

**GOVERNMENT COLLEGE OF TECHNOLOGY, COIMBATORE – 641 013**  
**B.E. CIVIL ENGINEERING**  
**CBCS 2018 & 2018A REGULATIONS**

**NAAN MUDHALVAN COURSES-(2022-2023) ODD SEMESTER**

Sl. No.	Course Code	Course Title	CAT	CA Marks	End Sem. Marks	Total Marks	Hours/Week			
							L	T	P	C
1.	18CVA\$04	MICROSOFT OFFICE FUNDAMENTALS (Common to all Branches)	VA	100	-	100	1	0	2	2
2.	18CVA\$05	BUILDING INFORMATION MODELING	VA	100	-	100	1	0	2	2
3.	18CVA\$06	TRANSPORTATION INFRASTRUCTURE – AIRPORTS, METROS & SEAPORTS	VA	100	-	100	1	0	2	2
4.	18CVA\$07	HIGH RISE BUILDING DESIGN	VA	100	-	100	1	0	2	2
5.	18CVA\$08	DESIGN AND CONSTRUCTION OF STEEL BUILDINGS	VA	100	-	100	1	0	2	2

<b>18CVA\$04</b>	<b>MICROSOFT OFFICE FUNDAMENTALS</b> <b>(Common to all Branches)</b>
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PREREQUISITES	CATEGORY	L	T	P	C
NIL	VA	1	0	2	2

## UNIT – I      MICROSOFT EXCEL      3T + 6P

### Beginners:

Introduction and importance of Excel - Row, column, cell & range - Formulae: Addition, Subtraction, Multiplication, Division - Copy Formula - Formatting: borders, merge, center cells, wrapping text, inserting rows & columns - Inserting Charts - Freeze pane & Tell Me - Paste a link, Paste Special, Transpose Paste - Page break & preview - Sheet, view, zoom - Ribbon Menu and Templates - Saving Formats and fillers.

**Advanced:**

Cell Reference - Conditional Formatting - Data validation - Dynamic Array - FlashFill - Formatting Lists as Tables-Hyperlinks & Macros-Single and Multilevel Sorting and Removing duplicates-Pivot Table- V lookup.

## UNIT – II MICROSOFT WORD 3T + 6P

### Beginners:

Introduction & starting up of Word - Inserting Bullets & Sub bullets - Spelling & Grammars - Reading, Draft and outline view - Layout view - Grouping & Aligning Objects - Using Ruler - Quick parts, Icons & 3D models - Ribbon menu and it's features.

**Advanced:**

Find and Replace - Paragraph styles - Inserting Audio, Video files & Online videos - Table of figures - Word Art - Wrapping words around pictures - Banded Row & Column- Saving word.

## UNIT – III MICROSOFT POWERPOINT PRESENTATION 3T + 6P

### Beginners:

Importance & Creation of Powerpoint- Working with Slides - Adding text - Creating and Editing Charts - Inserting Shapes, Graphics, Zoom, Icons & 3D Models - Overview of the views:slide sorter,notes page, slide show, presenter - Selecting , Editing, Formatting , Arranging & Grouping of Objects-Cropping & Formatting pictures -Saving Presentation as templates- Tips & Guidelines.

**Advanced:**

Advanced and repeat animation- Creating SmartArt and Flowchart - Tigger - Comments - Eyedropper-  
Exporting to pdf - Hyperlinking and Transitions - Uploading in One Drive

## UNIT – IV MS ONEDRIVE AND MS TEAMS 3T + 6P

## One Drive:

Introduction to One Drive - Files & Folders - Setting up of One Drive - Deleting File/Folder - Set a password - Shared Library - Sharing Access.

### Teams:

Teams setup - Features:meeting&calling,channels,chat& group chat -Collaborate &FileSharing - Schedule a Call & Meeting - Schedule Assistant - Hosting a webinar - Integrate Applications - Approvals.

## UNIT – V MS OUTLOOK AND MS SHAREPOINT 3T + 6P

## Outlook:

Introduction - Setting up of Outlook account - Notification & Navigation - Calendar, task ,people Creating tasks & reminder - Features: Rules ,Out of offline replies & Working Offline.

