



NEW HORIZON
COLLEGE OF ENGINEERING



Open Elective Syllabus
Batch: 2020-2024
(6th & 7th Semester)
(175 Credits- 2018 Scheme)

New Horizon College of Engineering, Bangalore

Autonomous College affiliated to VTU, Accredited by NAAC with 'A' Grade & NBA

VISION

To emerge as an institute of eminence in the fields of engineering, technology and management in serving the industry and the nation by empowering students with a high degree of technical, managerial and practical competence.

MISSION

- To strengthen the theoretical, practical and ethical dimensions of the learning process by fostering a culture of research and innovation among faculty members and students
- To encourage long-term interaction between the academia and industry through their involvement in the design of curriculum and its hands-on implementation
- To strengthen and mould students in professional, ethical, social and environmental dimensions by encouraging participation in co-curricular and extracurricular activities

Quality Policy

To emerge as an institute of eminence in the fields of engineering, technology and management in serving the industry and the nation by empowering students with a high degree of technical, managerial and practical competence.

Values

- | | |
|--------------------|-------------------------|
| ❖ Academic Freedom | ❖ Professionalism |
| ❖ Innovation | ❖ Inclusiveness |
| ❖ Integrity | ❖ Social Responsibility |

New Horizon College of Engineering

SIXTH SEMESTER OPEN ELECTIVES LIST FOR AY 2022-2023 (EVEN SEMESTER)

Batch: 2020-2024

Course Code	Course Name	BOS
20NHOP601	Big Data Analytics using HP Vertica- 1	CSE
20NHOP602	VM Ware Virtualization Essentials-1	ISE
20NHOP607	SAP	ME
20NHOP608	Schneider - Industrial Automation	EEE
20NHOP609	Cisco - Routing & Switching - 1	ECE
20NHOP612	Cisco - Routing & Switching -2	ECE
20NHOP614	Blockchain	CSE
20NHOP615	Product Life Cycle Management	ME
20NHOP620A	Robotic Process Automation	CSE
20NHOP621A	Industry 4.0	ME
20NHOP622A	Programming of Industrial Robot	ECE
20NHOP623A	5G Communication	ECE
20NHOP625A	VLSI Physical Design-I	ECE

New Horizon College of Engineering

SEVENTH SEMESTER OPEN ELECTIVES LIST FOR AY 2023-2024 (ODD SEMESTER)

Batch: 2020-2024

Course Code	Course Name	BOS
20NHOP701	Big Data Analytics using HP Vertica- 1	CSE
20NHOP702	VM Ware Virtualization Essentials-1	ISE
20NHOP704	Big Data Analytics using HP Vertica – 2	CSE
20NHOP707	SAP	ME
20NHOP708	Schneider - Industrial Automation	EEE
20NHOP709	Cisco - Routing & Switching - 1	ECE
20NHOP712	Cisco - Routing & Switching -2	ECE
20NHOP714	Blockchain	CSE
20NHOP715	Product Life Cycle Management	ME
20NHOP722A	Programming of Industrial Robot	ECE
20NHOP723A	5G Communication	ECE
20NHOP725A	VLSI Physical Design-I	ECE
20NHOP726A	VLSI Physical Design-2	ECE
20NHOP727A	Juniper Network Operating System	ECE
20NHOP728A	Database Administration using DB2	AIML

OPEN ELECTIVE

(6th & 7th SEMESTER SYLLABUS)

BIG DATA ANALYTICS USING HP VERTICA – 1													
Course Code		:	20NHOP601 / 20NHOP701								Credits:	3	
L:	T:	P:	S	:	3:	0:	0:	0				CIE Marks:	50
Exam Hours:		:	3								SEE Marks:	50	

Course Outcomes: At the end of the Course, the Student will be able to:												
CO#	COURSE OUTCOME											
20NHOP601.1	Analyse data in Oracle & Vertica databases using SQL statement											
20NHOP601.2	Explore Vertica for organizing and faster processing of data.											
20NHOP601.3	Create projection partition manually using Vertica for efficient data analysis.											
20NHOP601.4	Apply copy, delete, merge, purge operations in Vertica database.											
20NHOP601.5	Design multi-node clustering in Hadoop for real time applications											
20NHOP601.6	Illustrate working of Hadoop ecosystem tools for big analysis.											

Course Outcomes to Program Outcomes Articulation Matrix												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
20NHOP601.1	3	2	-	-	3	-	-	-	3	-	-	2
20NHOP601.2	3	-	-	-	3	-	-	-	3	-	-	-
20NHOP601.3	3	-	2	1	3	-	-	-	3	-	-	-
20NHOP601.4	3	-	-	-	3	-	-	-	3	-	-	-
20NHOP601.5	3	2	2	-	3	-	-	-	3	2	-	2
20NHOP601.6	3	-	-	-	-	-	-	-	-	2	-	-

Module No	Module Contents	Hours	COs
1	Introduction to SQL and HP Vertica: Types of SQL, Data Types, Constrains, JOINS, Types of JOINS, Clause, Group by Having, Order by, Where Clause with examples, SQL Alias, Views, Union, Union all aggregate functions, Operators Introduction to HP- Vertica Database, Vertica Analytics Platform, Columnar Orientation Advanced Compression, High Availability, Automatic Database design, Massively Parallel Processing, Application Integration. Hands on sessions	9	20NHOP601.1

	<p>Creation of tables with constrains and in setion of values into tables Hands on DML commands to apply different aggregate function. Group by –Having-Order by clause, Operators. Creation of views and working with joins.</p>		
2	<p>HP Vertica- 1 Projections, Query Execution, Vertica Transactions, Hybrid data store – WOS & ROS, Projection Design: Projection fundamentals, Projection types, Projection properties, Replication and Segmentation Database Designer, Comprehensive mode, Incremental mode, Sample data, Sample queries, DBD Advantages Hands on sessions Creation of schema, tables and execution of SQL statements on Vertica Database, Running Database designer Hands-on projections</p>	9	20NHOP601.2, 20NHOP601.3
3	<p>HP Vertica -2 Loading data via INSERT-COPY-MERGE, Deleting data in Vertica- delete vector, design for delete, process of deleting Truncate, Purge, Update, Partitioning, Tuple Mover- Move Out Parameter, Merge Out Parameter, Working with Vertica Management Console. Hands on sessions Loading data files from different sources to Vertica database. Verifying the log files after loading the data into Vertica database. Hands-on partitions</p>	9	20NHOP601.4
4	<p>Big Data Analytics with Hadoop Big data overview, Introduction to Hadoop, Overview of Hadoop Distribution File Systems[HDFS] and Map reduce Operations Clustering types in Hadoop- Standalone mode, Pseudo distributed mode, Fully distributed mode. Hands on Sessions: Verifying Hadoop installation(Pseudo distributed mode) Java path Hadoop location Hadoop configuration files Name Node setup Job Tracker Metadata files Accessing Hadoop on browse</p>	9	20NHOP601.5

5	<p>Hadoop Ecosystem Introduction to SQOOP, Overview of PIG -Standalone mode, cluster mode, when to use PIG latin, Introduction to HIVE, Introduction to HBASE- comparison of Hadoophdfs and HBASE.</p> <p>Hands on Sessions:</p> <p>a) Moving data from local file system to Hadoop file system</p> <p>b) Performing MAP Reduction operation in Hadoop</p> <p>Verification of operation results through terminal and browser</p>	9	20NHOP601.6
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Reference Books:

1. Boris lubinsky, Kevin t. Smith, Alexey Yakubovich, “Professional Hadoop Solutions”, Wiley, ISBN: 9788126551071, 2016
2. Chris Eaton,Dirk derooset, “Understanding Big data”, McGraw Hill, 2016.
3. Tom White, “HADOOP: The definitive Guide”, O Reilly 2015.

EVALUATION

CIE – Continuous Internal Evaluation: (50 Marks)

Bloom’s Taxonomy	Tests	Assignments	Daily Assessment
Marks (Out of 50)	25	15	10
L1: Remember	-	-	2
L2: Understand	5	-	2
L3: Apply	5	7.5	2
L4: Analyze	5	7.5	2
L5: Evaluate	10	-	2
L6: Create	-	-	-

SEE – Semester End Examination: (50 Marks)

Bloom’s Taxonomy	Questions (50 marks)
L1: Remember	-
L2: Understand	5
L3: Apply	15
L4: Analyze	15
L5: Evaluate	15
L6: Create	-

VM WARE VIRTUALIZATION ESSENTIALS-1												
Course Code		:	20NHOP602 / 20NHOP702								Credits:	3
L:	T:	P:	S:	:	3:	0:	0:	0:	0:		CIE Marks:	50
Exam Hours:		:	3								SEE Marks:	50

Course Outcomes: At the end of the Course, the Student will be able to:	
CO#	COURSE OUTCOME
20NHOP602.1	Understand the common terms and definitions of Operating System, Cloud Computing and Virtualization.
20NHOP602.2	Learning the business benefits and considerations of VMware virtualization.
20NHOP602.3	Knowing various approaches to server virtualization, its relevance to the modern data center, available platforms and important features.
20NHOP602.4	Analyzing the implications of virtualization on Data Center Challenges.
20NHOP602.5	Enable to configure the VMware vSphere storage and network virtualization.
20NHOP602.6	Enable to configure the VMware vSphere storage and network virtualization.

