes from R-19 to R-20

1.1.3 of NAAC

Name of the Course	Course Code	Year of Introduction	Activities/Content with a direct bearing on Employability/ Entrepreneurship/ Skill development	Mapping with Employability/Skill development/ Entrepreneurship
Operation Research	IT322	2022-23	1. Inventory Models 2. Game theory	Skill development

INTERNET OF THINGS

(Professional Elective – II)

COURSE CODE: IT323D

LP TE O

30 012

CREDITS 2.5

Sessional Marks: 40

End Exam Marks: 60

End Exam: 3 Hours

Prerequisite(s): Network standards, protocols, and technologies.

COURSE OBJECTIVES

1. Able to understand the application areas of IoT,
2. Able to realize the revolution of the Internet in Mobile Devices, Cloud & Sensor Networks
3. Able to understand the building blocks of the Internet of Things and its characteristics.

COURSE OUTCOMES

After completing this course, the students will be able to:

CO-1: Describe the design, functional blocks, levels, issues, and challenges of IoT solutions

CO-2: Analyse and evaluate protocols used in IOT

CO-3: Describe the basic building blocks of IoT devices

CO-4: Design, and evaluate an IoT system

Mapping of Course Outcomes with POs and PSOs

COs/POs- PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	3				2	2		2	2	1
CO2	3	2	1	1	3				2	2		2	2	1
CO3	3	2	1	1	3				2	2		2	2	1
CO4	3	2	1	1	3				2	2		2	2	1

UNIT-I Introduction:

10 Lectures

Internet of Things Vision, Emerging Trends, Economic Significance, Technical Building Blocks, Physical design of IoT, Things of IoT, IoT Protocols, Logical design of IoT, IoT functional blocks, IoT communication models, IoT Communication APIs, IoT enabling technologies, IoT levels and deployment templates, IoT Issues and Challenges, Applications.

Learning outcomes: At the end of this unit, the students will be able to

- Explain the functional building blocks of IoT.
- Understand IoT communication models.
- Enumerate IoT issues and challenges

UNIT-II: Communication Protocols**12 Lectures**

Protocol Standardization for IoT, Efforts, M2M and WSN Protocols, SCADA and RFID Protocols, Issues with IoT Standardization, Unified Data Standards, Protocols – IEEE 802.15.4, BACNet Protocol, Modbus, KNX, Zigbee Architecture, Network layer, APS layer

Learning outcomes: At the end of this unit, the students will be able to

- Classify communication protocols.
- List the issues with IoT standardization.
- Characterize Zigbee Architecture.

UNIT-III IoT Physical Devices and Endpoints**10 Lectures**

Basic building blocks of an IoT device, Exemplary device: Raspberry Pi, Raspberry Pi interfaces, Programming Arduino with sensor interfaces.

Learning outcomes: At the end of this unit, the students will understand

- Raspberry Pi interfaces.
- Programming Arduino with sensor interfaces.

UNIT-IV**12 Lectures****1) IoT applications.**

- a) Lighting as a service (case study)
- b) Intelligent Traffic systems (case study)
- c) Smart Parking (case study)
- d) Smart Water Management(case study)

2) IOT for smart cities

Learning outcomes: At the end of this unit, the students will be able to

- Apply IoT concepts in traffic systems.
- Know the importance of IoT in smart cities.

UNIT-V Interfacing with Arduino and Raspberry PI**10 Lectures**

IOT in Indian Scenario

- i) IOT and Aahaar
- ii) IOT for health services.
- iii) IOT for financial inclusion.
- iv) IOT for rural empowerment.

Challenges in IOT implementation.

- v) Big data management.
- vi) Connectivity Challenges

Learning outcomes: At the end of this unit, the students will understand

- Apply IoT in Indian scenarios.
- Enumerate the challenges in IoT implementation

TEXTBOOKS:

1. ArshdeepBahga, Vijay Madiseti, —Internet of Things – A hands-on approach, Universities Press, ISBN: 0: 0996025510, 13:978-0996025515

REFERENCES:

1. Honbo Zhou, —The Internet of Things in the Cloud: A Middleware Perspective, CRC Press,2012. ISBN : 9781439892992

CHANGE OF SYLLABUS:

No change

1.1.3 of NAAC

Name of the Course	Course Code	Year of Introduction	Activities/Content with a direct bearing on Employability/ Entrepreneurship/ Skill development	Mapping with Employability/ Skill development/ Entrepreneurship
Internet of Things	IT323	2021	Functional building blocks of IoT, Raspberry Pi interfaces, Programming Arduino with the sensor interfaces, IoT standardization	Employability

User Experience (Ux)
(Professional Elective – II)

COURSE CODE: IT322 E

L T P E O
3 0 0 1 2

CREDITS 3

Sessional Marks : 40
End Exam Marks: 60
End Exam: 3 Hours

Prerequisite(s): HTML5, CSS, JS

Course Objectives

1. Describe the User Interface.
2. Describe the User Experience.
3. Learn what the relevant tools are for UX Designers.

Course Outcomes

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

CO-1: Describe UI and UX design by their own way.

CO-2: Build their different type of prototyping.

CO-3: Fetch all UI Elements in designed page.

CO-4: Design the Personas by their own way and Conduct a Usability Test and submit the test Results Report.

Mapping of Course Outcomes with POs and PSOs

COs/POs- PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	1	3	1	1	1	2	1		1	3	2
CO2	2	2	2	2	3	2	1	1	2	1		1	3	2
CO3	2	2	2	2	3	2	1	1	2	1		1	3	2
CO4	2	2	2	2	3	2	2	1	2	1		2	3	2

UNIT I UI/UX Overview (Introduction)

9 Lectures

Introduction - What is UX Design? - What is UI Design? - What is Interaction Design – UX Design Deliverables - Basics of HCI UX Design - User Centered Design - Design Thinking - Activity Based Design - Agile Process - User Research - Competitor Analysis.

Learning outcomes: At the end of this unit the Students will be able to

- Understand the concepts of UI/UX Design and Agile Process.

UNIT II Interaction Design

9 Lectures

Interaction Design - Ideation Methods - Interaction & Prototyping - Paper Prototyping - Build your own Prototyping - Heuristic (Expert) Evaluation - Designing a Web / Mobile App.

Learning outcomes: At the end of this unit the Students will be able to

- Understand the concepts of Prototyping and web /Mobile app design.

UNITIII Visual Design

9 Lectures

Visual Design - Web App UI Elements - Mobile App UI Elements - Grid Systems - Colors Theory and Palette - Understanding Typography - Material UI and other UI Kit.

Learning outcomes: At the end of this unit the Students will be able to

- Understand the concepts of UI Elements , grid systems and Typography.

UNITIV User Research

9 Lectures

User Research - How to conduct user Interviews - User Research - Creating Personas - Empathy Mapping - Information Architecture - Building User Journey Maps.

Learning outcomes: At the end of this unit the Students will be able to

- Understand the concepts of User Research , Mapping , and Information Architecture.

UNITV Usability Testing

9 Lectures

Usability Testing - Testing Methods - User Testing - A/B Testing - Conducting a Usability Test - Test Results Report.

Learning outcomes: At the end of this unit the Students will be able to

- Understand the concepts of Different testing methods and test reports.

TEXT BOOKS

1. Text Books: Pardha S. Pyla, ,The UX Book: Agile UX Design for a Quality User Experience', Morgan Kaufmann; 2nd edition, 2019.

REFERENCES

1. Adam Boduch, React Material-UI Cookbook: Build captivating user experiences using React and Material-UI',PacktPublishingLimited,2019.
2. <https://www.coursera.org/specializations/ui-ux-design>
3. UX Design & User Experience Design Course - Theory Only:
<https://www.udemy.com/course/how-to-change-careers-and-become-a-uxdesigner/>

CHANGE OF SYLLABUS

No changes, introduced in R19 Regulations.