## SharePoint:

Introduction to SharePoint - My Files - My Lists - My News - My Site - Features of SharePoint.

### Contact Periods:

**Lecture: 15 Periods      Tutorial: 0 Periods      Practical: 30 Periods      Total: 45 Periods**

## REFERENCES

- 1 <https://in.coursera.org/courses?query=microsoft%20word>
- 2 <https://in.coursera.org/learn/microsoft-word-work-smarter>
- 3 <https://in.coursera.org/courses?query=microsoft%20excel>
- 4 <https://in.coursera.org/courses?query=advanced%20excel>
- 5 <https://in.coursera.org/learn/microsoft-powerpoint-work-smarter>
- 6 <https://in.coursera.org/courses?query=microsoft%20teams>
- 7 <https://www.coursera.org/lecture/microsoft-word-work-smarter/introduction-to-outlook-2AiwB>
- 8 <https://www.microsoft.com/en-us/p/courseraorg/9nblggh6dgzs>

<b>18CVA\$05</b>	<b>BUILDING INFORMATION MODELING</b>
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**PREREQUISITES**  
**NIL**

**CATEGORY L T P C**  
**VA 1 0 2 2**

**UNIT – I EVOLUTION OF ENGINEERING, INTRODUCTION TO BIM (3T+6P)**  
**CONCEPTS AND DESIGN AUTHORIZING**

Evolution of Engineering from 2D drawings to BIM Model, BIM Model of various projects like commercial & residential structures, Water Treatment Plant and Substation, Transportation.

Isometric View – Introduction to Isometric Drawings, Creation of isometric views from different 2D views and vice versa: example problems, Limitation of Isometric views and concept of 3D-Modeling.

Building Information Modelling – Introduction & Process.

Design Authoring – Concepts and workflow, Fundamentals of Discipline Based Modelling, Introduction to stages of BIM Modelling process as per ISO 19650- Architectural, Structural, MEP (HVAC, Electrical, Plumbing), WIP stage of ISO 19650, Shared stage concept, Interdisciplinary based modelling, Federated model- Introduction. Concepts and demonstrations, Concept, and workflow of design coordination.

Engineering Analysis – Concept and types of analysis, Workflow of structural analysis, energy analysis, lighting Analysis, Process and workflow of Design Review in BIM.

**UNIT – II VISUALIZATION AND INTERFERENCE/CLASH CHECK (3T+6P)**

Views in BIM Model- plan, section, elevation, 3DVisualization Modes- Concept and viewing rendered, shaded, wire frame and hidden line mode, Walkthrough of the Model, Fly through the model

Layers & Properties, Concept of viewpoints, Sectioning and Visualization through Tablet and Mobile Concept of BIM Kiosk & BIM Rooms, Visualization through Augment Reality (AR), Virtual Reality(VR) & Mixed Reality (MR)

Clash Check, Types of Clashes- Hard Clash & Soft Clash, Federated Model - Clash avoidance process, Clash Detection Process –Introduction, Clash Detection - Priority Matrix and Report generation, Clash Detection – Rules, Report, Grouping, Clash Detection - Roles & Responsibilities, Clash Detection Process – Demo.

**UNIT – III DOCUMENTATION & CDE & LEVEL OF DEVELOPMENT (3T+6P)**

Documentation and CDE (Common Data Environment) -2D drawings generation from BIM Model, Computer Network types, Concept of Cloud Computing, Concept and Application of CDE: Traditional Information Sharing, Definition, Reference, and Concept, Setting up the workflow and process for CDE- File naming convention, Roles and Responsibilities, Request for Information and Review Process

Concept of LOD (Level of Development), preparation of LOD matrix and Progression matrix- Definition of LOD, Level of Detail and Information, LOD- Wall foundation, Precast Structural Inverted T-Beam, Domestic Water Piping, Plumbing Fixture, Packaged Generator Assembly, LOD- Chart, Matrix and Model Progression Matrix.