Course Outcomes to Program Outcomes Articulation Matrix													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	
20NHOP602.1	2	2	2	2	2	1	-	-	1	2	1	1	
20NHOP602.2	2	2	2	2	2	1	-	-	1	2	1	1	
20NHOP602.3	2	2	2	2	2	1	-	-	1	2	1	1	
20NHOP602.4	2	2	2	2	2	1	-	-	1	2	1	1	
20NHOP602.5	2	2	2	2	2	1	-	-	1	2	1	1	
20NHOP602.6	2	2	2	2	2	1	-	-	1	2	1	1	

Module No	Module Contents	Hours	COs
1	<p>Understanding Virtualization: Operating Systems Essentials: Process Management, Memory Management, and Storage Management. Cloud</p> <p>Computing Essentials Introduction to Cloud Computing, Cloud Deployment Models, and Challenges.</p> <p>Virtualization Essentials: Importance of Virtualization, Examining today's trends, Virtualization</p> <p>Software Operations: Virtualizing Servers, Virtualizing Desktop, and Virtualizing Applications.</p> <p>List of programs:</p>	9	20NHOP602.1

	Using vSphere Web Client. Creating a Virtual Machine.		
2	<p>VMware vSphere Virtualization Overview :Introduction to Data Center</p> <p>Virtualization: Traditional Architecture, Virtual Architecture, Types of Virtualization.</p> <p>Understanding Hypervisors: Describing hypervisor, Type-1Hypervisor, Type-2 Hypervisor.</p> <p>vSphere Products & Features: vSphere Motion, vSphere HA, vSphere DRS, vSphere FT, vSphere replication, vSphere data protection.</p>	9	20NHOP602.2
	<p>List of programs:</p> <p>Deploying Virtual Machines Using Cloning, Templates, and a Content Library</p> <p>Modifying Virtual Machine Settings</p>		
3	<p>Creating & Managing Virtual Machines :Creating, Managing, Monitoring & Configuring VM: vSphere Client and vSphere Web Client, vSphere Web Client UI,</p> <p>Creating VM: VM Components, Installing Guest OS,</p> <p>Managing VM: Start-up and Shutdown of VM's, Creating and Managing Snapshots, RDM</p>	9	20NHOP602.3
	<p>Configuring VM: Memory/CPU Hot Plug, Swap Files. Creating Clones, Templates &Content Libraries Cloning VM, Creating Templates, OVF Templates, and Types of Content Library.</p>		
4	<p>vSphere Solutions to Data Center Challenges: Data Center Challenges: Availability, Scalability, Optimization, Management, Application Upgrade & Cloud Challenges .vSphere for Scalability and Business Continuity :vSphere Motion, vSphere HA, vSphere DRS, vSphere FT, vSphere replication, vSphere data protection.</p>	9	20NHOP602.4
	<p>List of programs:</p> <p>Managing Tasks, Events, and Alarms</p> <p>Using v Sphere Apps, Managing Multi-tiered Applications</p>		
5	<p>Understanding VMware vSphere Storage & Network Virtualization Storage Virtualization: Storage Concepts, iSCSI Concepts, NFS Data stores, VMFS Data stores, Virtual SAN Data stores, Virtual Volume</p> <p>Network Virtualization: Introduction to vSphere Standard Switch, Configuring Standard Switch Policies, Introduction to vSphere Distributed Switch</p>	9	20NHOP602.5 20NHOP602.6
	<p>List of programs: Using vSphere vMotion and Storage vMotion to Migrate Virtual Machines Implementing a vSphere DRS Cluster</p>		

TEXTBOOKS:

1. Nick Marshall, Scott Lowe (Foreword by) with Grant Orchard, Josh At well, **Mastering VM ware vSphere 6**, Publisher: SYbex:1 edition (24 March 2015)
2. Matthew Portnoy, **Virtualization Essentials**,2nd Edition, Wiley IndiaPvt.Ltd.

Reference Books:

1. Thomas Kraus, Kamau Wanguhu, Jason Karnes, VMware Network Virtualization Connectivity for the Software- Designed Data Center, VMware PressTechnology1stEdition
2. Bill Ferguson, vSphere 6Foundations Exam Official Cert Guide (Exam#2V0-620): VMware Certified Professional 6 VM ware Press, 1st Edition.

EVALUATION**CIE – Continuous Internal Evaluation: (50 Marks)**

Bloom’s Taxonomy	Tests	Assignments	Daily Assessment
Marks (Out of 50)	25	15	10
L1: Remember	-	-	-
L2: Understand	5	-	-
L3: Apply	5	7.5	5
L4: Analyze	5	-	-
L5: Evaluate	-	-	5
L6: Create	10	7.5	-

SEE – Semester End Examination: (50 Marks)

Blooms Taxonomy	Questions (50 marks)
L1: Remember	-
L2: Understand	5
L3: Apply	10
L4: Analyze	10
L5: Evaluate	5
L6: Create	20

Big Data Analytics Using HP Vertica- 2

Code : 20NHOP704

Credits: 03

L:P:T: 3:0:0

CIE Marks: 50

Exam Hours: 3

SEE Marks: 50

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

CO#	COURSE OUTCOMES
20NHOP704.1	Analyse Big data in Hadoop ecosystem using Map-reduce operations.
20NHOP704.2	Utilize import and export functionalities of SQOOP tool.
20NHOP704.3	Analyse Big data using Pig tool to address societal issues.
20NHOP704.4	Develop Pig Latin scripts to demonstrate real time applications
20NHOP704.5	Apply HQL to analyse various data sets.
20NHOP704.6	Create tables in HBase and illustrate various HBase commands.

Course Outcomes to Program Outcomes Articulation Matrix

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
20NHOP704.1	3	3	-	-	3	-	-	-	3	-	-	-
20NHOP704.2	3	-	-	-	3	-	-	-	3	-	-	2
20NHOP704.3	3	3	-	-	3	-	-	-	3	2	-	2
20NHOP704.4	3	3	1	1	3	-	-	-	3	2	-	-
20NHOP704.5	3	3	-	-	3	-	-	-	3	-	-	-
20NHOP704.6	3	-	-	-	3	-	-	-	3	-	-	-

Module No.	Module Contents	Hours	COS
1	<p>VERTICA & Hadoop Review Vertica Cluster Management: Adding nodes to an existing cluster, Removing nodes from a cluster, Replacing nodes, Node recovery in Vertica, Rebalancing data across nodes</p> <p>Hands on sessions</p> <ul style="list-style-type: none"> ~ Check Hadoop configuration file ~ Load a .csv file from local file system to Hadoop file system ~ Perform analysis on loaded files using Hadoop map-reduce programs and verify the output using Hadoop commands as well as browser <ul style="list-style-type: none"> o Count o Grep <p>SQOOP</p> <ul style="list-style-type: none"> ~ Verifying Sqoop status through cloudera manager ~ Hand-on Practice on various Sqoop basic commands <ul style="list-style-type: none"> o List-database o List-table o Eval ~ Import of tables from Mysql database to hdfs <ul style="list-style-type: none"> o Import of all tables o Import of specific tables to default directory /target directory o Import of subset of tables using ‘where’ clause o Import table as sequence file o Incremental import o Export files from hdfs to mysql database 	9	20NHOP704.1, 20NHOP704.2
2	<p>Apache Pig Architecture: -Apache Pig components, Pig Latin Data Model: atom, tuple, bag, relation, map.</p> <p>Basic grunt shell commands, Running local mode - mapreduce mode,</p> <p>Pig Latin 1: Pig Latin Statements: Data types- simple & Complex Data Types</p> <p>Hands on sessions:</p> <p>Operators (Part 1) :</p> <ul style="list-style-type: none"> • Loading and storing - from/to local file system, from/to hdfs • Diagnostic operator – Dump, Describe, Explain, illustrate • Filtering – filter operator; For Each Generate operator: projection, nested projection, schema; Distinct Operator • Arithmetic operators • Comparison operator • Boolean Operators 	9	20NHOP704.3
	<p>Hands on Sessions:</p> <p>Operators (Part 2) :</p> <ul style="list-style-type: none"> • Grouping & Joining Operator – GROUP, CO-GROUP, JOIN(INNER, SELF JOIN) 		

3	<ul style="list-style-type: none"> Combining & splitting – UNION, SPLIT Sorting – ORDER BY, LIMIT <p>Pig Latin Built-in functions:</p> <ul style="list-style-type: none"> Eval functions: AVG, SUM, MIN, MAX, COUNT, SIZE, CONCAT, TOKENIZE Bag&Tuple Functions: TOTUPLE, TOBAG, TOMAP String Functions: SUBSTRING, INDEXOF, LCFIRST(), UCFIRST(), UPPER(), LOWER(), REPLACE() Math Functions: ABS, CBRT, SQRT, COS, SIN, TAN, CEIL, FLOOR, EXP, LOG, LOG10, ROUND <p>Apache Pig - Running Scripts:</p> <ul style="list-style-type: none"> Creating pig script Commenting pig script Executing –running pig script – Sample examples: word count program using pig script, count of similar events from a log file, simple twitter case study example. 	9	20NHOP704.4
4	<p style="text-align: center;">HIVE</p> <p>Hive: Why hive? , components of hive, simple architecture of hive, data-model of hive(database, table, partition, bucket)</p> <p>Hands on Session: Hive Commands : <i>Data Definition Language (DDL)</i></p> <ul style="list-style-type: none"> CREATE database/ table/ external table , DROP, ALTER, SHOW, DESCRIBE Statements. <p><i>Data Manipulation Language (DML)</i></p> <ul style="list-style-type: none"> LOAD, INSERT Statements- INSERT INTO, INSERT OVERWRITE <p>Built-in Operators- Relational Operators- Arithmetic Operators- Logical Operators - Complex Operators- example: simple queries on these operators</p> <p>Order by clause- Group by clause- aggregate functions(sum, avg, count, min, max)</p> <p>Joins, Create and drop of views</p>	9	20NHOP704.5
5	<p>HBASE: Various types of No Sql Databases – when HBASE is used? - HBase Data Model (Table, Rowkey, Column families, Column qualifiers, Cell, Timestamp)</p> <p>Hands on Sessions:</p> <ul style="list-style-type: none"> HBase shell Command: Create table with /without version – put command get command with / without version Scan command delete column – column family disable – enable drop table 	9	20NHOP704.6

EVALUATION

CIE – Continuous Internal Evaluation: Lab (50 Marks)

Blooms Taxonomy	Tests	Assignments	Daily Assessment
Marks (Out of 50)	25	15	10
L1: Remember	-	-	-
L2: Understand	5	-	-
L3: Apply	5	7.5	5
L4: Analyze	5	-	-
L5: Evaluate	-	-	5
L6: Create	10	7.5	-

SEE – Semester End Examination: Lab (50 Marks)

Blooms Taxonomy	Marks (Out of 50)
L1: Remember	-
L2: Understand	5
L3: Apply	10
L4: Analyze	10
L5: Evaluate	5
L6: Create	20

SAP													
Course Code		:	20NHOP607 / 20NHOP707								Credits:	3	
L:	T:	P:	S	:	3:	0:	0:	0				CIE Marks:	50
Exam Hours:		:	3						SEE Marks:	50			

Course Outcomes: At the end of the Course, the Student will be able to:	
CO#	COURSE OUTCOME
20NHOP607.1	Understand the concept of production system and facilities, automation, Computer Aided Process planning (CAPP), Material Requirement Planning (MRP), Master Production Schedule (MPS), capacity planning
20NHOP607.2	Understand SAP system along with its navigation in the software
20NHOP607.3	Create master data for new vendor and new trading goods in Materials Management
20NHOP607.4	Evaluate and create production order for the product group
20NHOP607.5	Create master data for new customer
20NHOP607.6	Facilitate the flow of goods between producer and the purchaser for near fail proof logistic operations