1.1.3 of NAAC

Name of the Course	Course Code	Year of Introduction	Activities/Content with a direct bearing on Employability/ Entrepreneurship/ Skill development	Mapping with Employability/Skill development/ Entrepreneurship
User Experience	IT322	2021-22	1. Web /Mobile app design 2. User Research	Skill development

MOBILE ADHOC NETWORKS

(Professional Elective-III)

COURSECODE: IT323 A

LT P E O

3 0 0 12

CREDITS: 3

Sessional Marks: 40

External Marks: 60

End Exam: 3 Hrs

Prerequisite(s): Computer Networks

COURSE OBJECTIVES:

1. To give an understanding of the basic knowledge on wireless LANs, adhoc wireless networks, and protocols.
2. To give an overview of networking principles and how the wireless protocols, routing, operate.
3. To know the basic background in wireless networks that will allow them to practice in this field and that will form the foundation for more advanced courses in networking.
4. To acquire the basic skills needed to write network applications in software tools i.eNetsim, NS2/NS3.
5. To give an overview of the issues and challenges in adhoc networks.

COURSE OUTCOMES:

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

CO-1: Implement routing algorithm.

CO-2: Gain knowledge on different layers and services.

CO-3: Identify the issues involved in wireless network security.

CO-4: Find various QoS issues and energy management schemes.

Mapping of Course Outcomes with POs and PSOs

COs/POs-PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	1	3						3	1	2	1
CO2	3	1	1											1
CO3	3	2	1			3					2	1	1	1
CO4	3					2	1				2	1	1	

UNIT - I

8 Lectures

Wireless LANS AND PANS: Introduction Fundamentals of WLANS, IEEE 802.11 Standard, HIPERLAN Standard, Bluetooth, HomeRF.

Wireless Internet: Wireless Internet, Mobile IP, TCP in wireless Domain WAP, Optimizing Web over Wireless.

Learning outcomes: At the end of this unit, the students will be able to

- Learn different Wireless local area networks and personal area networks.
- Learn the mobile internet protocol.

UNIT – II

10 Lectures

Adhoc Wireless Networks: Introduction in Ad-Hoc wireless Networks, Ad-Hoc Wireless internet.

MAC Protocols For Adhoc Wireless Networks: Introduction, issues in designing a MAC protocol for adhoc wireless networks, design goals, classification of MAC protocols, contention based protocols.

Learning outcomes: At the end of this unit, the students will be able to

- Learn basics of wireless ad hoc networks
- Learn the different MAC protocols in wireless adhoc networks

UNIT – III

12 Lectures

Routing Protocols: Introduction, issues in designing a routing protocol for adhoc wireless networks, classification, table-driven routing protocols, on-demand routing protocols, hybrid routing protocols, hierarchical routing protocols, power-aware routing protocols.

Transport Layer And Security Protocols: Introduction, issues in designing a transport layer protocol for adhoc wireless networks, design goals of a Transport Layer Protocol for Ad-Hoc Wireless Networks, classification of Transport Layer Solutions, TCP over adhoc wireless networks, other Transport Layer Protocol for Ad-Hoc wireless Networks Security in adhoc wireless networks, network security requirements, issues and challenges in security provisioning.

Learning outcomes: At the end of this unit, the students will be able to

- Learn different routing protocols at network layer
- Learn different routing protocols at transport layer and security issues.

UNIT – IV

12 Lectures

Quality Of Service: Introduction, issues and challenges in providing QoS in adhoc wireless networks, classification of QoS solutions, MAC layer solutions, network layer solutions, QoS frameworks for adhoc wireless networks.

Learning outcomes: At the end of this unit, the students will be able to

- Learn different Quality Of Service solutions
- Learn the framework for MANETs

UNIT – V

12 Lectures

Energy Management: Introduction, need for energy management in adhoc wireless networks, classification of energy management schemes, battery management schemes, transmission power management schemes, system power management schemes.

Learning outcomes: At the end of this unit, the students will be able to

- Learn different energy management schemes
- Recollect the power-aware routing protocols

TEXT BOOKS:

1. Adhoc wireless networks architecture and protocols, C. Siva Ram Murthy, B.S. Manoj (2004), Prentice Hall of India, NewDelhi.
2. Wireless Adhoc and sensornetworks, protocols, performance and control, Jagannathan Sarangapani (2007), CRC press, NewDelhi.

REFERENCES:

1. Adhoc mobile wireless networks protocols & systems, C. K. Toh (2009), Pearson Education India, NewDelhi.
2. Wireless sensor networks, C .S. Raghavendra, Krishna M. Sivalingam (2004), Springer Science, USA.

CHANGE OF SYLLABUS

New Course

1.1.3 of NAAC

Name of the Course	Course Code	Year of Introduction	Activities/Content with a direct bearing on Employability/ Entrepreneurship/ Skill development	Mapping with Employability/ Skill development/ Enterprenuership
Mobile Adhoc Networks	IT323	2022	Wireless LANS AND PANS, Wireless Internet, MAC Protocols For Adhoc Wireless Networks, Routing Protocols, Transport Layer And Security Protocols, Quality Of Service, Energy Management	Mapping with Skill development

SOFT COMPUTING
(Professional Elective – III)

COURSE CODE: IT323 B

L T P E O
3 0 0 1 2

CREDITS 3

Sessional Marks: 40

End Exam Marks: 60

End Exam: 3 Hours

Prerequisite(s): Artificial Intelligence

COURSE OBJECTIVES

The course would aim to make the student understand the basic idea of problem solving through the principles of soft computing, which would be seen as a well-balanced integration of fuzzy logic, evolutionary computing, and neural information processing.

1. To introduce the ideas of fuzzy sets, fuzzy logic and use of heuristics based on human experience.
2. To familiarize with genetic algorithms.
3. To become familiar with neural networks that can learn from available examples and generalize to form appropriate rules for inferencing systems

COURSE OUTCOMES

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

CO-1: Recognize the feasibility of applying a soft computing methodology for a particular problem.

CO-2: Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems.

CO-3: Apply genetic algorithms to combinatorial optimization problems.

CO-4: Apply neural networks to pattern classification and regression problems.

Mapping of Course Outcomes with POs and PSOs

COs/POs-PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	3	2	1	1	1				1	3	2
CO2	3	3	3	3	2	1	1	1				1	3	2
CO3	3	3	3	3	3	1	1	1				1	3	2
CO4	3	3	3	3	3	1	1	1				1	3	2

UNIT I

9 Lectures

Fuzzy Logic: Fuzzy Set Theory: Basic Definition and Terminology, Set Theoretic Operations, MF Formulation and Parameterization, MF of two dimensions, Fuzzy Union, Intersection and Complement.

Learning outcomes: At the end of this unit, the students will be able to

- understand the basics of fuzzy logic
- illustrate the operations on fuzzy logic

UNIT II

9 Lectures

Fuzzy Rules and Fuzzy Reasoning: Extension Principles and Fuzzy Relations, Fuzzy IF THEN Rules, Fuzzy Reasoning. Fuzzy Inference System Introduction, Mamdani Fuzzy models, Other Variants, Sugeno Fuzzy Models, Tekamoto Fuzzy Models.

Learning outcomes: At the end of this unit, the students will be able to

- explore different types of fuzzy models
- apply fuzzy models to real world applications

UNIT III

9 Lectures

Genetic Algorithms: Fundamentals of Genetic Algorithms: Basic Concepts Creation, Offspring's Encoding, Fitness functions, Reproduction, Genetic Modelling: Inheritance Operators, Cross over, Inversion and detection, Mutation operator, Bitwise operators.

Learning outcomes: At the end of this unit, the students will be able to

- understand the importance of genetic algorithms
- explore the applications of genetic algorithms

UNIT IV

9 Lectures

Artificial Neural Networks: Introduction, Architecture, Back Propagation and feed Forward Networks, Offline Learning, Online Learning.

Supervised Learning of Neural Networks: Introduction, Perceptrons, Adaline Back Propagation Multilayer Perceptrons, Back Propagation Learning Rules, Methods of Speeding. Radial Basis Function Networks, Functional Expansion Networks.

Learning outcomes: At the end of this unit, the students will be able to

- understand the basics of neural networks
- explore the importance of neural networks in supervised learning

UNIT V

9 Lectures

Neuro-Fuzzy Modeling: Adaptive Neuro-Fuzzy Inference Systems – Architecture – Hybrid Learning Algorithm – Learning Methods that Cross-fertilize ANFIS and RBFN – Coactive Neuro Fuzzy Modeling – Framework Neuron Functions for Adaptive Networks – Neuro Fuzzy Spectrum.