**UNIT – IV 4D / FIELD BIM & ITS APPLICATIONS (3T+6P)**

Introduction to 4D / Field BIM: Concept of 4D, Introduction to construction sequence and project schedule, Project scheduling using Gantt Chart and its limitation, 4D BIM Modeling-Project demo and workflow, Synchronization of 4D BIM Model with project schedule, Reviewing project progress w.r.t planned dates and actual dates, Generation of Reports.

Application of Field BIM/ 4D BIM: Understanding concept and usage of BIM in field for coordination- 3D Coordination and Visual Communication, Site utilization planning and Construction analysis, Application of wearables in coordination. 3D Control and planning.

Other Applications of Field BIM/ 4D BIM: Concept and usages of BIM in field for safety, disaster and risk analysis, digital fabrication and scan to BIM, Existing Condition Modelling, Phase Planning, As-built/ Record Models.

#### **UNIT – V      5D BIM, AIM & BEYOND BIM - EMERGING TRENDS      (3T+6P)**

5D BIM: Introduction concepts of 5D BIM, Quantity take off with UoM, Concept of QTO with UoM, 5D BIM with UoM with cost, Quantity take off exercise, Demo of Quantity take off: Understanding QTO for Wall, Plaster & Tile, BIM Maturity LOD and General Practice of QTO, Cost Breakup structures, 5D BIM and cost control.

AIM: Introduction to Asset Information Model (AIM), COBie structures and Asset Information Deliverables, Space Attributes and Asset Attributes- Examples with data, Asset requirement-Discipline wise Infrastructure System, Classification code and Information Exchange, Information Exchange with Facility Management.

Beyond BIM: Emerging Trends- Concepts of Industrialisation, IoT, Big Data, Data Analytics and their applications in BIM: Industrialisation of Construction through BIM- DfMA, IoT in BIM, BIM and Big data, Data Analytics using AI & ML.

Future scope of BIM Applications: Smart Infrastructure and the need for connected infrastructure, Digital twins- Concepts and benefits, National Digital Twin or a City level Digital Twin in a Smart City, Fundamental requirements for the success of a Digital Twin and its uses, Digital Twin applications in diverse industries.

#### **Contact Periods:**

**Lecture: 15 Periods      Tutorial: 0 Periods      Practical: 30 Periods      Total: 45 Periods**

#### **TEXT BOOKS:**

- 1 *De Wilde, P., Mahdjoubi, L., & Garrigós, A. G., “Building Information Modeling (BIM) in Design, Construction and Operations”, WIT Press, 2019.*
- 2 *Karen Kensek, Douglas Noble, “Building Information Modeling: BIM in Current and Future Practice”, John Wiley & Sons, 2014.*

#### **REFERENCES:**

- 1 *M. Reza Hosseini, Farzad Khosrowshahi, Ajibade Aibinu, Sepehr Abrishami, “BIM Teaching and Learning Handbook” Taylor & Francis Publications, 2021.*
- 2 *Dana K. Smith, Michael Tardif, “Building Information Modeling: A Strategic Implementation Guide for Architects, Engineers, Constructors and Real Estate Asset Managers” John Wiley & Sons 2012.*
- 3 *Kymmell, W., McGraw-Hill Education, “Building Information Modeling: Planning and Managing Construction Projects with 4D CAD and Simulations”, McGraw Hill Construction, 2008.*
- 4 *N.O Nawari, M Kuenstle, “Building Information Modeling: Framework for Structural Design”, CRC Press, 2015.*
- 5 *André Borrmann, Markus König, Christian Koch, Jakob Beetz Springer, “Building Information Modeling: Technology Foundations and Industry Practice”, Springer 2018.*
- 6 *Brad Hardin, Dave McCool “BIM and Construction Management: Proven Tools, Methods, and Workflows”, Wiley Publications 2015.*

<b>18CVA\$06</b>	<b>TRANSPORTATION INFRASTRUCTURE – AIRPORTS, METROS &amp; SEAPORTS</b>
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## **PREREQUISITES**