Mapping of Course Outcomes to Program Outcomes												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
20NHOP607.1	3	1	-	-	-	3	1	1	2	2	3	2
20NHOP607.2	3	1	-	-	3	3	1	1	2	2	1	2
20NHOP607.3	2	2	2	2	3	3	1	1	2	2	3	2
20NHOP607.4	2	2	2	2	3	3	1	1	2	2	3	2
20NHOP607.5	2	2	2	2	3	3	1	1	2	2	3	2
20NHOP607.6	3	2	2	2	3	3	1	1	2	2	3	2

Module No	Module Contents	Hours	COs
1	<p>Computer Integrated Manufacturing Systems: Introduction, Production system facilities, Manufacturing support system, Automation definition, Types of Automation, Reasons for Automation, limitations of Automation, Automation principles & Strategies, CIM, Information Processing Cycle in Manufacturing, Production concepts.</p> <p>Computerized Manufacturing Planning System: Introduction, Computer Aided Process Planning, Retrieval types of process planning, Generative type of process planning, Material requirement Planning, Fundamental Concepts of MRP, Inputs to MRP, Capacity planning.</p>	9	20NHOP607.1
2	<p>Introduction to SAP: Case study of Global bike group (GBI), Materials Management (MM)Case study: Creation of new vendor, Creation of material master for trading goods, create purchase requisition, creating request for quotation, Create and display purchase order, create and verify goods receipt for purchase order, create invoice receipt from vendor, post payments to vendor, display and review goods ledger account balances</p>	9	20NHOP607.2 20NHOP607.3

3	Production Planning and Execution (PP) Case study: Change material master record, change routing, display product group, creating sales and operation plan, Transfer SOP to demand management, Review demand management, Run MPS with MRP, Review stock and requirement list, convert planned order into production order, receiving goods from inventory, issuing goods to production order, review production order status, confirm production completion, receive goods from Production order, review costs assigned to production order, settle costs of production order.	9	20NHOP607.4
4	Sales and Distribution (SD)Case study: Creation of new customer, create contact person for customer, changing the customer, create customer inquiry and quotation, create sales order referencing for quotation, check stock status, display sales order, start delivery process, pick materials on delivery note, post goods issue, create invoice for customer, display billing document and customer invoice, post receipt of customer payment, review the document flow	9	20NHOP607.5
5	Warehouse Management (WM)Case study: Create purchase order, display material inventory, display material inventory value, receive the goods, display material inventory and value, run bin status report, create transfer order, confirm transfer order	9	20NHOP607.6

TEXTBOOKS:

1. Automation, Production System & Computer Integrated Manufacturing, M.P. Groover, Person India, 2015, 3rdEdition
2. Principles of Computer Integrated Manufacturing, S.Kant Vajpayee, Prentice Hall India.
3. A beginner’s guide to SAP, Martin Munzel, Sydney Mc Connel
4. Online course material for SAP

EVALUATION

CIE – Continuous Internal Evaluation: (50 Marks)

Bloom’s Taxonomy	Tests	Assignments	Daily Assessment
Marks (Out of 50)	25	15	10
L1: Remember	5	-	-
L2: Understand	5	5	5
L3: Apply	5	5	5
L4: Analyze	5	5	-
L5: Evaluate	5	-	-
L6: Create	-	-	-

SEE – Semester End Examination: (50 Marks)

Blooms Taxonomy	Marks (Out of 50)
L1: Remember	05
L2: Understand	05
L3: Apply	--
L4: Analyze	05
L5: Evaluate	05
L6: Create	30

SCHNEIDER- INDUSTRIAL AUTOMATION												
Course Code		:	20NHOP608/ 20NHOP708								Credits:	3
L:	T:	P:	S	:	3:	0:	0:	0:	0		CIE Marks:	50
Exam Hours:		:	3								SEE Marks:	50

Course Outcomes: At the end of the Course, the Student will be able to:	
CO#	COURSE OUTCOME
20NHOP608.1	Explore the various aspects of industrial automation.
20NHOP608.2	Analyze the architecture of PLC.
20NHOP608.3	Select an appropriate communication protocol to communicate with PLC using Open Systems Interconnection model.
20NHOP608.4	Develop a suitable logic for various real time applications using specific programming language for PLC.
20NHOP608.5	Deploy Schneider Electric PLC for various industrial applications using dedicated software tool Unity Pro.
20NHOP608.6	Build a Human Machine Interface for various applications through Vijeo Designer software.

Course Out comes to Program Outcomes Articulation Matrix												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
20NHOP608.1	3	2	-	-	-	3	1	1	2	2	3	3
20NHOP608.2	3	2	3	2	3	3	1	1	2	2	3	3
20NHOP608.3	3	2	3	2	3	3	1	1	2	2	3	3
20NHOP608.4	3	2	3	2	3	3	1	1	2	2	3	3
20NHOP608.5	3	2	3	2	3	3	1	1	2	2	3	3
20NHOP608.6	3	2	3	2	3	3	1	1	2	2	3	3

Module No	Module Contents	Hours	COs
1	<p>Basics of Automation: Automation Strategy- Evolution of instrumentation and control, role of automation in industries, benefits, types.</p> <p>Structure of PLC: Evolution of PLC - Principle of operation-Elements of Power supply unit - PLC Scan –Memory organization – Input Types - Types and Selection of PLC- Application-Schneider M340 pedagogic bench for wiring of input and output elements.</p>	09	20NHOP608.1 20NHOP608.2
2	<p>Standard Communication Protocols:</p> <p>Definition- Open System Interconnection (OSI) model, Communication standards –RS 232 and RS 485, Modbus- ASCII and RTU, Introduction to third party interface, concept of OPC (Object linking and embedding for process Control), Internet protocols.</p>	09	20NHOP608.3
3	<p>PLC Programming:</p> <p>Types–Programming devices – Logical operations – Relay instructions-Timer and Counter Instructions – Program Control Instructions – Data Manipulation Instructions – Data Compare Instructions – Arithmetic Instructions – Sequence Instructions – PID ladder and FBD methods as per IEC 61131.</p>	09	20NHOP608.1 20NHOP608.2 20NHOP608.3 20NHOP608.4 20NHOP608.5

4	Sequential Functional Chart (SFC) Programming SFC Structure- SFC programming as per IEC61131, Advances in SFC- Application	09	20NHOP608.1 20NHOP608.3 20NHOP608.5
5	Human Machine Interfacing (HMI) Evolution of HMI, Building HMI graphics, Communication with PLC, Overview of software(Vejiro Designer)- Applications	09	20NHOP608.1 20NHOP608.6

TEXTBOOKS:

1. Programming Industrial Control Systems Using IEC 1131-3 (IEE CONTROL ENGINEERING SERIES) REVISED Edition,
2. Programmable Logic Controllers and Industrial Automation: An Introduction 2nd Edition, by Madhuchhanda Mitra and Samarjit Sengupta
3. Industrial Controls and Manufacturing (Engineering) 1st Edition by Edward W. Kamen

Reference books:

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3. Industrial Controls and Manufacturing (Engineering) 1st Edition by Edward W. Kamen

EVALUATION

CIE – Continuous Internal Evaluation: (50 Marks)

Bloom's Taxonomy	Tests	Assignments	Quizzes 10 Marks	
			Q-1 5 Marks	Q-2 5 Marks
Marks (Out of 50)	25 Marks	15 Marks		
L1: Remember	-	-	-	-
L2: Understand	5	7.5	-	-
L3: Apply	10	7.5	5	5
L4: Analyze	-	-	-	-
L5: Evaluate	-	-	-	-
L6: Create	10	-	-	-

SEE – Semester End Examination: Lab (50 Marks)

Blooms Taxonomy	Questions (50 marks)
L1:Remember	-
L2:Understand	10
L3:Apply	15
L4:Analyze	-
L5:Evaluate	-
L6:Create	25

CISCO- ROUTING AND SWITCHING-1													
Course Code		:	20NHOP609 / 20NHOP709								Credits:	3	
L:	T:	P:	S	:	3:	0:	0:	0				CIE Marks:	50
Exam Hours:		:	3								SEE Marks:	50	

Course Outcomes: At the end of the Course, the Student will be able to:	
CO#	COURSE OUTCOME
20NHOP609.1	Compare the network models and the protocols at each layer
20NHOP609.2	Construct IP addressing table and perform sub netting in IPv4 and IPv6 network.
20NHOP609.3	Analyze the network to implement LAN security to mitigate threats and attack
20NHOP609.4	Design logically separate networks using Virtual LANs and IEEE802.1Q trunking protocol.
20NHOP609.5	Examine the operation of Spanning tree protocols and Ether channel for network scalability
20NHOP609.6	Analyze Dynamic Host Configuration Protocol (DHCP) operation for scalable networks.

Mapping of Course Outcomes to Program Outcomes												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
20NHOP609.1	3	3	3	3	3	-	-	-	-	-	-	-
20NHOP609.2	3	3	3	3	3	-	-	-	-	-	-	2
20NHOP609.3	3	3	3	3	3	2	-	2	2	-	2	-
20NHOP609.4	3	3	3	3	3	-	3	-	-	-	-	-
20NHOP609.5	3	3	3	3	3	-	3	-	-	-	2	-
20NHOP609.6	3	3	3	3	3	-	3	-	-	-	-	2

Module No	Module Contents	Hours	Cos
1	<p>Networking Today: Network Components, Protocols and Models: The Protocol Suites, Reference Models, Data Encapsulation, Data Link Layer: Purpose of the Data Link Layer, LAN Topologies, Ethernet Switching: Ethernet Frame, Ethernet MAC Address, The MAC Address Table, Network Layer: Network Layer, IPv4 Packet, IPv6 Packet, Router Routing Tables, MAC and IP, ARP, Transport Layer: Port Numbers, TCP Communication Process, UDP Communication, Application Layer: Application, Presentation, and Session</p> <p>LAN Security Concepts: Endpoint Security, Access Control, Layer 2 Security Threats, MAC Address Table Attack, LAN Attacks, Switch Security Configuration: Implement Port Security.</p> <p>Basic Switch and End Device Configuration: Cisco IOS Access, IOS Navigation, The Command Structure, Basic Device Configuration, Save Configurations, Configure IP Addressing, Verify Connectivity.</p> <p>SSH and Telnet Configuration</p> <p>Switchport security Configuration</p>	9	20NHOP609.1 20NHOP609.3