Learning outcomes: At the end of this unit, the students will be able to

- understand the architecture of neuro-fuzzy systems
- understand the framework of neuron functions

TEXT BOOKS

1. J.S.R. Jang, C.T.Sun and E.Mizutani, “Neuro-Fuzzy and Soft Computing” PHI/Pearson Education, New Delhi 2004.

REFERENCES

1. T. J. Ross, “Fuzzy Logic with Engineering Applications.” TMH, New York, 1997.
2. D. E. Goldberg, Genetic Algorithms in Search Optimization and Machine Learning, Addison Wesley, 3rd Ed.
3. B. Kosko, Neural Network and fuzzy systems, Prentice Hall of India, 2006
4. Kecman, Learning and Soft Computing, Pearson, 1st Ed, 2001.

CHANGE OF SYLLABUS

No change in syllabus

1.1.3 of NAAC

Name of the Course	Course Code	Year of Introduction	Activities/Content with a direct bearing on Employability/ Entrepreneurship/ Skill development	Mapping with Employability/ Skill development/Entrepreneurship
Soft Computing	IT323	R15	Back Propagation and feed Forward Networks Hybrid Learning Algorithm	Skill development

ORGANIZATIONAL BEHAVIOUR

(Professional Elective-III)

COURSE CODE IT323 C

LT P E O

3 001 2

CREDITS 3

Sessional Marks : 40

End Exam Marks: 60

End Exam: 3 Hours

PRE-REQUISITES: Basic knowledge of general Management

COURSE OBJECTIVES

1. To help the students to develop cognizance of the importance of human behaviour.
2. To enable students to describe how people behave under different conditions and understand why people behave as they do.
3. To provide the students to analyse specific strategic human resources demands for future action.
4. To enable students to synthesize related information and evaluate options for the most logical and optimal solution such that they would be able to predict and control human behaviour and improve results.

COURSE OUTCOMES

On completion of this course, the students will be able to

CO1: Demonstrate the applicability of the concept of Organizational behavior to understand the behavior of people in the organization.

CO2: Demonstrate the applicability of analyzing the complexities associated with management of individual behavior in the organization.

CO3: Analyze the complexities associated with management of the group behavior in the organization.

CO4: Demonstrate how the organizational behavior can integrate in understanding the motivation (why) behind behavior of people in the organization.

Mapping of course outcomes with program outcomes

COs/POs- PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1	1	1	1	2	1	2	1	2	2	1	1
CO2	1	1	1	1	1	1	2	1	2	1	2	2	1	1
CO3	1	1	1	1	1	2	2	1	2	1	2	2	1	1
CO4	1	1	1	1	1	2	3	1	2	1	2	2	1	1

Unit I:

9 Lectures

Meaning, Fundamental concepts, Definition, Approaches to OB, Characteristics and limitations of OB, Challenges and Opportunities of OB, Models of OB.

Learning Outcomes: At the end of the Unit, Student will be able to

- Understand the Fundamental concepts of Organizational Behaviour.
- Understand the Challenges and Opportunities of OB.

Unit II:**9 Lectures**

Personality: Definition, Features, Big five model, MBTI, Johari Window, Managerial Implications of Personality. Perceptions and Attributions: Definition, Features, factors affecting perception, Process. Attribution, perceptual and attribution errors, Managerial Implications of Perception.

Learning Outcomes: At the end of the Unit, Student will able to

- Demonstrate the concepts of Managerial Implications of Personality.
- Understand the Managerial Implications of Perception.

Unit III:**9 Lectures**

Learning: Definition, Features, Classical and operant conditioning, social learning theory, Behavioral modification. Attitude: Definition, Features, ABC model of Attitude, Managerial Implications of Attitude.

Learning Outcomes: At the end of the Unit, Student will able to

- Analyse Behavioural Modification.
- Understand the Managerial Implications of Attitude.

Unit IV:**9 Lectures**

Motivation: Concept, Definition, Features, Types of Motivation, Process, Managerial Implications of Motivation. Leadership: Concept, Definition, Leadership Styles, Transactional and Transformational Leadership, Leadership development.

Learning Outcomes: At the end of the Unit, Student will able to

- Understand the Managerial Implications of Motivation.
- Understand the Transactional and Transformational Leadership.

Unit V:**9 Lectures**

Groups and Teams: Definition, Features, Group development stages, Group vs. Teams, Managing and developing effective teams. Conflict Management: Definition, Features, Types of Conflict, Conflict Resolution Strategies, Relationship between Conflict and Performance.

Learning Outcomes: At the end of the Unit, Student will able to

- Demonstrate the concepts of Group development stages.
- Analyse the Relationship between Conflict and Performance.

TEXT BOOKS

1. Robbins, S. P., & Judge, T. (2013). Organizational behavior (15th ed.). Boston: Pearson.

REFERENCE BOOKS

1. Newstrom J. W., & Davis, K. (2011). Human behavior at work (12th ed.). Tata McGraw Hill
2. Pareek. U. (2010). Understanding Organizational Behavior (2nd ed.). Oxford University Press
3. Schermerhorn, J. R., Osborn, R.N., Hunt, M.U.J (2016). Organizational Behavior (12th ed.). Wiley.

CHANGE OF SYLLABUS

New Subject

1.1.3 of NAAC

Name of the Course	Course Code	Year of Introduction	Activities/Content with a direct bearing on Employability/ Entrepreneurship/ Skill development	Mapping with Employability/Skill development/Enterpreunership
Organizational Behaviour	IT323	2022-23	1. Managerial Implications of Personality 2. Conflict Management	Entrepreneurship

WEB SECURITY

COURSE CODE: IT323 D

L T P E O
3 0 0 1 2

CREDITS 3

Sessional Marks: 40
End Exam Marks: 60
End Exam: 3 Hours

PREREQUISITE: Basic knowledge of Computer Networks and various types of attacks.

COURSE OBJECTIVE:

1. This course provides the foundation for understanding the key issues associated with securing web applications.
2. The purpose of this course is to provide the physical and host security for the servers.
3. Understand how to control access to the web content..

COURSE OUTCOMES:

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

CO1: Analyze the risks associated with problem identification in web security.

CO2: Minimize the risks by minimizing services of the host computer to secure.

CO3: Maintain security for web applications and for digital payments.

CO4: Apply control access methods for web content.

Mapping of Course Outcomes with POs and PSOs

COs/POs- PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	1	2		2	2	2	2	1		3	3	2
CO2	1	2	2	2		2	2		2	1		3	3	2
CO3	1	2	3	2	1	3	2	2	3	3	2	3	3	3
CO4	1	2	3	2	2	3	2	2	3	3	3	3	3	3

UNIT 1:

9 Lectures

The Web Security Landscape- The Web Security Problem, Risk Analysis and Best Practices, Cryptography and the Web - Cryptography and Web Security, Working Cryptographic Systems and Protocols- Offline Encryption Systems, PGP/OpenPGP, S/MIME, Online Cryptographic Protocols and Systems, Legal Restrictions on Cryptography

Learning Outcomes: At the end of this unit, the students will be able to

- Understand the web security problem and analyze the risks in it.
- Know the legal restrictions on cryptography.

UNIT 2:**9 Lectures**

Physical Security for Servers: Planning for the Forgotten Threats, Protecting Computer Hardware, Protecting your data, Story- A failed site inspection.

Host Security for Servers: Current host security problems, Securing the host computer, Minimizing risk by minimizing services, Operating securely, Secure remote access and content updating, Firewalls and the web.

Learning Outcomes: At the end of this unit, the students will be able to

- Understand how security will be provided to the servers.
- Understand the risk minimization.

UNIT 3:**9 Lectures**

Securing web applications: Securely using fields, hidden fields and cookies, Rules for programming languages, Using PHP securely, writing scripts that run with additional privileges, connecting to databases.

Deploying SSL service certificates: Planning for your SSL server, Creating SSL servers with free BSD, installing an SSL certificate on Microsoft IIS, Obtaining certificate from a commercial CA.

Securing Web services: Protecting via Redundancy, Protecting your DNS, Protecting your domain registration.

Learning Outcomes: At the end of this unit, the students will be able to

- Understand how to maintain security for web applications
- Deploy the SSL service certificate.
- Protect web services via redundancy and also understand the role of DNS protection.

UNIT 4:**9 Lectures**

Controlling access to your web content: Access control strategies, controlling access with Apache, controlling access with Microsoft IIS

Client side digital certificates- client certificates, A tour of the verisign digital ID center.

Code Signing and Microsoft's Authenticode- Why code signing, Microsoft authenticode technology, other code signing methods.