**NIL**

## **CATEGORY L T P C**

**VA 1 0 2 2**

### **UNIT – I INTRODUCTION AND PLANNING OF MASS RAPID TRANSIT SYSTEM (MRTS) (3T+6P)**

Introduction - Overview of Metro, Transit Oriented Development, Necessity and Feasibility Study for MRTS Project, Sustainable and Smart Technologies, Recent Advancements & Future Technologies - Automated Guideway Transit Systems, Suspended Railway / Monorail, High Speed Rail, Semi Highspeed Rail, Maglev Trains, Vactrain History, Development and Technology Planning – Alignment Basic Interfacing Principles, Urban level planning constraints and restrictions, Planning of the Station, Integration of systems, HVAC Systems, Tunnel Ventilation System, Fire Protection System, Public Health Engineering, Electrical System, Fire Alarm System, Building Information Modelling (BIM) Walkthrough Contracts and Quality system - Introduction to Contracts, Overview of FIDIC standards, Introduction to Quality Systems.

Overview of Elevated metros – Alignment/ Span configuration of elevated structures, Superstructure, Substructure and foundation of elevated metro, Bridge articulation based on profile alignment Overview of Station – Station overall layout, Station foundation, substructure and Pier arm Construction Methods - Challenges in Metro Construction, Precast and cast in-situ construction, Precast yard and Mould development, Precast Erection and Launching methods, Overview of Obligatory Span overview, foundation construction methods.

### **UNIT – II ANALYSIS AND DESIGN OF ELEVATED AND UNDERGROUND STATIONS (3T+6P)**

Elevated station and Viaducts – Overview and components, Loads and load combination according to IRC/IRS Codes, Modelling, Analysis and Design of superstructure, Substructure and foundation of Viaduct, Idealization of Framed Station and Cantilever station, Design and analysis of platform slab, track slab and above ground structures, Spine beam method, Ductile detailing of structures, Introduction to Modelling Software - STAAD Pro and Midas Civil

Earth retaining structures – Types of Earth retaining structures, Diaphragm wall Analysis and design, Shoring Systems, Secant pile wall design, Guide walls, capping beams, supporting systems, Tunnels - Mined/Bored/NATM

Underground Stations – Configurations of underground station, Loads and load combination according to IRC/IRS Codes, SIDL for UG stations, Construction Methodology (Bottom-Up method/ Top Down method), Fire resistant criteria and Floatation check, 2D & 3D model generation, SOD restrictions & Element sizing for UG Stations, Design of all the components of UG station.

### **UNIT – III INTRODUCTION AND TYPICAL MASTER PLANNING OF AN AIRPORT (3T+6P)**

Introduction - key features of a modern airport, Codes and aviation regulation organizations, Growth Requirements and Passenger Demand Capacity, Overview of existing and future Indian Airports Outline of Master Planning process according to ICAO and FAA Planning and Design of Airside works – Topography and geotechnical investigation for green field airport and upgradation of existing airport, Survey of various elements/facilities, Layout plans, Configuration and orientation of runways, Design of Runway, Taxiway, Apron, Drainage System and Ducts

Planning of Terminal Building – Functions of Terminal building, Building Information Modelling (BIM) walkthrough, Facilities and services of terminal building: Passenger conveniences,

Travellers, Departure and Arrival gates, MEP and HVAC Services etc., Planning of Landside works – Planning of Approach roads to Terminal building, Landside access for Arrival/Departure Planning, Multi- Level/Surface car parking/Waiting areas, Air Traffic Control Tower, Drainage Planning, arboriculture, Water harvesting cum storage/distribution, Fuel storage and supply, Power supply and Renewable Energy, Airport fire & Rescue station.