2	<p>IPv4 Addressing: IPv4 Address Structure, IPv4 Unicast, Broadcast, and Multicast, Types of IPv4 Addresses, Network Segmentation, Subnet an IPv4 Network</p> <p>IPv6 Addressing: IPv6 Address Representation, IPv6 Address Types, GUA and LLA Static Configuration, Dynamic Addressing for IPv6 GUAs, Dynamic Addressing for IPv6 LLAs, Subnet an IPv6 Network</p>	9	20NHOP609.2
	<p>Basic Router Configuration: Configure Initial Router Settings, Configure Interfaces, Configure the Default Gateway, Ping and Trace route Testing</p> <p>Subnetting Scenarios using IPv4 address</p> <p>IPv4 address Configuration IPv6 address Configuration</p>		
3	<p>VLAN: Overview of VLANs, VLANs in a Multi-Switched Environment, VLAN Configuration, VLAN Trunks, Dynamic Trunking Protocol.</p> <p>Inter-VLAN Routing: Inter-VLAN Routing Operation, Router-on-a-Stick Inter-VLAN Routing.</p>	9	20NHOP609.4
	<p>VLAN Configuration</p> <p>2. Dynamic Trunking Protocol Configuration</p> <p>Inter-VLAN routing Configuration</p>		
4	<p>Spanning Tree Protocol: Purpose of STP, STP Operations, Evolution of STP, RSTP, RSTP+, Port fast, BPDU Guard.</p> <p>Ether Channel: Ether Channel Operation, LACP, PAGP, Passive and Active mode in Ether channel.</p>	9	20NHOP609.5
	<p>Spanning Tree Protocol Configuration</p> <p>2. Etherchannel Configuration</p>		
5	<p>DHCPv4: DHCP4 Concepts Configure a Cisco IOS DHCP4 Server; Configure a DHCP4 Client, SLAAC and DHCPv6: IPv6 Global Unicast Address Assignment, SLAAC, DHCPv6, Configure DHCPv6 Server.</p>	9	20NHOP609.6
	<p>1. DHCPv4 Configuration</p> <p>2. DHCPv6 Configuration</p>		

TEXTBOOKS:

1. CISCO Netacad Course-1 : CCNA v7-Introduction to network (ONLINE ACCESS)
2. CISCO Netacad Course-2 : CCNA v7-Switching, Routing and Wireless Essentials (ONLINE ACCESS)
3. CCNA Routing and Switching – Todd Lammle, 2nd Edition, Sybex Publisher (Wiley Brand), 2016

REFERENCE BOOKS

1. Data Communications and Networking. Forouzan, 5th Edition, McGraw Hill, Reprint-2017

EVALUATION

CIE – Continuous Internal Evaluation: (50 Marks)

Bloom's Taxonomy	Tests	Assignments	Daily Assessment
Marks (Out of 50)	25	15	10
L1: Remember	-	-	-
L2: Understand	-	-	5
L3: Apply	20	10	5
L4: Analyze	5	5	-
L5: Evaluate	-	-	-
L6: Create	-	-	-

SEE – Semester End Examination: Lab (50 Marks)

Blooms Taxonomy	Questions (50 marks)
L1: Remember	-
L2: Understand	5
L3: Apply	10
L4: Analyze	10
L5: Evaluate	5
L6: Create	20

CISCO-ROUTING AND SWITCHING-2												
Course Code		:	20NHOP612 / 20NHOP712								Credits:	3
L:	T:	P:	S	:	3:	0:	0:	0		CIE Marks:	50	
Exam Hours:		:	3								SEE Marks:	50

Course Outcomes: At the end of the Course, the Student will be able to:												
CO#	COURSE OUTCOME											
20NHOP612.1	Configure and troubleshoot advanced operations of routers and implement static and dynamic routing protocols(OSPF) for IPv4 and IPv6											
20NHOP612.2	Configure and troubleshoot advanced operation of ACL and implement standard ACL, Extended ACL for IPv4 and IPv6.											
20NHOP612.3	Configure and troubleshoot Network address translation(NAT) for IPv4											
20NHOP612.4	Evaluate the ethical principal and practice of Wired LAN, Wireless LAN and Network security of Home environment											
20NHOP612.5	Examine the operations of WAN, WAN Authentication Protocols, virtual private networks (VPNs) and tunnelling.											
20NHOP612.6	Evaluate the operation of network virtualization and network automation for life-long learning in real networking environment.											

Mapping of Course Outcomes to Program Outcomes												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
20NHOP612.1	3	3	3	3	3	-	-	-	-	3	-	3
20NHOP612.2	3	3	3	3	3	-	-	-	-	3	-	3
20NHOP612.3	3	3	3	3	3	-	-	-	-	3	-	3
20NHOP612.4	3	3	3	3	3	2	2	2	3	3	-	3
20NHOP612.5	3	3	3	3	3	2	2	2	3	3	-	3
20NHOP612.6	3	3	3	3	3	2	2	2	3	3	-	3

Module No	Module Contents	Hours	COs
1	Routing Concepts: Path Determination, Packet Forwarding, IP Routing Table, Static and Dynamic Routing, IP Static Routing Static Routes(Course 2 -Last Modules) Single-Area OSPF Concepts: OSPF Features and Characteristics, OSPF Packets, OSPF Operation, OSPF Router ID, Modify Single-Area OSPFv2. (Course 3, 1-2 Chapter)	9	20NHOP612.1
	HANDS-ON Configure IP Static Routes Configure IP Default Static Routes Configure Static Host Routes Single-Area OSPFv2 Configuration		
2	ACL Concepts: Purpose of ACLs, Wildcard Masks in ACLs, Guidelines for ACL Creation, Types of IPv4 ACLs-Standard ACL and Extended ACL. (Course 3- 4 & 5 Chapters)	9	20NHOP612.2
	HANDS-ON ACLs for IPv4 Configuration Configure Standard IPv4 ACLs Secure VTY Ports with a Standard IPv4 ACL Configure Extended IPv4 ACLs		

3	NAT for IPv4: NAT Characteristics, Types of NAT, NAT Advantages and Disadvantages, Static NAT, Dynamic NAT, PAT, NAT64(Course 3 - Chapter 6)	9	20NHOP612.3
	HANDS-ON Configure Static NAT 2. Configure Dynamic NAT Configure PAT		
4	WLAN Concepts Introduction to Wireless, Components of WLANs, WLAN Operation, Channel Management, WLAN Threats, Secure WLANs(Course 2- Chapter 12 & Chapter 13) Network Security Concepts: Threat Actors, Malware, Common Network Attacks, IP Vulnerabilities and Threats, TCP and UDP Vulnerabilities, IP Services, Cryptography (Course 3-Chapter 3)	9	20NHOP612.4
	HANDS-ON Remote Site WLAN Configuration Configure a Basic WLAN on the WLC Configure a WPA2 Enterprise WLAN on the WLC		
5	WAN Concepts: Purpose of WANs,WAN Operations, VPN and IPsec Concepts: VPN Technology, Types of VPNs, IPsec(Course 3- Chapter 7 & Chapter 8) Network Virtualization: Cloud Computing, Virtualization, Virtual Network Infrastructure, Software-Defined Networking Controllers(Course 3 -Chapter 13) Network Automation: Data Formats, APIs, REST, Configuration Management Tools, IBN and Cisco DNA Center (Course 3 -Chapter 14)	9	20NHOP612.5 20NHOP612.6
	HANDS-ON 1. Configuration of PPP WAN Authentication and VPN 2 Configuration of CDP,LLDP,NTP		

TEXTBOOKS:

1. CISCO Netacad Course-2: CCNAv7-Switching, Routing and Wireless Essentials (ONLINE ACCESS)
2. CISCO Netacad Course-3: CCNAv7-Enterprise Network, Security and Automation (ONLINE ACCESS)
3. CCNA Routing and Switching – Todd Lammle, 2nd Edition, Sybex Publisher (Wiley Brand), 2016

REFERENCE BOOKS:

1. Data Communications and Networking. Forouzan,5th Edition, McGraw Hill, Reprint -2017

Assessment Pattern

CIE- Continuous Internal Evaluation: (50 Marks)

Bloom's Taxonomy Marks (Out of 50)	Tests	Assignments	Daily Assessment
		25	15
L1: Remember	-	-	-
L2: Understand	-	-	5
L3: Apply	10	10	5
L4: Analyze	10	5	-
L5: Evaluate	5	-	-
L6: Create	-	-	-

SEE – Semester End Examination:(50 Marks)

Blooms Taxonomy	Questions (50 marks)
Remember	-
Understand	-
Apply	20
Analyze	20
Evaluate	10
Create	-

BLOCKCHAIN													
Course Code		: 20NHOP614 / 20NHOP714									Credits:	3	
L:	T:	P:	S	:	3:	0:	0:	0				CIE Marks:	50
Exam Hours:		: 3									SEE Marks:	50	

Course Outcomes: At the end of the Course, the Student will be able to:	
CO#	COURSE OUTCOME
20NHOP614.1	Apply the fundamentals of Blockchain Technology in different domains.
20NHOP614.2	Apply and analyze the various cryptographic mechanisms used in Blockchain
20NHOP614.3	Analyze various Ethereum environment and wallets
20NHOP614.4	Design smart contracts using solidity
20NHOP614.5	Design and develop solutions with Ethereum concepts using any open source tools
20NHOP614.6	Design projects based on smart contracts

Mapping of Course Outcomes to Program Outcomes												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
20NHOP614.1	3	3	-	-	3	-	-	-	-	-	-	3
20NHOP614.2	3	3	3	-	3	-	-	-	-	-	-	3
20NHOP614.3	3	3	3	-	3	-	-	-	-	-	-	-
20NHOP614.4	3	3	3	2	3	-	-	-	-	-	-	3
20NHOP614.5	3	3	3	2	3	-	-	1	1	1	1	-
20NHOP614.6	3	3	3	2	3	-	-	1	1	1	1	-

Module No	Module Contents	Hours	COs
1	<p>Fundamentals of Blockchain: History of Blockchain, Distributed ledgers, Problems with distributed ledger, Blockchain popularity, Pros and Cons of Blockchain ,Use case of Blockchain, The problem of trust, Trust through consensus, Consensus models and mining, Types of Blockchain platforms, Cryptocurrencies, P2P applications, Genesis Block, Blockchain wallets, Decentralized applications.</p> <p>Hands-On Installation Metamask Getting free Ethers Explore mining and live transactions Explore Past transactions and blocks Blockchain Demo</p>	9	20NHOP614.1
2	<p>Blockchain Cryptography: Understanding digital signatures, Encryption, Decryption, Types of encryption, Stream Ciphers, Block Ciphers, Encryption Algorithms, Elliptical curve cryptography, Public and private keys in Blockchain, Transaction Signing, Hashing, Merkle Trees.</p> <p>Hands-On Encryption and Decryption using SHA/MD5 Public and private keys</p>	9	20NHOP614.2