Learning Outcomes: At the end of this unit, the students will be able to

- Understand the access control strategies to control the access to web content.
- Understand the role of signing.

UNIT 5:**9 Lectures**

Pornography, Filtering Software, and Censorship: Pornography Filtering, PICS, PSACi.

Privacy Policies, Legislation, and P3P: Policies That Protect Privacy and Privacy Policies, Children's Online Privacy Protection Act, P3P.

Digital Payments: Charga-Plates, Diners Club, and Credit Cards, Internet based payment systems, How to evaluate a credit card payment system.

Learning Outcomes: At the end of this unit, the students will be able to

- Understand various filtering softwares.
- Know about various policies that protect privacy.
- Understand how to evaluate digital payments.

TEXT BOOKS:

1. “Web Security, Privacy and Commerce”, 2nd edition, Simson Garfinkel, O’Reilly, 2002.

REFERENCES:

1. “E-commerce: Business, Technology, Society”, 3rd edition, Kenneth C. Laudon and Carol Guercio Traver, Addison Wesley, 2007

CHANGE OF SYLLABUS

New Syllabus

1.1.3 of NAAC

Name of the Course	Course Code	Year of Introduction	Activities/Content with a direct bearing on Employability/ Entrepreneurship/ Skill development	Mapping with Employability/Skill development/ Enterprenuership
Web security	IT412	2022	Protecting your data, Securing the host computer, Minimizing risk by minimizing services, Operating securely, Secure remote access and content updating, Firewalls and the web, Rules for programming languages, Using PHP securely, writing scripts that run with additional privileges, connecting to databases, Protecting via Redundancy, Protecting your DNS, Protecting your domain registration, code signing, Pornography Filtering, Charga-Plates, Diners Club, and Credit Cards, Internet based payment systems, How to evaluate a credit card payment system.	Employability & Skill development

SOFTWARE TESTING METHODOLOGIES

Professional Elective- III

COURSE CODE: IT323 E

L P T E O

3 0 0 1 2

CREDITS 3

Sessional Marks: 40

End Exam Marks: 60

End Exam: 3hours

Pre-requisite(s): Software Engineering

Course Objectives:

1. To get familiar the students about basic concepts of software testing and its techniques.
2. To study in detail the process of performing the black box and white box testing approaches with examples.
3. To study about the various test cases and advanced concepts of object oriented testing.

Course Outcomes:

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

CO-1: Identify the basic needs for developing a test tool to support test automation

CO-2: Explain the importance of Contemporary issues in Software Testing.

CO-3: Apply software testing methods and modern software testing tools for testing the projects.

CO-4: Analyze the problems by designing and selecting software test models, criteria, strategies, and methods and how to maintain quality of software.

Mapping of Course Outcomes with POs and PSOs

COs/POs- PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	3	2	1	1			3	3	3	3	3	3
CO2	1	3	3	2	1		1		3	3	3	3	3	3
CO3		2	3		2	1		1	3	3	3	3	3	3
CO4	1	2	3	3	3		1	1	3	3	3	3	3	3

UNIT-I:

10 Lectures

Software Testing: Introduction, Myths & Facts, Goals, Psychology, Definition, Model for testing, Effective Vs Exhaustive Software Testing.

Software Testing Terminology and Methodology: Software Testing Terminology, Software Testing Life Cycle, relating test life cycle to development life cycle, Software Testing Methodology.

Learning Outcomes: At the end of this unit student will be able to learn

- Software Testing its myths and facts
- Software Testing lifecycle
- Methodology for Software Testing.

UNIT-II:**7 Lectures**

Verification and Validation: Verification & Validation Activities, Verification, Verification of Requirements, High level and low level designs, How to verify code, Validation

Validation activities: Unit testing, Integration Testing, Function testing, system testing, acceptance testing

Learning Outcomes: At the end of this unit student will be able to learn the

- Difference between Verification and Validation
- Verification activities
- Validation activities

UNIT-III:**12 Lectures**

Dynamic Testing I:Black Box testing techniques: Boundary Value Analysis, Equivalence class Testing, State Table based testing, Decision table based testing, Cause-Effect Graphing based testing, Error guessing

Dynamic Testing II: White-Box Testing: need, Logic coverage criteria, Basis path testing, Graph matrices, Loop testing, data flow testing, mutation testing

Static Testing: inspections, Structured Walkthroughs, Technical reviews

Regression testing: Progressivevs regressive testing, Regression testing techniques

Learning Outcomes: At the end of this unit student will be able to learn

- To evaluate different black box testing techniques
- White box testing techniques
- Regression testing techniques.

UNIT-IV:**10 Lectures**

Efficient Test Suite Management: Test case design. Why does a test suite grow, Minimizing the test suite and its benefits, test suite prioritization, Types of test case prioritization, prioritization techniques, measuring the effectiveness of a prioritized test suite

Learning Outcomes: At the end of this unit student will be able to learn

- Analyze types of test case prioritization and techniques
- To synthesis efficiency of test suite management

UNIT-V:**8 Lectures**

Software Quality Management: Software Quality, Broadening the Concept of Quality, Quality Cost, Benefits of Investment on Quality, Quality Control and Quality Assurance, Software Quality Metrics, SQA Models

Testing Process Maturity Models: Need for Test Process Maturity, Measurement and Improvement of a Test Process, Test Process Maturity Models

Learning Outcomes: At the end of this unit student will be able to learn

- Quality Assurance with models and techniques
- Identify Testing Process Maturity Models

CASE STUDY (Not considered in the examination): Introduction Selenium testing tool - Installation process, how to write and run a test case in Selenium.

Text Books:

1. Software Testing, Principles and Practices ,Naresh Chauhan, Oxford University Press 2010.

Reference Books:

1. Software Testing, Principles, techniques and Tools, M G Limaye, TMH, 2009
2. Effective Methods for Software testing, Willian E Perry, 3ed, Wiley 2006

Change of syllabus:

No change of syllabus. Introduced in R19 regulation.

1.1.3 of NAAC

Name of the Course	Course Code	Year of Introduction	Activities/Content with a direct bearing on Employability/ Entrepreneurship/ Skill development	Mapping with Employability/ Skill development/ Entrepreneurship
Software Testing Methodologies	IT323	2021-2022	Skill development Black Box testing techniques, White-Box Testing techniques	Skill Development

DESIGN AND ANALYSIS OF ALGORITHMS

COURSE CODE:IT324

L T P E O

3 0 0 1 3

CREDITS 3

Sessional Marks: 40

End Exam Marks: 60

End Exam: 3 Hours

Prerequisite(s): Introduction to programming, programming and data structures.

Course Objectives:

1. Make students understand how asymptotic notations are used to provide a rough classification of algorithms.
2. Explain different computational models (e.g., divide-and-conquer), complexity measures (e.g., running time) to analyze the complexity/performance of different algorithms.
3. Explain various advanced design and analysis techniques such as greedy algorithms, dynamic programming & know the concepts of tractable and intractable problems.

Course Outcomes: After completion of this course student will be able to:

CO-1: Evaluate time complexities of various Brute force and other algorithms.

CO-2: Design algorithms to solve problems using divide and conquer, Decrease and conquer, Dynamic programming and Greedy Techniques.

CO-3: Transform and solve the problems with known algorithms.

CO-4: Solve the problems using tractable algorithms (Backtracking and Branch- and-bound).

Mapping of Course Outcomes with POs and PSOs

COs/POs-PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	3								1	2	2
CO2	3	3	3	2	2						2	3	3	
CO3	3	3	1									2	2	
CO4	3	3	1	2								1	2	

UNIT-I:

12

Lectures

Introduction: Fundamentals of algorithmic problem solving.

Fundamentals of analysis of algorithms and efficiency: Analysis framework –Asymptotic Notations and Basic Efficiency classes –Mathematical Analysis of Non-recursive Algorithms –Mathematical Analysis of recursive Algorithms.

Brute Force –Selection Sort, Bubble sort, Sequential Search, Brute Force String Matching, Closest Pair and Convex-Hull Problems by Brute Force, Exhaustive search problems.

Learning outcomes: At the end of this unit the students will be able to

- Understand the concepts of time complexity, worst case, average case and best case complexities.

- Evaluate the time complexities of various algorithms under Brute force technique.