#### **UNIT – IV CONSTRUCTION AND MAINTENANCE OF AIRPORT (3T+6P)** **AIRSIDE WORKS**

Pre-construction activities - Statutory Approvals, mobilization of key resources and Estimation of requirement of Plant and equipment - Earthmoving Plants, Dumpers and Compaction Equipment, Hoists and Tower Cranes

Construction of Runways and Taxiways - Airport Layout and Grading Plan, Execution and Estimation of various Layers of Flexible Pavements and Rigid Pavements, precast and cast in-situ drainage and duct, Navigational and Meteorological aids - Marking, Lighting, Instrument landing system and stations, etc., Maintenance, Evaluation and Rehabilitation of Runways and Taxiways - Evaluation of runways and taxiways, Causes & Typical Failures of Flexible and Rigid Pavements, Maintenance, Strengthening and Rehabilitation of Pavements, Discussion on pavement repairs.

#### **UNIT – V OVERVIEW OF PORTS AND HARBOURS (3T+6P)**

Introduction and Evolution of Ports and Harbours, Classification of Ports, Overview of Indian Seaports General Terms and Conventions – Waves and Tides, Tidal Variations, Return Period, Tranquility, Littoral Drift, Wave Transmission, Wave Reflection, Wave Overtopping, Wave Diffraction, Types of Ships, Parts of Ship, Ship Size Parameters, Ship Motions

Overview of Marine structures - Container and bulk terminal, Liquid terminals, Breakwaters, Shipyard facilities, port infrastructures and Bulk Terminals, Walkthrough of Typical Shipyard Cum Port Operation and components of Ports – Vessel and cargo related Operations of Ports, Berthing Structures – Wharf, Quay, Pier, jetty, Storages - Container yards, Stack yards, Warehouse, Tankage

Site Investigation and Survey – Hydrographic, topographic, Meteorological, Oceanographic, Geological, Seismic, Resources data

Approach Facilities, Navigation Aids – Audible, Radio, Visual, Others, Design considerations and Functional requirements of typical structures, Breakwater Structures, Fenders, Dolphin, Shipyard structures - Slipways, Dry Docks, Floating Docks, and Ship Lifts, Shore protection and Reclamation works.

#### **Contact Periods :**

**Lecture: 15 Periods      Tutorial: 0 Periods      Practical: 30 Periods      Total: 45 Periods**

#### **TEXT BOOKS:**

- 1 *Khanna.S.KandArora.M.G., “Airport planning and design”, Sixth edition, S.Chand and Bros, 2017.*
- 2 *Srinivasan.R., “Harbour, Dock and Tunnel Engineering”, Twenty sixth edition, Chartor publishing house, Anand, India, 2013.*

#### **REFERENCES :**

- 1 *Horonjeff R and Mackelvey F. X., “Planning and Design of Airports”, fifth Edition, McGraw Hill book Co., New Delhi, 2010*
- 2 *John W.Dickey, “Metropolitan Transportation Planning”- second edition, Taylor & Francis Group, 2018*
- 3 *Vazirani.V.NandChandola.S.P., “Transportation and Engineering, Vol.2”, Khanna publishers, New Delhi, 2005.*
- 4 **IS:4651, Indian standard Code of practice for planning and design of ports and harbour,** Bureau of Indian Standards, New Delhi.

<b>18CVA\$07</b>	<b>HIGH RISE BUILDING DESIGN</b>
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**PREREQUISITES**

**NILL**

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**UNIT – I INTRODUCTION AND CODES - DESIGN BASIS (3T+6P)  
PARAMETERS AND REPORT**

Indian & International Codes for Reinforced concrete Design, Design loads and detailing of reinforcement, Handbooks for reinforced concrete design, National Building Code 2016, Practical building examples, drawing sizes and scales, Reading Drawings – Architectural & Structural.

Introduction to DBR Parameters - Geometric Parameters, Occupancy Categories, Site location and associated parameters, Design life of structures, Material Specifications - Grade of concrete for vertical and floor elements – Grade of reinforcing steel, Exposure and cover requirements, Fire rating requirements, Load Combinations, Serviceability Requirements, Analysis tools, Design Basis Report, Concept explanation with example buildings.