3	<p>Fundamentals of Ethereum: History of Ethereum, Ethereum Concepts and Terminology, Ethereum Virtual Machine, Ethereum Releases, Ethereum Networks, Ethereum Wallets, Ethereum currency and units (ether, gwei, wei), Gas, Types of Ethereum Accounts, Ethereum Block chain Explorers, Ether Faucets, Ethereum clients.</p> <p>Hands-On Creating Ethereum wallets Creating Ethereum accounts Transacting between Ethereum accounts Exploring Ethereum mining and transactions</p>	9	20NHOP614 .3
4	<p>Smart Contract Programming with Solidity: A smart contract, Lifecycle of Smart Contract, need of smart contracts, Smart contracts in B2C applications (Business to consumer), Smart contracts in B2B applications (Business to business), Solidity Programming: Solidity - Introduction, Need and features, Language: Types, Structures, Control Flow and Smartcontract structure.</p> <p>Hands-On Interacting with smart contracts Writing a basic smart contract Compiling a smart contract Deploying a smart contract Debugging smart contract code</p>	9	20NHOP614 .4
5	<p>Ethereum Infrastructure Development and Testing Introduction to geth client, interacting with Ethereum network using geth, Ethereum development tools, Setting up the development environment.</p> <p>Hands-On Installing Ethereum Clients Basic geth Node Administration Mining with geth Writing unit tests for smart contract functions Testing deployments</p>	9	20NHOP614 .5, 20NHOP61 4.6

EVALUATION

Assessment Pattern

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Taxonomy	Tests	Assignments (Mini Project)	Quiz
Marks (Out of 50)	25	20	5
L1: Remember	-	-	-
L2: Understand	5	-	5
L3: Apply	10	5	-
L4: Analyze	5	5	-
L5: Evaluate	5	5	-
L6: Create	-	5	-

SEE – Semester End Examination: (50 Marks)

Blooms Taxonomy	Questions (50 marks)
L1: Remember	-
L2: Understand	10
L3: Apply	20
L4: Analyze	10
L5: Evaluate	10
L6: Create	-

PRODUCT LIFE CYCLE MANAGEMENT													
Course Code		:	20NHOP615 / 20NHOP715								Credits:	3	
L:	T:	P:	S	:	3:	0:	0:	0				CIE Marks:	50
Exam Hours:		:	3									SEE Marks:	50

Course Outcomes: At the end of the Course, the Student will be able to:												
CO#	COURSE OUTCOME											
20NHOP615.1	Integrate the various stages of PLM into engineering product categories and portfolios that will evaluate into commercial success.											
20NHOP615.2	Interpret the data with information and/or communicate the same for the supply chain and value supplier chain quotation to ensure sustainable development.											
20NHOP615.3	Examine life cycle management strategies and knowledge to develop new and/or appropriate engineering design solutions in engineering environment.											
20NHOP615.4	Translate and implement the legal, environmental and international regulatory frame works into product design, development and manufacturing requirements.											
20NHOP615.5	Assess system for corrective and preventive action to track production quality issues through digital manufacturing.											
20NHOP615.6	Incorporate preventive approaches concentrating on minimizing waste, hazard and risk associated with product design, development and Manufacturing.											

Mapping of Course Outcomes to Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	
20NHOP615.1	3	-	3	-	-	-	-	-	-	-	-	-	
20NHOP615.2	3	-	-	1	3	-	-	-	-	-	-	-	
20NHOP615.3	3	-	3	-	-	-	-	-	1	-	-	-	
20NHOP615.4	-	2	3	-	-	-	-	-	-	-	-	-	
20NHOP615.5	-	-	-	-	3	-	-	-	-	-	-	-	
20NHOP615.6	-	-	-	-	3	-	-	-	-	-	1	-	
Module No	Module Contents								Hours	Cos			
1	Introduction to Product Life Cycle Management(PLM): Definition, PLM Lifecycle Model, Threads of PLM, Need for PLM, Opportunities and Benefits of PLM, Views, Components and Phases of PLM, PLM feasibility Study, PLM Visioning. Case Study of Life Cycle of Products using PLM software								9	20NHOP615.1			
2	PLM Concepts, Processes and Workflow: Characteristics of PLM, Environment Driving PLM, PLM Elements, Drivers of PLM, Conceptualization, Design, Development, Validation, Production, Support of PLM. Case study of drivers of PLM using software Collaborative Product Development: Engineering Vaulting, Product Reuse, Smart Parts, Engineering Change Management								9	20NHOP615.2 20NHOP615.3			
3	Collaborative Product Development Bill of Materials and Process Consistency, Digital Mock-Up and Prototype Development, Design for Environment, Virtual Testing and Validation, Marketing Collateral. Case Study on collaborate product development for simple product using PLM software								9	20NHOP615.3 20NHOP615.4			

4	Digital Manufacturing – PLM: Digital Manufacturing, Benefits of Digital Manufacturing, Manufacturing the First-One, Ramp Up, Virtual Learning Curve, Manufacturing the Rest, Production Planning. Digital Manufacturing case study using PLM software	9	20NHOP615.4
5	Developing a PLM Strategy and Conducting a PLM Assessment: Strategy, Impact of strategy, Implementing a PLM strategy, PLM Initiatives to Support Corporate Objectives, Infrastructure Assessment, Assessment of Current Systems and Applications. PLM strategy and assessment using software	9	20NHOP615.5 20NHOP615.6

TEXTBOOKS:

1. Product Lifecycle Management: Grieves, Michael, McGraw-Hill Publications, Edition 2013, ISBN:978-0071452304
2. Product Lifecycle Management Volume I:Stark, John, Springer, 3rd Edition, 2016, ISBN: 978-3319174396
3. Product Lifecycle Management Volume II:Stark, John, Springer, 3rd Edition, 2016, ISBN: 978-3319244341

REFERENCE BOOKS:

1. Fabio Guidice, Guido LaRosa, Product Design for the environment –A life cycle approach, Taylor and Francis 2013,ISBN:978-1420001044
2. Robert J.Thomas,“NDP:“Managing and forecasting for strategic processes”,
3. Stark, John, “Product Life cycle Management: Paradigm for 21st Century Product Realization,”Springer – Ve 2015. ISBN:978-3-319-17440-2
4. Saaksvuori, Antti and Impnen, Anselmi. “Product Lifecycle Management”, Springer – Verlag, 2013. ISBN978-3-319-26906-9
5. PDM: Product Data Management: Burden, Rodger, Resource Pub,2013.ISBN:978- 0970035226 Springer – Ve 2013. ISBN978- 0970035226
6. Suggested Software Packages: Catia V5R19, Delmia V5R19, 3Dvia Composer, 3DXML player, Smart Team 19

EVALUATION

Assessment Pattern

CIE- Continuous Internal Evaluation (50 Marks)

Bloom’s Taxonomy	Tests	Assignments	Daily Assessment
Marks (Out of 50)	25	15	10
L1: Remember	5	-	-
L2: Understand	5	5	5
L3: Apply	5	5	5
L4: Analyze	5	5	-
L5: Evaluate	5	-	-
L6: Create	-	-	-

SEE – Semester End Examination: (50 Marks)

Blooms Taxonomy	Questions (50 marks)
L1: Remember	10
L2: Understand	10
L3: Apply	10
L4: Analyze	10
L5: Evaluate	10
L6: Create	-

ROBOTIC PROCESS AUTOMATION													
Course Code		: 20NHOP620A / 20NHOP720A									Credits:	3	
L:	T:	P:	S	:	3:	0:	0:	0				CIE Marks:	50
Exam Hours:		: 3									SEE Marks:	50	

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

CO#	COURSE OUTCOMES
20NHOP620A.1	Identify the automation potential and realizing the value in RPA.
20NHOP620A.2	Demonstrate good understanding RPA Platform Architecture and Components.
20NHOP620A.3	Apply the Recorders, Editor, and various essential Commands to build simple tasks / Bots for automating simple processes.
20NHOP620A.4	Analyze the automating tasks through office automation packages.
20NHOP620A.5	Evaluate independently developed solution for automating the tasks.
20NHOP620A.6	Develop the RPA solutions for the real-time use cases.

Course Outcomes to Program Outcomes Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
20NHOP620A.1	3	3	3	-	3	-	-	-	-	3	-	3
20NHOP620A.2	3	3	3	-	3	-	-	-	3	3	-	3
20NHOP620A.3	3	3	3	3	3	-	-	-	3	3	-	3
20NHOP620A.4	3	3	3	3	3	-	-	-	3	3	-	3
20NHOP620A.5	3	3	3	3	3	-	-	-	3	3	-	3
20NHOP620A.6	3	3	3	3	3	-	-	-	3	3	-	3

Module No	Module Contents	Hours	COs
1	Introduction to RPA: Understanding Enterprise Processes Robotic Process Automation, Areas Ripe for Automation, Seeking an RPA Solution, Seeing the Value in RPA, Attended and Unattended Automation, RPA improvement cycle, Introduction to RPA. Automation Anywhere Enterprise Tool – An introduction.	9	20NHOP620A.1
2	Platform Architecture and Components: <ul style="list-style-type: none"> Installing Automation Anywhere Enterprise Setting up a cloud-enabled deployment model for enterprise, AA Control Room control Room Settings License Settings Theory, demonstration and hands on practice and experience on the system.	9	20NHOP620A.2
3	Building best practice automations: Recorder versus Design-based. Recorders: Web Recorder, Screen Recorder, Smart Recorder. AA commands Read from CSV/Text, Excel Database Files/Folder. Practice Exercises: 1. Screen recorder	9	20NHOP620A.3, 20NHOP620A.4