UNIT-II:

12

Lectures

Divide-and-Conquer: Merge sort, Quicksort, Binary Search, Strassen's Matrix Multiplication,

Closest-Pair and Convex-Hull Problems by Divide-and conquer.

Decrease –and –Conquer: Decrease by a Constant Algorithms -Insertion Sort, Depth First Search and Breadth First Search, Topological Sorting, Decrease by a Constant Factor and Variable Size Decrease Algorithms.

Learning outcomes: At the end of this unit the students will be able to

- Understand Divide-and-Conquer and Decrease –and –Conquer strategies to solve problems.
- Evaluate time complexities of various algorithms under Divide-and-Conquer and Decrease –and –Conquer techniques.

UNIT-III:

10

Lectures

Transform-and-Conquer: Presorting, Balanced Search Trees (AVL), Heaps and Heapsort, Problem Reduction.

Space and Time Tradeoffs –Sorting by Counting, Input Enhancement in string Matching – Horspool's algorithm, B-Trees.

Learning outcomes: At the end of this unit the students will be able to

- Understand a wide range of searching and sorting algorithms.
- Evaluate time complexities of various algorithms under Transform-and-Conquer technique.

UNIT-IV:

10

Lectures

Dynamic Programming: Warshall's and Floyd's Algorithms, Optimal Binary Search Trees, The Knapsack Problem.

Greedy Technique: Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm, Huffman Trees.

Learning outcomes: At the end of this unit the students will be able to

- Understand Dynamic Programming and Greedy Techniques to solve problems.
- Evaluate time complexities of various algorithms under Dynamic Programming and Greedy Technique.

UNIT-V:

10

Lectures Limitations of Algorithm Power: Lower-Bound Arguments, Decision Trees, P, NP, NP hard and NP complete problems.

Coping with the Limitations of Algorithms Power: Backtracking-n queens, Hamiltonian circuit, subset sum problem.

Branch and Bound-Assignment Problem, knapsack Problem, Traveling salesman problem.

Learning outcomes: At the end of this unit the students will be able to

- Understand the notion of tractable and intractable problems.
- Understand the notion of P, NP and NP-complete class problems.

TEXT BOOK:

1. Introduction to Design & Analysis of Algorithms by Anany Levitin, Pearson Education, 2003.

REFERENCE BOOKS:

1. Introduction to Algorithms by Thomas H. Corman, Charles E. Leiserson, Ronald R. Rivest & Clifford Stein, Prentice Hall.
2. The Design and Analysis of computer Algorithms, Aho, Hopcroft & Ullman, Pearson Education.

CHANGE OF SYLLABUS

NO Change in R20 Regulation same as R19 Regulation

1.1.3 of NAAC

Name of the Course	Course Code	Year of Introduction	Activities/Content with a direct bearing on Employability/ Entrepreneurship/ Skill development	Mapping with Employability/ Skill development/ Entrepreneurship
Design and Analysis of Algorithms	IT324	R15	Mathematical Analysis of Non-recursive Algorithms, Mathematical Analysis of recursive Algorithms, Merge sort, Quicksort, Binary Search, Decrease by a Constant Algorithms, Balanced Search Trees (AVL), Heaps and Heapsort, Optimal Binary Search Trees, Backtracking, Branch and Bound.	Employability

DESIGN THINKING

COURSE CODE: IT325

L T P E O

3 0 0 1 2

CREDITS 3

Sessional Marks: 40

End Exam Marks: 60

End Exam: 3 Hours

Prerequisite(s): Nil

Course Objectives:

1. The course titled Design thinking is aimed to give an in-depth Understanding on Various aspects of Innovation, Creativity, evolving business models, incubation and entrepreneurship. Come up with exposure to design thinking for designing innovative products.
2. The course is a blend of theory and practice therefore this course does not require any prerequisite and will be useful to understand innovation and its applications in different spheres of development and growth.

Course Outcomes:

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

CO-1: Able to Explain the fundamental also Design Thinking and innovation

CO-2: Empathize and analyze model action plan.

CO-3: Apply design thinking techniques for given tasks.

CO-4: Apply the design thinking techniques for solving problems in various sectors.

Mapping of Course Outcomes with POs and PSOs

COs/POs-PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2				1			1	1	1	2	1
CO2	3	3	1				1			1	1	1	2	1
CO3	3	3	2				1			1	1	1	2	1
CO4	3	2	1				1			1	1	1	2	1

UNIT-I

9 Lectures

Introduction to Design Thinking: Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry.

Learning outcomes: At the end of this unit, the students will be able to

- Know the fundamentals of Design thinking.
- Analyse the design components.

UNIT-II

9 Lectures

Design thinking: Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, customer, journey map, brain storming, product development.

Learning outcomes: At the end of this unit, the students will be able to

- Apply Design thinking on Social innovations.
- Apply the tools of Design thinking.

UNIT-III

9 Lectures

Innovation: Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations. Creativity to Innovation, Teams for innovation, Measuring the impact and value of creativity.

Learning outcomes: At the end of this unit, the students will be able to

- Categorize the innovation and creativity.
- Apply creativity and innovation in organizations.

UNIT-IV

9 Lectures

Design thinking for strategic Innovation: An exercise in design thinking — implementing design thinking for better process. Implement design thinking process in various Industries. Design thinking for Startups.

Learning outcomes: At the end of this unit, the students will be able to

- Apply Design thinking as an exercise.
- Analyse Design thinking for start-ups.

UNIT-V

9 Lectures

Design thinking in various sectors: Case studies in Information Technology, Finance, Education, Management and Retail sector. Analyze and Prototyping, Usability testing, Organizing and interpreting results.

Learning outcomes: At the end of this unit, the students will be able to

- Apply Design thinking Finance and Education.
- Analyse and Organizing interpreting Results.

TEXT BOOKS

1. Design Thinking in the Class Room by David Lee, Ulysses press

REFERENCES

1. Change by design, Tim Brown, Harper Bollins (2009)
2. Design the Future , by Shrrutin N Shetty , Norton Press
3. Universal principles of design- William lidwell, kritinaholden, Jill butter.
4. The era of open innovation — chesbrough.H
5. Product Design and Manufacturing by A.K. Chitale and R.C. Gupta, Prentice Hall

CHANGE OF SYLLABUS

NO change from R-19 to R-20

1.1.3 of NAAC

Name of the Course	Course Code	Year of Introduction	Activities/Content with a direct bearing on Employability/ Entrepreneurship/ Skill development	Mapping with Employability/Skill development/Enterprenuership
Design Thinking	IT325	2021-22	Creativity toInnovation	Entrepreneurship

ETL Tools
(Elective Lab-II)

COURSE CODE: IT327

L T P E O
0 1 3 0 3

CREDITS: 2.5

Sessional Marks: 50

End Exam Marks: 50

End Exam: 3 Hours

Prerequisite: Basics of Data Warehousing, Programming Knowledge preferably Python

Course Objectives

1. To explore different types of data and learn the key aspects of warehousing in extracting, transforming, and loading the warehouse with the data.
2. To be able to perform the tasks using familiar tools such as Talend Open Studio, Apache Airflow

Course Outcomes

At the end of the course, the student will be able to:

CO-1: Consolidate data from different sources into a centralized location and assimilate different types of data into a common format using ETL Tools.

CO-2: Refine the data during the transformation phase using ETL Tools.

CO-3: Load the transformed data to a single, unified target location for storage and analysis using ETL Tools.

Mapping of Course Outcomes with POs and PSOs

COs/POs-PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		2	1	2	3						1	2	3	3
CO2		2	3	1	3						1	2	3	3
CO3		2	3	1	3						1	2	3	3

Memory Requirements

- Memory usage: 4 GB minimum, 8 GB recommended
- Disk space: 20 GB

Software Requirements

- Java 8 JRE Oracle.
- A properly installed and configured MySQL database, with a database named getting started.
- Talend Open Studio

Syllabus overview

1) Data Extraction from Sources (CO-1)

- Identifying different types of data and sources.
- Extracting raw data from an array of sources including databases, network appliances, security hardware and software applications, and others.
- Identify relevant data necessary for transformation.