**UNIT – II LOADS & SETTING THE STRUCTURAL SCHEME (3T+6P)**

Introduction, dead loads, superimposed dead loads, Live loads, Wind loads, Wind pressure coefficients, Determining global wind forces and wind velocity, storey forces and base shears. Earthquake loads, response spectrum to earthquake excitation, seismic design parameters - horizontal acceleration coefficient, Time period, Evaluation and application of seismic base shear, equivalent static method. Loads due to pressure – earth pressure, hydrostatic pressure. Loads from MEP Services and architectural considerations like façade loads.

Scheme Design, Concrete floor systems, Sizing and design of various slab systems, Dimensioning & designing of drop panels, Beams, Reinforced Concrete Columns - Location and Shape, Design Axial Load, Sizing, Lateral Load Systems, IS 1893- Requirements, Shear Walls – Location and thickness. Estimating relative stiffness of core walls.

**UNIT – III STRUCTURAL MODELS (3T+6P)**

Introduction to Analysis & Modelling, Modelling of Cantilever, Portal Frame, three bay Portal Frame, 3D structural models - Geometry, gravity loads, defining earthquake loads, defining wind loads, Modelling Shear walls, Practical Structural Model of building, Structural models of Floor System, Direct design method for Flat Slabs, Analysis of two-way slabs using moment coefficient method, Application of moment coefficient method, Estimation of deflections

ETABS software demonstration for correct modelling and design of Vertical and Lateral loading systems like Shear Walls.

**UNIT – IV DESIGN OF STRUCTURAL ELEMENTS (3T+6P)**

Design of structural elements - Design of Beams- flexural reinforcement, shear reinforcement-design of edge beam, Practical examples, Design of flat slabs- Flexural Reinforcement, shear reinforcement- Practical Examples-Design of mesh reinforcement, additional bottom reinforcement, additional top reinforcement, Design of 2-way continuous slabs.

Design of Reinforcements in Columns - Post processing of column forces from analysis, Design and arrangement of vertical reinforcement, Design of horizontal reinforcement, Design of stirrups, Cardinal rules in scheme design of buildings, Coordination with other Engineering disciplines

Design of shear walls – General considerations, Seismic response of RC structures, Vertical and Horizontal Reinforcement, Calculation of design forces, moment capacity of vertical distributed reinforcement,

Design of boundary elements and boundary zone. Sizing of elements based on Constructability aspects like formwork, concrete placement and compaction, rebar arrangement to satisfy economy and optimum utilization.



## **UNIT – V      DETAILING OF STRUCTURAL ELEMENTS- BILL OF      (3T+6P) QUANTITIES AND CONCLUSION**

Development length of rebars, detailing of various structural elements - flat slabs, two-way continuous slabs, beams, columns and shear wall, detailing and documentation of practical example building.

Bill of quantities - Concrete and steel indices for RC buildings, Reinforcement consumption in RC members, BoQ of practical example building.

### **Contact Periods:**

**Lecture: 15 Periods      Tutorial: 0 Periods      Practical: 30 Periods      Total: 45 Periods**

### **TEXT BOOKS:**

- 1 *Bryan Stafford Smith and Alexcoull, “Tall Building Structures - Analysis and Design”, John Wiley and Sons, Inc., 2011.*
- 2 *Taranath B.S., “Structural Analysis and Design of Tall Buildings”, McGraw Hill, 2011.*

### **REFERENCES:**

- 1 *Bryan Stafford Smith and Alex Coull, “Tall Building Structures, Analysis and Design”, John Wiley and Sons, Inc., 2011.*
- 2 *Lin T.Y. and Burry D.Stotes, “Structural Concepts and Systems for Architects and Engineers”, John Wiley, 1994*
- 3 *Wolfgang Schuler, “High Rise Building Structures”, John Wiley and Sons, New York, 2016.*
- 4 *Beedle.L.S., “Advances in Tall Buildings”, CBS Publishers and Distributors, Delhi, 1986.*

<b>18CVA\$08</b>	<b>DESIGN AND CONSTRUCTION OF STEEL BUILDINGS</b>
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**PREREQUISITES**