	<ul style="list-style-type: none"> 2. Simple web recorder 3. Web recorder with database automation 		
4	<p>Building best practice automations: Error Handling String Operation Variables Variable Operation PDF Integration Email Automation, OCR Web Recorder Properties, Workflow, Tips & Tricks.</p> <p>Practice Exercises:</p> <ul style="list-style-type: none"> 1. Email Automation 2. FTP automation and PDF integration 3. String operation 4. Web recorder & send email 5. Smart recorder 	9	20NHOP620A.5
5	<p>Getting smarter through cognitive Automation: What AI brings, Automated customer engagement – Chat bots, Voice bots, Virtual agent, Automated mails, Dynamic interactive voice response, Visual IVR.</p> <p>USE-CASES:</p> <ul style="list-style-type: none"> 1. Advanced <ul style="list-style-type: none"> a. Smart Recorder with Excel automation and database automation b. Web recorder with files and folder 2. Masters <ul style="list-style-type: none"> a. Xml automation b. Web recorder to excel automation 	9	20NHOP620A.6

EVALUATION

CIE – Continuous Internal Evaluation: Lab (50 Marks)

Blooms Taxonomy	Tests	Assignments	Daily Assessment
Marks (Out of 50)	25	15	10
L1: Remember	-	-	2
L2: Understand	5	-	2
L3: Apply	5	7.5	2
L4: Analyze	5	7.5	2
L5: Evaluate	10	-	2
L6: Create	-	-	-

SEE – Semester End Examination: Lab (50 Marks)

Blooms Taxonomy	Marks (Out of 50)
L1: Remember	-
L2: Understand	10
L3: Apply	10
L4: Analyze	10
L5: Evaluate	10
L6: Create	10

Industry 4.0

Course Code: 20NHOP621A / 20NHOP721A	Credits: 03
L: T: P: S:: 3:0:0:0	CIE Marks: 50
Exams Hours: 03	SEE Marks: 50

Course Outcomes: At the end of the Course, the student will be able to:

20NHOP621A.1	Understand the fundamental principles of Industry4.0
20NHOP621A.2	Analyze the concepts of Industrial IoT
20NHOP621A.3	Discuss the feature of Manufacturing Execution System Platform
20NHOP621A.4	Implementation of MES Platform in Smart Factories
20NHOP621A.5	Analyze the concept of Industrial Data Transmission & Acquisition
20NHOP621A.6	Understand the safety and security features and protocols for smart Industries through cloud computing

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
20NHOP621A.1	3	2	-	-	-	-	-	-	-	-	-	-
20NHOP621A.2	3	-	3	-	-	-	-	-	-	-	-	-
20NHOP621A.3	3	-	-	-	3	2	-	-	-	-	-	-
20NHOP621A.4	3	2	3	-	3	2	-	-	-	-	-	-
20NHOP621A.5	3	2	-	-	3		-	-	-	-	-	-
20NHOP621A.6	3	2	-	-	3	2	-	-	-	-	-	-

Ratings: 3 for high, 2 for substantial, 1 for low. To be followed in mapping.

Module No	Module Contents	Hrs	COs
1	Introduction to Industry 4.0: Definition of Industry 4.0, design requirement of Industry 4.0, drivers of Industry 4.0, evolution of industry 4.0, digital enterprise and digital twin, application of Industry 4.0, impacts of Industry 4.0, smart business perspective and overview of Industry standards	9	20NHOP621A.1
<p>Hands on: <u>Digital Twin for Industry 4.0</u> Platform: Microsoft Azure</p> <ol style="list-style-type: none"> 1. To Create a Digital Twin model for Demo Factory using DTDL (Digital Twin Definition Language) 2. To create Azure Digital Twin instance on Azure cloud. 3. To create IoT Hub for updating Digital Twin. 4. To update Digital Twin real Sensor Data from Raspberry pi. 			
2	Manufacturing Execution system: Manufacturing Execution System (MES): History and Evolution of MES, Benefits, Core and Support Modules, Tools for MES. Applications of IIOT in inventory management and quality control.	9	20NHOP621A.2 20NHOP621A.3

Hands on: Introduction to Manufacturing Execution system Odoo Inventory is both an inventory application and a warehouse management system. Learn how to manage lead times, automate replenishments, and configure advanced routes like drop-shipping, cross-docks, etc.			
3	Smart Factories: Technologies used in smart factories (PLM, MES, Industrial automation), Lean manufacturing system ,value streams in lean production system, necessity and implementation of lean production system .	9	20NHOP621A.2 20NHOP621A.4
Hands on: Manufacturing Execution system Odoo Manufacturing helps manufacturers schedule, plan and process manufacturing orders. With the work center control panel, put tablets on the shop floor to control work orders in real-time and allow workers to trigger maintenance operations, feedback loops, quality issues, etc. OdooMRP, Odoo Barcode Scanner, IoT Boxes (MES)			
4	Industrial Data Transmission and acquisition: Features, components, and architecture of data transmission devices in Foundation Fieldbus, Profibus, HART, Interbus, Bitbus, CC-link, Modbus, Batibus, Digital STORM, Control Area Network, Device Net, Lon Works, LoRa and lorawan, NB-IoT, IEEE802.11AH, MQTT, Data acquisition: distributed control system, PLC, SCADA architecture and components	9	20NHOP621A.5
Hands on <ol style="list-style-type: none"> 1. Temperature Humidity Digital sensor for the floor monitor. (using MQTT) 2. Ultrasonic distance sensor for AGV Movement in the shop floor. (Node MCU) 3. Photoresistor for energy management in the shop floor. (node MCU) 4. Smart Inventory management system for Industry 4.0 application using Proetus software. 			
5	Cloud computing: Introduction to cloud computing, cloud computing service in IIoT, Deployment based models of cloud, industrial cloud platform providers. Cloud architecture, Introduction to Platform As a service (PaaS), Integration of Private and Public Cloud.	8	20NHOP621A.6
Cloud computing: Platform: Arduino IoT cloud, Thingspeak, IFTTT trigger events. <ol style="list-style-type: none"> 1. IoT based real time power monitoring system using ESP8266 & Arduino IoT cloud. 2. Thingspeak IoT cloud with Node MCU – Temperature monitoring Dashboard. 3. Trigger Events with IFTTT & Node MCU 			

TEXT BOOKS:

1. Misra, Sudip, Chandana Roy, and Anandarup Mukherjee. Introduction to the industrial Internet of Things and industry 4.0. CRC Press, 2021.ISBN:9781032146751
2. Gilchrist, Alasdair. Industry 4.0: the industrial internet of things. Apress, 2016. ISBN:9781484220467
3. Elangovan, U. (2020). Product Lifecycle Management (PLM): A Digital Journey Using Industrial Internet of Things (IIoT) (1st ed.). CRC Press. ISBN:9781003001706

REFERENCE BOOKS:

- 1.Lasi, H., Fettke, P., Kemper, HG. et al. Industry 4.0. Bus Inf Syst Eng 6, 239–242 (2014). ISBN 1259901403344
2. Raj, Alok, et al. "Barriers to the adoption of industry 4.0 technologies in the manufacturing sector:

An inter-country comparative perspective." International Journal of Production Economics 224 (2020): 107546.

3. Lele, Ajey. "Industry 4.0." Disruptive Technologies for the Militaries and Security. Springer, Singapore, 2019. 205-215. ISBN: 9789811333835

4. Patnaik, Srikanta. "New Paradigm of Industry 4.0." Switzerland: Springer (2020). ISBN 978-3-030-25777-4

Assessment Pattern

CIE (50 Marks)

Bloom's Category	Tests	Assignments	Quizzes
Marks	25	15	10
Remember	5		
Understand	15		
Apply	5	8	5
Analyze		7	5
Evaluate			
Create			

SEE (50 Marks)

Bloom's Category	Tests (theory)
Remember	10
Understand	30
Apply	10
Analyze	
Evaluate	
Create	

PROGRAMMING OF INDUSTRIAL ROBOT													
Course Code		:	20NHOP622A/ 20NHOP722A								Credits:	3	
L:	T:	P:	S	:	3:	0:	0:	0				CIE Marks:	50
Exam Hours:		:	3								SEE Marks:	50	

Course Outcomes: At the end of the Course, the Student will be able to:												
CO#		COURSE OUTCOME										
20NHOP622A.1		Infer the various coordinate systems and degrees of freedom for a robot										
20NHOP622A.2		Illustrate the robotic coordinate systems by teaching the robot										
20NHOP622A.3		Examine the functionalities of robotic end effectors										
20NHOP622A.4		Develop various industrial applications using FANUC Robot ER-4iA										
20NHOP622A.5		Model various applications using Robo guide simulation tool										
20NHOP622A.6		Experiment with FANUC Robot ER-4iA using teach pendant										

Course Outcomes to Program Outcomes Articulation Matrix												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
20NHOP622A.1	3	3	1	1	3	1	-	-	-	-	-	1
20NHOP622A.2	3	3	2	1	3	-	-	-	-	-	-	1
20NHOP622A.3	3	3	2	1	3	-	-	-	-	-	2	1
20NHOP622A.4	-	3	3	3	3	-	-	-	-	-	3	1
20NHOP622A.5	-	3	3	3	3	-	-	-	-	-	3	1
20NHOP622A.6	-	3	3	3	3	-	-	-	-	-	3	1

Correlationlevels: 1-Less (Low)

2-Moderate (Medium)

3-Substantial (High)

Module No	Module Contents	Hours	COs
1	BASICS OF ROBOTICS: Basic Concepts – Definition – Three laws – Degrees of Freedom. Robot – Components of a robot, Classification of robots Articulated – Cartesian – Cylindrical – Polar – SCARA – Delta – Co-ordinate systems, Work envelope – Specifications – Pitch, yaw, roll, joint notations, speed of motion and pay load – Robot parts and their functions.	09	20NHOP622A.1
2	ROBOT TEACHING Teach pendant programming: Various Teaching Methods, Task Programming, Motion Interpolation. Hands on: <ol style="list-style-type: none"> Explanation on tool Orienting Selection & Creation of Teach program Explanation on Joint, Linear & Circular motion Program testing, editing & Touch up Using and setting up of User frame Using and setting up of Tool Frame 	09	20NHOP622A.2, 20NHOP622A.6