2) Data Profiling & Data Quality (CO-1)

- **Structure discovery** — Structure discovery (or analysis) helps determine whether your data is consistent and formatted correctly. It uses basic statistics to provide information about the validity of data.
- **Relationship discovery** — Relationship discovery identifies connections between different data sets.
- **Content discovery** — Content discovery focuses on data quality. Data needs to be formatted, standardized, and properly integrated with existing data in a timely and efficient manner. For example, if a street address is incorrectly formatted it could mean that certain customers can't be reached, or a delivery becomes misplaced.
- **Quality Analysis**
 - Connecting to a data source including databases and delimited file
 - Database content analysis
 - Column analysis
 - Table analysis
 - Redundancy analysis
 - Correlation analysis
 - Patterns and Indicators

3) Data Transformations (CO-2)

- Data cleaning
- Data recovery – using data profiling.
- Data mapping
- Generating code
- Executing the code
- Review
- Customized operations – Additional steps
 - Filtering (e.g., Selecting only certain columns to load).
 - Enriching (e.g., Full name to First Name, Middle Name, Last Name).
 - Splitting a column into multiple columns and vice versa.
 - Joining together data from multiple sources.
 - Removing duplicate data.

4) Data Loading to Target (CO-3)

The transformed, high quality data is then delivered to a single, unified target location for storage and analysis.

5) Data Reconciliation (CO-3)

- Setting up a reconciliation strategy for deployment conflicts
- Setting up the reconciliation strategy for deployment conflicts in preferences

Note: This course is related to Employability/Skill development.

List of Experiments

Week No	Name of the experiment	CO#
1	Discovering Talend Open Studio	1
2	Working with Projects, Extracting Data	1
3	Quality Analysis	1
4	Transformation	2
5	Working with Databases	2
6	Filtering, Sorting, and other processing techniques	2
7	Managing Files	2
8	Job Orchestration	2
9	Managing Jobs	2
10	Global Variables and contexts	2
11	Loading (Publishing)	3
12	Auditing and Reconciliation	3
13	Archive and clean up	3

TEXT BOOKS

1. Getting started with Talend Open Studio for Data Integration, Jonathan Bowen, Packt, 2012, ISBN: 9781849514729

REFERENCES

1. Talend Open Studio Cookbook, Rick Barton, Packt, 2013, ISBN: 9781782167266
2. Talend Open Studio for Data Quality User Guide, Creative Commons Public License
3. Talend Open Studio for Big Data User Guide, 2017, Creative Commons Public License
4. The data warehouse ETL toolkit : practical techniques for extracting, cleaning, conforming, and
5. delivering data / Ralph Kimball, Joe Caserta, Wiley Publishing, 2004, eISBN: 0-764-57923-1.

CHANGE OF SYLLABUS

No change of syllabus w.r.t. R19.

1.1.3 of NAAC

Name of the Course	Course Code	Year of Introduction	Activities/Content with a direct bearing on Employability/ Entrepreneurship/ Skill development	Mapping with Employability/ Skill development/ Entrepreneurship
ETL Tools	IT327	R19	Working with Projects, Extracting Data Quality Analysis, Transformation Working with Databases Filtering, Sorting, and other processing techniques, Managing Files Auditing and Reconciliation	Skill Development

DEVOpps
(Elective lab II)

COURSE CODE: IT327 B

L T P E O
0 1 3 0 3

CREDITS 2.5

Sessional Marks: 50

End Exam Marks: 50

End Exam: 3 Hours

Prerequisite(s): Operating System, Virtualization, Cloud Computing, Java and Web Programming, and Software Engineering & Monitor the Software Applications

Course Objectives

1. DevOps improves collaboration and productivity by automating infrastructure and workflows and continuously measuring applications performance.

Course Outcomes

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

CO-1: Remember the importance of DEVOpps tools used in software development life cycle

CO-2: Analyze & Illustrate the Containerization of OS images and deployment of applications over Docker.

CO-3: Summarize and Synthesize the importance of Software Configuration Management in DevOps using Chef/Puppet/Ansible or Saltstack

Mapping of Course Outcomes with POs and PSOs

COs/POs-PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	1	3	1	1	1	2	1		1	3	3
CO2	2	2	3	3	3	2	1	1	2	1		1	3	3
CO3	1	3	3	3	3	2	1	1	2	1		1	3	3

Hardware & Software Requirements:

PC with following Configuration

1. Windows or Linux Desktop OS for Client machines
2. Internet Connection for each PC with at least 2 MBPS
3. Intel Core i3/i5/i7 Processor with Intel VT-X support
4. GB RAM Minimum
5. 500 GB Hard Disk
6. Gigabit Ethernet (GbE) network interface card (NIC CentOS/Fedora/Ubuntu/Redhat Server OS for One Server)
7. JDK or higher
8. Netbeans or Eclipse
9. OpenSSH.
10. List of Software's - Maven, Jenkins

Sr. No	Module / Experiment Number	Detailed Content	CO Mapping
1	Prerequisite	To Understand the Concept of DevOppswithrelated technologies which are used to Code, Build, Test, Configure & Monitor the Software Applications	CO1
2	Build & Test Applications with Continuous Integration	To Install and Configure Jenkins to test, and deploy Java or Web Applications using Netbeans or eclipse.	CO1
3	Version Control	To Perform Version Control on websites/ Softwares using different Version control tools like RCS/ CVS/ <u>GIT</u> /Mercurial (Any two)	CO1 CO2
4	Virtualization & Containerization	To Install and Configure Docker for creating Containers of different Operating System Images	CO1 CO2
5	Virtualization & Containerization	To Build, deploy and manage web or Java application on Docker	CO1 CO2
6	Software Configuration Management	To install and configure Software Configuration Management using Chef/Puppet/Ansible or Saltstack.	CO1 CO3
7	Provisioning	To Perform Software Configuration Management and provisioning usingChef/ Puppet/ Ansible or Saltstack.	CO1 CO3

TEXT BOOKS:

1. ProGit, Scott Chacon and Ben Straub, Apress, 2nd Edition 2014. (Exp: 1, 3)
2. Docker: Up and Running Karl Matthias & Sean P. Kane, O'Reilly Publication. (Exp: 1, 4, 5)
3. DevOpps, A Software Architects Perspective Len Bass, IngoWeber, LimingZhu, Addison Wesley-Pearson Publication. (Exp: 1, 6, 7)
4. The Definitive Guide John Ferguson Smart, Jenkins, O'Reilly Publication. (Exp: 1, 2)

Reference Books:

1. DevOpps for Dummies Sanjeev Sharma and Bernie Coyne, Wiley Publication
2. DevOpps for Developers, Httermann, Michael, Apress Publication.
3. Practical DevOpps, Joakim Verona, Pack publication.

Term Work: Term Work shall consist of experiments on above guidelines/syllabus. Also Term work Journal must include at least 2 assignments.

CHANGE OF SYLLABUS

New Lab added in R19 Regulation. No changes in syllabus

1.1.3 of NAAC

Name of the Course	Course Code	Year of Introduction	Activities/Content with a direct bearing on Employability/ Entrepreneurship/ Skill development	Mapping with Employability/Skill development/ Entrepreneurship
DEVOops	IT327	2021-22	Experiments 3, 4, 5 and 6. 1. Version Control 2.Virtualization & Containerization 3.Virtualization & Containerization 4.Software Configuration Management	Skill development

ADVANCED JAVA PROGRAMMING LAB

COURSE CODE: IT327 C

L T P E O

0 1 3 0 3

CREDITS 2.5

Sessional Marks: 50

End Exam Marks: 50

End Exam: 3 Hours

Prerequisite(s): Basic Knowledge on core Java Concepts, HTML tags and DBMS.

Course Objectives:

1. Familiarize with User Interface (GUI), networking, and data basemanipulation.
2. Understand the enterprise application concepts and HTTP protocol.
3. Illustrate the concepts of Java Servlets and Java Server Pages to develop web applications.

Course Outcomes:

After completion of this course student will be able to:

CO-1: Design and develop various web applications by integrating any of Servlets, JSPs, Swing and Applet using Database.

CO-2: Design and implement components like: Session, JSTL, Tag Extension and Filter.

CO-3: Distinguish Web Server, Web Container and Application Server.

Mapping of Course Outcomes with POs and PSOs

COs/POs-PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	3				3	1	2	3	3	
CO2	3	2	2	2	3				3	1	2	3	3	
CO3	3	1			3							1	2	

UNIT-I: J2EE and Web Development

J2EE and Web Development Java Platform, J2EE Architecture Types, Explore Java EE Containers, Types of Servers in J2EE Application, HTTP Protocols and API, Request Processing in Web Application, Web Application Structure, Web Containers and Web Architecture Models. **Learning Outcomes:** At the end of this Unit the student will be able to

- Distinguish Web Server, Web Container and Application Server.
- Understand various Types of Enterprise Edition Architectures and Web Servers.