**CATEGORY L T P C**

**NILL**

**VA 1 0 2 2**

**UNIT – I ANALYSIS & DESIGN PHILOSOPHIES, CODES OF PRACTICE AND GENERAL DESIGN ASPECTS (3T+6P)**

Structural steel and its Mechanical Properties, Hot Rolled steel sections, Structural Steel sections and section classification. Analysis and design of buildings as per Codes of Practice, design philosophies, Advantages of steel buildings in comparison with other types of structures Inputs for the design of a steel building - Design Basis Report covering Site location, Site Specific aspects, building functionality, Construction planning, Geometric parameters of the building, Structural systems, Special geometries and its structural systems, Functional requirements necessary for the end user, Material specifications. Methods of designing a steel building, Design life of a building, Exposure conditions and corrosion protection, Gravity and lateral load resisting elements and systems, Concrete and reinforcement, Block work, floors and Roofs, Structural steel, bolts, welds, fire proofing and Painting materials

**UNIT – II COMPUTATION OF VERTICAL, LATERAL & SPECIAL LOADS AND LOAD COMBINATIONS (3T+6P)**

Calculating the various loads acting on a steel building - Vertical & lateral loads - Effects of each loads separately and in combination – Dead, superimposed dead, live, temperature, MEP service loads - Lateral loads due to wind and seismic effects. Design of wind speed and pressure, Pressure and Force coefficient method, Deflection and drift limits, Drag, interference and dynamic effects Floor Vibration, Fire resistance, Analysis and design methods, Wind load calculation for an example steel building.

**UNIT – III SELECTION OF LOAD RESISTING SYSTEMS, STRUCTURAL MODELLING, ANALYSIS & DESIGN (3T+6P)**

Studying the layout plans of the structure – Codes and Reference drawings, Selection of load resisting systems - Load flow in each system -Satisfying stability & strength of the structure - Vertical and lateral load resisting systems, Integration of MEP services and its supporting structures in buildings Overview of BIM and its importance in structural modeling Computer aided modelling, analysis & design (STAAD Pro) - Geometric & structural parameters of the structure - Loading the structure - Interpretation of the results of the software – Analysis & design of a multistoried building from a project for comprehending the design from a practical standpoint. A sample of Structural Design Basis report

**UNIT – IV DESIGN OF VARIOUS ELEMENTS & CONNECTIONS OF A STEEL BUILDING (3T+6P)**

Manual & software aided design – Beams, columns, floors, bracings, purlins/girts & facades, base plates & anchor bolts –different conditions of supports, exposure, and purpose of use - Design of connections between the members – Bolted and welded, moment and shear connections to be adopted in various locations of a building. Tension members in buildings – Types and grades of tension members, Design of mullions and transoms Special connections for equipment and other services like staircases, roof, terrace, and other special elements. Project based on excel spreadsheet development.

**UNIT – V DESIGN OF AN INDUSTRIAL BUILDING & DETAILING, FABRICATION AND ERECTION ASPECTS (3T+6P)**

Design of an industrial building - Selection of sections as per requirements - Configuration of the elements and their connectivity - Functional requirements. Beam design Approach for buildings – Manual and software Design of beams- Cantilever beams and built-up beam, torsion in beams and back up beam concept, Service integration in beams, Simplified floor vibration analysis Column Design Approach for buildings -Manual and software design of column, Addressing failures and optimization

in column design Beam-Column design approach for buildings- Design of beam-columns, Base plate and anchor bolts, Planning and design approach of terrace floor, architecturally exposed steel.Study of General Assembly drawings, Fabrication drawings and procedures - Fabrication processes - Transportation for structural Steel construction and erection - Sequence of erection - Inspection of a completed structure Good Design, Detailing and construction Practices. Design summary of Example building

**Contact Periods:**

**Lecture: 15 Periods      Tutorial: 0 Periods      Practical: 30 Periods      Total:45 Periods**

**TEXT BOOKS :**

- 1 SubramanianN., “**Design of steel structures**” ,Oxford university press, 2016
- 2 “**Teaching Resources for Structural Steel Design – Volume I and II**”, INSDAG, Kolkatta, 2009.