3	<p>ROBOT SENSORS, ACTUATORS, END EFFECTORS AND INSTRUCTION SET</p> <p>Sensors and Actuators: PIR sensors, Optical Transducers, Servomotor, Stepper Motors.</p> <p>End effectors – Grippers: Mechanical grippers, Hydraulic & Pneumatic grippers, Magnetic grippers, Vacuum grippers, RCC grippers – Two and three fingered grippers – External grippers – Selection considerations, Gripper force analysis.</p> <p>Instruction set – Registers, Timers, Wait, Branching.</p> <p>Hands on:</p> <ol style="list-style-type: none"> Practice on various I/O instructions Practice on Timer/Wait and Branching Instructions Practice on user Alarms 	09	20NHOP622A.3 20NHOP622A.6
4	<p>INDUSTRIAL APPLICATIONS OF ROBOTS</p> <p>Robot Application: Implementation of robots in industries Various steps, Machine loading/unloading. Assembly and Inspection, Feature Application, Material handling Applications – PICK and PLACE & Palletization, Robot cycle time analysis</p> <p>Hands on:</p> <ol style="list-style-type: none"> Practice on Pick and Place application Practice on Palletization Practice on real time applications 	09	20NHOP622A.4, 20NHOP622A.6
5	<p>ROBOT PROGRAMMING AND SIMULATION</p> <p>Introduction to Robo Guide: Create, program and simulate a robotic workcell - Integrated Virtual Teach Pendant looks and operates like a real Teach Pendant- Reach verification, collision detection, accurate cycle time and robot trajectory and other system-</p> <p>Hands on: Practice on</p> <ol style="list-style-type: none"> Reach verification collision detection accurate cycle time robot trajectory other system 	09	20NHOP722A.5, 20NHOP722A.6

TEXTBOOKS:

- [1]. Introduction to Robotics: mechanics and control, Craig J J, 3/E, Pearson Education India, 2008.
- [2]. Deb S.R, “Robotics Technology and flexible automation”, Tata McGraw-Hill Education, 2nd Edition, 2017.
- [3]. Mikell P Groover & Nicholas G Odrey, Mitchel Weiss, Roger N Nagel, Ashish Dutta, Industrial Robotics, “Technology Programming and Applications”, McGraw Hill, 2012.

REFERENCEBOOKS:

- [1]. Introduction to Robotics: S K Saha, Tata McGraw-Hill Education, 2008
- [2]. ROBOT GUIDE MANUAL, FANUC.

Assessment Pattern

CIE-Continuous Internal Evaluation Theory (50marks)

Bloom’s Taxonomy	Tests	Assignments	Reports
Marks	25	15	10
L1:Remember	-	-	-
L2:Understand	5	-	5
L3:Apply	10	7.5	5
L4:Analyze	5	7.5	-
L5:Evaluate	5	-	-
L6:Create	-	-	-

SEE-Semester End Examination Theory (50 Marks)

Bloom's Taxonomy	Tests
L1:Remember	-
L2:Understand	5
L3:Apply	30
L4:Analyze	5
L5:Evaluate	5
L6:Create	5

5G COMMUNICATION													
Course Code		:	20NHOP623A / 20NHOP723A								Credits:	3	
L:	T:	P:	S	:	3:	0:	0:	0				CIE Marks:	50
Exam Hours:		:	3								SEE Marks:	50	

Course Outcomes: At the end of the Course, the Student will be able to:												
CO#	COURSE OUTCOME											
20NHOP623A.1	Understand 5G spectrum requirement, its channel model and use cases											
20NHOP623A.2	Familiarize with 5G architecture options and physical layer concepts											
20NHOP623A.3	Examine the multicarrier techniques and new waveform options for 5G communication											
20NHOP623A.4	Appraise the current research avenues in 5G domain											
20NHOP623A.5	Illustrate the concept of network slicing and V2V Communication											
20NHOP623A.6	Interpret the Interference and Mobility management in 5G networks											

Mapping of Course Outcomes to Program Outcomes												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
20NHOP623A.1	3	2	-	-	-	3	3	-	-	-	-	2
20NHOP623A.2	3	3	3	3	3	-	-	-	3	3	-	3
20NHOP623A.3	3	3	3	3	3	-	-	-	2	2	-	3
20NHOP623A.4	3	3	3	3	3	2	2	2	3	3	-	3
20NHOP623A.5	3	3	2	2	-	3	-	-	-	-	-	2
20NHOP623A.6	3	3	2	-	-	-	-	-	-	-	-	-

Correlation levels: 1-Slight(Low)

2-Moderate(Medium)

3-Substantial(High)

Module No	Module Contents	Hours	COs
1	<p>5G RADIO SPECTRUM: 5G spectrum landscape and requirements, Spectrum access modes and sharing scenarios, 5G spectrum technologies.</p> <p>5G CHANNEL MODEL: The 5G wireless Propagation Channels: Channel modeling requirements, propagation scenarios and challenges in the 5G modeling.</p> <p>5G USE CASES AND SYSTEM CONCEPT: Use cases and requirements, 5G system concept.</p>	9	20NHOP623A.1, 20NHOP623A.4
2	<p>RADIO INTERFACE ARCHITECTURE: 5G architecture options, core network architecture, RAN architecture.</p> <p>5G PHYSICAL LAYER: Physical channels and signals, 5G frame structure, physical layer procedures (MIMO, Power control, link adaptation, beam forming).</p>	9	20NHOP623A.2
3	<p>5G RADIO-ACCESS TECHNOLOGIES: Access design principles for multi-user communications, multi-carrier with filtering: a new waveform, non-orthogonal schemes for efficient multiple access</p>	9	20NHOP623A.3, 20NHOP623A.4
4	<p>INTRODUCTION TO 5G NETWORK SLICING: Network Slicing, E2E Slicing, SDN and NFV Slicing</p> <p>VEHICULAR COMMUNICATIONS: From V2V to AV2X, key standards, VC architectures, V2X Use cases</p>	9	20NHOP623A.4, 20NHOP623A.5

5	MOBILITY AND HANDOFF MANAGEMENT IN 5G: Network deployment types, Interference management in 5G, Mobility management in 5G, Dynamic network reconfiguration in 5G.	9	20NHOP623A.6
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Textbooks:

1. Afif Osseiran, Jose F Monserrat, Patrick Marsch, “5G Mobile and Wireless Communications Technology”, Cambridge University Press, 2016
2. Saad Z. Asif, “5G Mobile Communications Concepts and Technologies”, CRC Press, Taylor & Francis Group, First Edition, 2018
3. Harri Holma, Antti Toskala, Takehiro Nakamura, “5G Technology 3GPP NEW RADIO”, John Wiley & Sons First Edition, 2020

References:

1. Gordon L. Stuber, “Principles of Mobile Communication”, KLUWER ACADEMIC PUBLISHERS, 2nd Edition, 2002
2. Joseph C. Liberti, Theodore S. Rappaport, “Smart Antennas for Wireless Communications”, Prentice Hall PTR, 1999
3. Ying Zhang, “Network Function Virtualization Concepts and Applicability in 5G Networks”, John Wiley & Sons, 2018

Assessment Pattern

CIE-Continuous Internal Evaluation (50marks)

Bloom’s Taxonomy	Tests	Assignments	Quizzes
L1: Marks	25	15	10
L2: Remember	-	-	-
L3: Understand	10	-	-
L4: Apply	10	7.5	5
L5: Analyze	5	7.5	5
L6: Evaluate	-	-	-
L7: Create	-	-	-

SEE-Semester End Examination (50Marks)

Bloom’s Taxonomy	Tests
L1: Remember	-
L2: Understand	15
L3: Apply	20
L4: Analyze	15
L5: Evaluate	-
L6: Create	-

VLSI PHYSICAL DESIGN - I

Course Code : 20NHOP625A
 L:T:P:S : 3:0:0:0
 Exam Hours : 03

Credits : 3
 CIE Marks : 50
 SEE Marks : 50

Course Outcomes: At the end of the Course, the student will be able to:

20NHOP625A.1	Analyze the pre-requisites required for back-end VLSI design flow and its implementations
20NHOP625A.2	Gain sufficient practical knowledge on LINUX, GVIM editor usage and apply the scripting skills for the VLSI tools
20NHOP625A.3	Understand VLSI Synthesis and Evaluate the functionality of RTL and netlist
20NHOP625A.4	Understand timing analyses at various process and environment
20NHOP625A.5	Apply the learnt concepts of STA to evaluate the delay of the circuits.
20NHOP625A.6	Engage in independent learning and perform the timing and power report analysis

Mapping of Course Outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
20NHOP625A.1	3	2	3	1	3	1	1	-	1	-	1	1
20NHOP625A.2	3	2	2	2	3	-	-	-	1	-	1	1
20NHOP625A.3	3	2	2	2	3	1	1	-	1	-	1	1
20NHOP625A.4	3	2	3	3	3	1	2	-	1	-	1	1
20NHOP625A.5	3	2	3	3	3	1	2	-	1	-	1	1
20NHOP625A.6	3	2	3	3	3	1	3	1	1	-	1	1

Module No	Module Contents	Hours	COs
1	GVIM Editor: GVIM Introduction, Features of GVIM, Create new file, Open file in Read-Only mode, Edit existing file, Basic modes, Insert, Append, Open new line, Substitute, Change, Replace, Join, VIM Navigating, Buffer, Swap files, Cut, copy, delete, paste actions, Undo and redo actions, Search settings , Search in current file ,Search in multiple files , Search in help files, Working with multiple files, buffers, Markers, Macros, Diff, Recording, Remote file editing Ref 2, Chapter 1,2,3,4,9,11,12,13,14,16	8	20NHOP625A.1, 20NHOP625A.2
2	Basics of Linux: Linux commands, File management, Directories, File Permission, Basic utilities. Pipes and filters, Processes, Communication, shell scripting, Advanced Linux: Regular expressions, File system Basics TCL: Basic syntax, Commands, Operators, Loops, Arrays, Strings, Lists, Procedures, Packages, Files I/O, Regular expressions Text 1, Chapter 2,3,11 Reference 3, Chapter: 1,5,6,8,9	8	20NHOP625A.1, 20NHOP625A.2

3	Logic Synthesis: Introduction to Logic Synthesis, Goals of Synthesis, Synthesis Flow, Input and Output of Synthesis	8	20NHOP625A.1, 20NHOP625A.3
	Reference 4		
4	Introduction to STA: Nanometer Designs, What is Static Timing Analysis? Why Static Timing Analysis?, Crosstalk and Noise, Design Flow, CMOS Digital Designs, FPGA Designs, Asynchronous Designs, STA at Different Design Phases, Limitations of Static Timing Analysis, Power Considerations	8	20NHOP625A.4
	Text 3: Chapter 1		
5	STA Concepts: Standard Cells, Propagation Delay, Slew of a Waveform, Skew between Signals, Timing Arcs and Unateness, Min and Max Timing Paths, Timing Modeling, Wireload Models, Crosstalk Glitch analysis, Configuring STA Environment, Setup and Hold Timing Check	8	20NHOP625A.5, 20NHOP625A.6
	Text 3:2.1.3,2.4,2.5,2.6,2.7,2.8,3.2,4.2,6.2,7.2,8.1 and 8.2		