UNIT-II: Advance Networking

Advance Networking Basics, Introduction of Socket, Types of Socket, Socket API, TCP/IP client sockets, URL, TCP/IP server sockets, Datagrams, java.net package, ServerSocket, Client Server programming.

Learning Outcomes: At the end of this Unit the student will be able to

- Understand various sockets available in java.net package for network programming.
- Develop applications using networking connections.

UNIT-III: JDBC Programming

JDBC Programming JDBC Architecture, Types of JDBC Drivers, Introduction to major JDBC Classes and Interface, Creating simple JDBC Application, Types of Statement (Statement Interface, Prepared Statement, Callable Statement), Exploring Result Set Operations.

Learning Outcomes: At the end of this Unit the student will be able to

- Develop applications to interact with Databases.
- Distinguish various statements available in JDBC.

UNIT-IV: Servlets

Servlet API and Overview Servlet Introduction, Servlet Life Cycle, Types of Servlet, Servlet Configuration with Deployment Descriptor, Working with ServletContext and ServletConfig Object, Attributes in Servlet,, Response and Redirection using Request Dispatcher and using sendRedirect Method, Filter API, Manipulating Responses using Filter API, Session Tracking: using Cookies, HttpSession.

Learning Outcomes: At the end of this Unit the student will be able to

- Develop applications using Servlets.
- Develop applications to track sessions.

UNIT-V: JSP and JSTL

JSP architecture, JSP page life cycle, JSP elements, Expression Language, Tag Extensions, Tag Extension API, Tag handlers, JSP Fragments, Tag Files, JSTL, Core Tag library, overview of XML Tag library.

Learning Outcomes: At the end of this Unit the student will be able to

- Develop applications using JSP.
- Develop applications using XMLtags.

TEXTBOOKS:

1. BlackBook-JavaserverprogrammingJ2EE, 1sted., DreamTechPublishers,2008.
2. Complete Reference J2EE by James Keogh mcgraw publication.
3. Professional Java Server Programming by Subrahmanyam Allamaraju, Cedric Buest Wiley Publication.

LIST OF PROGRAMS:

Sl.No	PROGRAM	CO
1	Week-1: Working with Net Beans: Installing NetBeans and Oracle Database on Windows / Linux operating System.	3
2	Week-2: Socket Programming using Java.net package. Develop a chatting application by establishing connection between client and server.	1
3	Week 3: JDBC Programs using Statement A program to test the connection with the database.	1
	A program to create a table	1

Sl.No	PROGRAM	CO
	A program to insert record in a table	1
4	Week-4: JDBC Programs using Statement	1
	A program to fetch records from a table	1
	A program to update record in a table	1
5	Week-5: JDBC Programs using PreparedStatement	1
	A program to insert a record and select records.	1
6	Week-6: JDBC Programs using CallableStatement	1
	A program to execute a procedure to compute a square.	1
7	Week-7: Servlet Programming	1
	Servlet Execution on tomcat.	1
	A servlet program to print hello world.	1
	A servlet program to display request details.	1
8	Week-8:Servlet Programming	2
	servlet program to create a cookie.	2
	A servlet program to display cookie.	2
9	Week-9: JSP Programming	1
	JSP program to demonstrate arithmetic operations.	1
10	Week-10: JSP Programming	1
	JSP program to demonstrate jsp:forward action tag.	1
	JSP program to request implicit object.	1
11	Week-11: JSTL Programs	2
	Write a JSTL program to demonstrate core tags.	2
	Write a JSTL program to find the given Number is Even OR Odd using CORE Tags in JSTL.	2
	Write a JSTL program to demonstrate IF Statement using Core Tags.	2
12	Week-12: JSTL Programs	2
	Write a JSTL program to demonstrate XML tags to parse an XML document.	2
	Write a JSTL program to demonstrate XML tags to read an XML document.	2

CHANGE OF SYLLABUS:

No Change in R20 Regulation same as R19 Regulation

1.1.3 of NAAC

Name of the Course	Course Code	Year of Introduction	Activities/Content with a direct bearing on Employability/ Entrepreneurship/ Skill development	Mapping with Employability/ Skill development/ Entrepreneurship
Advanced Java Programming Lab	IT327	R19	Request Processing in Web Application, Web Application Structure, Web Containers and Web Architecture Models, Client Server programming, Creating simple JDBC Application, Session Tracking: using Cookies, HTTP Session, JSP architecture, Tag Extension API.	Skill Development

INTERNET OF THINGSLAB

COURSE CODE IT328

L P T E O
0 1 3 0 0

CREDITS 2.5

Sessional Marks: 50
End Exam Marks: 50
End Exam: 3 Hours

Prerequisite(s): Network Standards, Network Protocols, Network Technologies.

Course Objectives

1. Able to understand the application areas of IOT.
2. To acquire the knowledge and realize the revolution of Internet and Sensor Networks
3. To acquire knowledge in designing, creating and deploying the real-time applications of IOT.

Course Outcomes

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

CO-1: Describe the embedded systems with Arduino environment and Raspberry Pi platforms.

CO-2: Analyze the designing, building and testing microcontroller based embedded Network Systems in modeling real world.

CO-3: Identify the appropriate cloud architectures and applications to deploy models in different domains.

CO-4: Create, Design and deploy IOT devices using Arduino and Raspberry Pi applications.

Mapping of Course Outcomes with POs and PSOs

COs/POs-PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	3				2	2		2	2	1
CO2	3	2	1	1	3				2	2		2	2	1
CO3	3	2	1	1	3				2	2		2	2	1
CO4	3	2	1	1	3				2	2		2	2	1

UNIT-I Introduction to Internet of things and Embedded Systems: 2 Lectures

Defining IOT, Technologies and trends with IOT, Impact of IOT in society, components of an embedded system, core hardware components most commonly used in IoT devices, Interaction between software and hardware in an IoT device, use of networking and basic networking hardware, Structure of the Internet and meaning of a Network Protocol.

Learning outcomes: At the end of this unit, the students will be able to

- Understand and describe the IOT, Technologies, Trends of Embedded Systems.

UNIT-II Arduino and RaspberryPi Programming 2 Lectures

Arduino Platform and C Programming: Composition of Arduino development board, read board schematics, Arduino IDE, what "shields" are and how they are used,

Raspberry Pi platform and python programming: Composition of Raspberry pi development board, GPIO pins, Raspberry softwares.

Learning outcomes: At the end of this unit, the students will be able to

- Understand and learn the various compositions of Arduino development boards, Shields
- Implement various loops, functions and build process

UNIT-III Communication Protocols

2 Lectures

Protocol Standardization for IoT, M2M and WSN Protocols, SCADA and RFID Protocols, Unified Data Standards, Protocols – IEEE 802.15.4, BAC Net Protocol, Modbus, Zigbee Architecture.

Learning outcomes: At the end of this unit, the students will be able to

- Understand M2M and WSN Protocols.
- Classify Unified Data Standards.
- Explain Zigbee Architecture.

UNIT-IV IoT Physical Devices and Endpoints

2 Lectures

Basic building blocks of an IoT device, Exemplary device: Raspberry Pi, Raspberry Pi interfaces, Programming Arduino with sensor interfaces.

Learning outcomes: At the end of this unit, the students will be able to

- Describe Basic building blocks of IoT devices.
- Understand Raspberry Pi interfaces.

UNIT-V Interfacing with Arduino and Raspberry PI

2 Lectures

Sensors. Resistive Sensors, Actuators, Analog Actuators, Pulse Width Modulation, Arduino Libraries, I2C Communication, I2C Transactions, Arduino Shields, Ethernet Shield, Ethernet Library, Ethernet Client, Ethernet Server, Ethernet Shield Demo, WiFi Shield, Camera Module, pi camera Library, Capturing Images, PWM on RPI, Servo Control, Servo motor

Learning outcomes: At the end of this unit, the students will be able to

- Understand the various sensors, shields, libraries.

REFERENCES

1. DThe Internet of Things: How Smart TVs, Smart Cars, Smart Homes, and Smart Cities Are Changing the World
2. ArshdeepBahga, Vijay Madiseti, —Internet of Things – A hands- on approachl, Universities Press, ISBN: 0: 0996025510, 13:978-0996025515
3. Honbo Zhou, —The Internet of Things in the Cloud: A Middleware Perspective, CRC Press,2012. ISBN : 9781439892992
4. Dieter Uckelmann, Mark Harrison, Florian Michahelles, —Architecting the Internet of Things, Springer, 2011. ISBN:978-3-642-19156-5

List of Experiments

S. No	Experiments	CO
1.	Introduction to IOT 1. Understanding IoT fundamentals 2. IOT Architecture and protocols 3. Various Platforms for IoT 4. Real time Examples of IoT 5. Overview of IoT components and IoT Communication Technologies 6. Challenges in IOT	1
2.	Arduino Simulation Environment and Raspberry pi Environment 1. Arduino and Raspberry Pi Architecture 2. Setup the IDE, Writing Arduino Software, installing Raspberry OS 3. Arduino Libraries, Raspberry commands 4. Basics of Embedded C programming for Arduino and Raspberry pi 5. Interfacing LED, push button and buzzer with Arduino and Raspberry 6. Interfacing Arduino with LCD	1
3.	Sensor & Actuators with Arduino & Raspberry Pi 1. Overview of Sensors working 2. Analog and Digital Sensors 3. Interfacing of Temperature, Humidity, Motion, Light and Gas Sensor with Arduino and Raspberry pi 4. Interfacing of Actuators with Arduino and Raspberry pi 5. Interfacing of Relay Switch and Servo Motor with Arduino and Raspberry pi	2
4.	Basic Networking with ESP8266 WiFi module 1. Basics of Wireless Networking 2. Introduction to ESP8266 Wi-Fi Module 3. Various Wi-Fi library 4. Web server- introduction, installation, configuration 5. Posting sensor(s) data to web server	2
5.	IoT Protocols 1. M2M vs. IOT 2. Communication Protocols	3
6.	Cloud Platforms for IOT 1. Virtualization concepts and Cloud Architecture 2. Cloud computing, benefits 3. Cloud services -- SaaS, PaaS, IaaS 4. Cloud providers & offerings 5. Study of IOT Cloud platforms 6. Thing Speak API and MQTT 7. Interfacing ESP8266 with Web services	3
7	Project	4

CHANGE OF SYLLABUS

Previous (R19)	Current (R20) Changes Incorporated
Lab Experiments are specific	Labs are generalized and simplified in R20 Regulation
Unit 1	Introduction of embedded systems
Unit 2	Introduced Arduino and Raspberry Platforms
Unit 3	No Change
Unit 4	No Change
Unit 5	Introduced interfacing With Arduino and Raspberry pi
<u>Overall change: 10%</u>	

1.1.3 of NAAC

Name of the Course	Course Code	Year of Introduction	Activities/Content with a direct bearing on Employability/ Entrepreneurship/ Skill development	Mapping with Employability/ Skill development/ Entrepreneurship
Internet of Things Lab	IT328	2021	Technologies and trends with IOT, compositions of Arduino development boards, Shields, M2M and WSN Protocols, Raspberry Pi interfaces.	Employability

COMPUTER GRAPHICS AND MULTIMEDIA LAB

COURSE CODE IT329

L T P E O

0 030 1

CREDITS 1.5

Sessional Marks : 50

End Exam Marks: 50

End Exam: 3 Hours

Prerequisite(s): C Programming, coordinate geometry.

Course Objectives

1. Understand the basics of computer graphics, different graphics systems and applications of computer graphics.
2. Learn the various photo editing features and animation techniques and demonstrate proficiency in developing the multimedia presentations.

Course Outcomes

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

CO-1: Implement scan conversion algorithms for lines and curves. Perform transformations on 2D and 3D objects

CO-2: Create animations using various editing tools.

CO-3: Use audio, video, image editing tools to develop multimedia applications

Mapping of Course Outcomes with POs and PSOs

COs/POs-PSOs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1	3	2	1	1	3				2	2		2	2	1
CO2	3	2	1	1	3				2	2		2	2	1
CO3	3	2	1	1	3				2	2		2	2	1

UNIT-I Introduction

3 Lectures

Advantage of Computer Graphics and Areas of Applications, Hardware and Software for Computer Graphics. (Hard Copy, Display Technologies), Scan Conversion Algorithms (Line, Circle)

Learning outcomes: At the end of this unit, the students will be able to

- Enumerate computer graphics applications
- Implement scan conversion algorithms

UNIT-II

3 Lectures

2-Dimensional transformation, 2-D Translation, Rotation, Scaling, Homogeneous Coordinates, Reflection, Shear transformation 3-dimensional transformation, 3-D Translation, Rotation Scaling, Reflection, Shear.

Learning outcomes: At the end of this unit, the students will be able to

- Implement 2D transformations on graphic objects.
- Implement 3D transformations on graphic objects.

UNIT-III

3 Lectures

Basic Principles of Animation and Types of Animation, Introduction to the flash interface, Setting stage dimensions, working with panels, panel layouts, Layers & Views, Shaping Objects – Overview of shapes, Drawing & Modifying Shapes, Animation -Principles, Frame by frame animation, tweening, masks

Learning outcomes: At the end of this unit, the students will be able to

- Enumerate types of animations.
- Describe animation principles.

UNIT-IV

3 Lectures

Introduction to Digital Image Processing: Definition, application areas. File forms, Basic digital Image processing techniques like antialiasing, Convolutions, Thresholdingetc, Image enhancement.

Learning outcomes: At the end of this unit, the students will be able to

- Understand the applications of IoT in day to day life.
- Explain the application of IoT for smart cities

UNIT-V

3 Lectures

Video – Broadcast video standards (NTSC, PAL), Integrating computer and television, video capture board, video, colour, shooting and editing video, recording formats 9S-VHS video hardware resolution, video compression (JPEG, MPEG)

Learning outcomes: At the end of this unit, the students will be able to

- Understand the applications of IoT in Indian Scenario.
- Explain the challenges in IoT implementation.

List of Experiments

S.No	Experiment	Course Outcome
1	To implement Bresenham's algorithms for line, circle drawing	CO1
2	To perform 2D Transformations such as translation, rotation, scaling, Reflection and shearing.	CO1
3	To implement Cohen-Sutherland 2D clipping.	CO1
4	To perform 3D Transformations such as translation, rotation and scaling.	CO1
5	User Interface Design & Graphics II: Create a user interface for your final project. Include 2 backgrounds and 1 button set. Aim for a cohesive look.	CO3
6	Multimedia Sound: Create 2 soundtracks and 2 EFX sounds for a previous project.	CO3
7	Procedure to create an animation to indicate a ball bouncing on steps	CO2
8	Procedure to simulate movement of a cloud.	CO2
9	Procedure to create an animation with the following features. WELCOME	CO2
10	Letters should appear one by one the fill color of the text should change to a different color after the display of the full word. Procedure to create an animation to represent the growing moon	CO2
11	Procedure to extract the flower only from given photographic image and organize it on a background. Selecting your own background for organization.	CO3
12	Procedure to use appropriate tool(s) from the toolbox cut the objects from 3 files (f1.jpg, f2.jpg & f3.jpg); organize them in a single file and apply feather effects.	CO3

TEXT BOOKS

1. Hearn & Baker: Computer Graphics (2nd Ed.). Prentice Hall India.
2. Vaughan, T. “Multimedia – Making it work (5th edition)”, McGrawHill.

REFERENCE BOOKS

1. Krihsna murthy N: Introduction to computer Graphics, Tata McGraw Hill Edition.
2. Zhigang X. & PlastockR.a. : Theory and problems of Computer Graphics (Schaum's Outline), Tata McGraw Hill.
3. Gonzalez & gonzalez, Digital Image Processing, Pearson Education.
4. Jain V.K. Fundamentals of Digital Image processing, Pearson Education.

CHANGE OF SYLLABUS

No Change

1.1.3 of NAAC

Name of the Course	Course Code	Year of Introduction	Activities/Content with a direct bearing on Employability/ Entrepreneurship/ Skill development	Mapping with Employability/ Skill development/ Entrepreneurship
Internet of Things Lab	IT329	R19	2-D, 3-D Transformations, Digital Processing Techniques	Skill Development