TEXTBOOKS:

1. Beginning Linux Programming, 4th Edition, N. Matthew, R. Stones, Wrox, Wiley India Edition.
2. Richard Peterson, "Linux: The Complete Reference", sixth edition, Mc-Graw Hill, 2008
3. J. Bhasker, R Chadha, "Static Timing Analysis for Nanometer Designs: A Practical Approach", Springer, 2009

REFERENCE BOOKS:

1. Sridhar Gangadharan, Sanjay Churiwala, "Constraining Designs for Synthesis and Timing Analysis – A Practical Guide to Synopsis Design Constraints (SDC)", Springer, 2013.
2. <https://www.iopb.res.in/vimbook-OPL.pdf>
3. <https://www.ee.columbia.edu/~shane/projects/sensornet/part1.pdf>
4. https://www.vlsi-backend-adventure.com/logic_synthesis.html
5. <https://www.ee.columbia.edu/~shane/projects/sensornet/part1.pdf>

Assessment Pattern

CIE- Continuous Internal Evaluation: Hands On(50 Marks)

Bloom's Taxonomy	Tests	Assignments	Quizzes	Co-curricular Activities
Marks	25	10	5	10
Remember	5	-	-	-
Understand	5	-	-	-
Apply	5	5	5	5
Analyze	10	-	-	-
Evaluate	-	-	-	5
Create	-	5	-	-

SEE- Semester End Examination: 50 Marks

Bloom's Taxonomy	Tests
Marks	50
Remember	10
Understand	10
Apply	20
Analyze	10
Evaluate	-
Create	-

JUNIPER NETWORK OPERATING SYSTEM

Course Code : 20NHOP727A

Credits : 03

L:T:P:S : 3:0:0:0

CIE Marks : 50

Exam Hours : 3

SEE Marks : 50

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

20NHOP727A.1	Compare the network models and the protocols at each layer
20NHOP727A.2	Construct IP addressing table and perform subnetting in IPv4 and IPv6 networks
20NHOP727A.3	Analyze the network to implement LAN security to mitigate threats and attacks
20NHOP727A.4	Design logically separate networks using Virtual LANs and IEEE802.1Q trunking protocol
20NHOP727A.5	Examine the operation of Spanning tree protocols and Etherchannel for network scalability
20NHOP727A.6	Analyze Dynamic Host Configuration Protocol (DHCP) operation for scalable networks

Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
20NHOP727A.1	3	3	3	3	3	-	-	-	-	-	-	-
20NHOP727A.2	3	3	3	3	3	-	-	-	-	-	-	2
20NHOP727A.3	3	3	3	3	3	1	-	2	2	-	2	-
20NHOP727A.4	3	3	3	3	3	-	3	-	-	-	-	-
20NHOP727A.5	3	3	3	3	3	-	3	-	-	-	2	-
20NHOP727A.6	3	3	3	3	3	-	3	-	-	-	-	2

Module No.	Module Contents	Hours	CO's
1	<p>Networking: Network Components, Protocols and Models: The Protocol Suites, Reference Models, Data Encapsulation, Data Link Layer: Purpose of the Data Link Layer, LAN Topologies, Ethernet Switching: Ethernet Frame, Ethernet MAC Address, The MAC Address Table, Network Layer: Network Layer, IPv4 Packet, IPv6 Packet, Router Routing Tables, MAC and IP, ARP, Transport Layer: Port Numbers, TCP Communication Process, UDP Communication, Application Layer: Application, Presentation, Session</p> <p>LAN Security Concepts: Endpoint Security, Access Control, Layer 2 Security Threats, MAC Address Table Attack, LAN Attacks, Switch Security Configuration: Implement Port Security.</p> <p>List of programs:</p> <ol style="list-style-type: none"> 1. Basic Switch and End Device Configuration: Introduction to Junos, Junos CLI operation mode, Junos CLI configuration mode, Basic Device Configuration, Save Configurations, Configure IP Addressing, Verify Connectivity. 	9	20NHOP727A.1, 20NHOP727A.3

	<ul style="list-style-type: none"> 2. SSH and Telnet Configuration 3. Switchport security Configuration 		
2	<p>IPv4 Addressing: IPv4 Address Structure, IPv4 Unicast, Broadcast, and Multicast, Types of IPv4 Addresses, Network Segmentation, Subnet an IPv4 Network</p> <p>IPv6 Addressing: IPv6 Address Representation, IPv6 Address Types, GUA and LLA Static Configuration, Dynamic Addressing for IPv6 GUAs, Dynamic Addressing for IPv6 LLAs, Subnet IPv6 Network</p> <p>List of programs:</p> <ul style="list-style-type: none"> 1. Basic Router Configuration: Configure Initial Router Settings, Configure Interfaces, Configure the Default Gateway, Ping and Traceroute Testing 2. Subnetting Scenarios using IPv4 address 3. IPv4 address Configuration 4. IPv6 address Configuration 	9	20NHOP727A.2
3	<p>VLAN Concepts: Overview of VLANs, VLANs in a Multi-Switched Environment, VLAN Configuration, VLAN Trunks, Dynamic Trunking Protocol.</p> <p>Inter-VLAN Routing: Inter-VLAN Routing Operation, Router-on-a-Stick Inter-VLAN Routing.</p> <p>List of programs:</p> <ul style="list-style-type: none"> 1. VLAN Configuration 2. Dynamic Trunking Protocol Configuration 3. Inter-VLAN routing Configuration 	9	20NHOP727A.4
4	<p>Spanning Tree Protocol: Purpose of STP, STP Operations, Evolution of STP, RSTP, RSTP+, Portfast, BPDU Guard.</p> <p>EtherChannel: EtherChannel Operation, LACP, Passive and Active mode in EtherChannel.</p> <p>List of programs:</p> <ul style="list-style-type: none"> 1. Spanning Tree Protocol Configuration 2. EtherChannel Configuration 	9	20NHOP727A.5
5	<p>DHCPv4: DHCP4 Concept, Configure a DHCP4 Server, Configure a DHCP4 Client,</p> <p>SLAAC and DHCPv6: IPv6 Global Unicast Address Assignment, SLAAC, DHCPv6, Configure DHCPv6 Server.</p> <p>List of programs:</p> <ul style="list-style-type: none"> 1. DHCPv4 Configuration 2. DHCPv6 Configuration 	9	20NHOP727A.6

Text Books:

1. Juniper Enterprise Switching – Harry Reynolds and Doug Marschke, O'REILLY, Juniper Networks.
2. JUNOS Cookbook: Time-Saving Techniques for JUNOS software Configuration by Aviva Garrett, O'REILLY, Juniper Networks

Reference Books:

1. Junos® OS Interfaces Fundamentals for Junos OS
2. Data Communications and Networking. Forouzan, 5th Edition, McGraw Hill, Reprint-2017.
3. Routing and Switching – Todd Lammle, 2nd Edition, Sybex Publisher (Wiley Brand), 2016.

CIE- Continuous Internal Evaluation (50 Marks)

Blooms Taxonomy	Tests	Assignments	Daily Assessment
Marks (Out of 50)	25	15	10
L1: Remember	-	-	-
L2: Understand	-	-	5
L3: Apply	15	10	5
L4: Analyze	10	5	-
L5: Evaluate	-	-	-
L6: Create	-	-	-

SEE- Semester End Examination (50 Marks)

Bloom's Taxonomy	Tests
Remember	-
Understand	-
Apply	30
Analyze	20
Evaluate	-
Create	-

Database Administration Using DB2

Course Code : 20NHOP728A

Credits: 3

L: T: P:S: : 0: 0:0

CIE Marks: 50

Exam Hours: :

SEE Marks: 50

Course Outcomes: At the end of the Course, the Student will be able to:												
20NHOP728A.1	Apply the knowledge of SQL and Locks in Data integrity and security in DB2											
20NHOP728A.2	Analyze the processing instructions given to DB2 via DB2 SQL statements											
20NHOP728A.3	Design a solution for data base operations and its security using DB2											
20NHOP728A.4	Examine the different functional operations and recovery concepts in DB2.											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
20NHOP728A.1	3	-	-	-	-	-	-	-	-	-	-	-
20NHOP728A.2	-	3	-	-	-	-	-	-	-	-	-	-
20NHOP728A.3	-	-	3	-	3	-	-	-	-	-	-	3
20NHOP728A.4	-	-	-	3	-	-	-	-	-	-	-	3

Module No	Module Contents	Hrs.	COs
1	DB2-Introduction- Database -Table Space- Simple table space- Segmented table space-Partitioned table space- Database Design-Logical Database-Physical Database Design- Implementing and Altering Database Design.	9	20NHOP728A.1, 20NHOP728A.2
2	DB2 SQL concepts and Linux Basics – Introduction to SQL- characteristics of SQL in DB2-DB2 SQL: Create Storage- Alter Storage -Create View- Alias- DB2 catalog tables. Introduction to Linux- Basic commands- File Access and other Commands	9	20NHOP728A.2, 20NHOP728A.3
3	DB2 Locks: Locks- Lock Size-Grant- Revoke-Isolation Level- Data Integrity- Interaction with DB2	9	20NHOP728A.1, 20NHOP728A.2
4	DESIGNING A DATABASE AND ITS SECURITY Database objects and relationships – implementing and altering database design – DB2 security – managing access through authorization IDs or roles – managing access through trusted contexts and data definition control	9	20NHOP728A.3, 20NHOP728A.4
5	OPERATION AND RECOVERY DB2 basic operational concepts – starting and stopping DB2 – scheduling administrative tasks – monitoring and controlling DB2 and its connection – managing the log and the bootstrap data set – recovering from different DB2 – reading log records.	9	20NHOP728A.3, 20NHOP728A.4

Text Books:

1. DB2 11 for z/OS Application Programming and SQL Guide”, 2021, IBM Corp
2. DB2 11 for z/OS Administration Guide”, 2021, IBM Corp

Reference Books:

1. <https://www.db2tutorial.com/>

CIE-Continuous Internal Evaluation (50 Marks)

Bloom’s Taxonomy	Test (50 Marks)
Remember	-
Understand	10
Apply	15
Analyze	15
Evaluate	10
Create	-

SEE–Semester End Examination(50marks)

Bloom’s Taxonomy	Questions (50 Marks)
Remember	-
Understand	10
Apply	15
Analyze	15
Evaluate	10
Create	-

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