**REFERENCES :**

- 1 *P.Dayaratnam, “Design of steelstructures”,S.ChandPublishers2011-12.*
- 2 *M.R.Shiyekar, “Limit State Design of Steel Structures”,PHILearningPrivateLtd,NewDelhi,2011.*
- 3 *B.C.Punmia, Ashok Kumar Jain and Arunkumar Jain, “ Design of Steel Structures, Vol.I&II”, Laxmi Publications (P)Ltd,2014.*
- 4 *InstituteFor SteelDevelopment&Growth (INSDAG)-TeachingMaterial*

**GOVERNMENT COLLEGE OF TECHNOLOGY, COIMBATORE – 641 013****B.E. MECHANICAL ENGINEERING****CBCS – 2018 & 2018A REGULATIONS****NAAN MUDHALVAN COURSES – (2022 – 2023) ODD SEMESTER**

Sl. No.	Course Code	Course Title	CAT	CA Marks	End Sem Marks	Total Marks	Hours/Week			
							L	T	P	C
1.	18MVA\$11	Microsoft Office Fundamentals (Common to all Branches)	VA	100	-	100	1	0	2	2
2.	18MVA\$12	Powering IoT using Arduino/Raspberry PI (Common to MECH,EEE,ECE,PRODN & EIE branches)	VA	100	-	100	1	0	2	2
3.	18MVA\$13	Robotics Simulation for Manufacturing (Common to MECH & PRODN)	VA	100	-	100	1	0	2	2
4.	18MVA\$14	Machine Learning ( Common to MECH,EEE,ECE,PRODN & IBT branches)	VA	100	-	100	1	0	2	2
5.	18MVA\$15	Electric Systems for E-Mobility	VA	100	-	100	1	0	2	2
6.	18MVA\$16	Industry 4.0 (Common to MECH,EEE & PRODN branches)	VA	100	-	100	1	0	2	2

<b>18MVA\$11</b>	<b>MICROSOFT OFFICE FUNDAMENTALS (Common to all Branches)</b>
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**PREREQUISITES**

NIL

**CATEGORY**

**VA**

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<b>UNIT – I</b>	<b>MICROSOFT EXCEL</b>	<b>3T + 6P</b>
<p>Beginners: Introduction and importance of Excel - Row, column, cell &amp; range - Formulae: Addition, Subtraction, Multiplication, Division - Copy Formula - Formatting: borders, merge, center cells, wrapping text, inserting rows &amp; columns - Inserting Charts - Freeze pane &amp; Tell Me - Paste a link, Paste Special, Transpose Paste - Page break &amp; preview - Sheet, view, zoom - Ribbon Menu and Templates - Saving Formats and fillers.</p> <p>Advanced: Cell Reference - Conditional Formatting - Data validation - Dynamic Array - FlashFill - Formatting Lists as Tables-Hyperlinks &amp; Macros-Single and Multilevel Sorting and Removing duplicates-Pivot Table- V lookup.</p>		
<b>UNIT – II</b>	<b>MICROSOFT WORD</b>	<b>3T + 6P</b>
<p>Beginners: Introduction &amp; starting up of Word - Inserting Bullets &amp; Sub bullets - Spelling &amp; Grammars - Reading, Draft and outline view - Layout view - Grouping &amp; Aligning Objects - Using Ruler - Quick parts, Icons &amp; 3D models - Ribbon menu and it's features.</p> <p>Advanced: Find and Replace - Paragraph styles - Inserting Audio, Video files &amp; Online videos - Table of figures - Word Art - Wrapping words around pictures - Banded Row &amp; Column- Saving word.</p>		
<b>UNIT – III</b>	<b>MICROSOFT POWERPOINT PRESENTATION</b>	<b>3T + 6P</b>
<p>Beginners: Importance &amp; Creation of Powerpoint- Working with Slides - Adding text - Creating and Editing Charts - Inserting Shapes, Graphics, Zoom, Icons &amp; 3D Models - Overview of the views:slide sorter,notes page, slide show, presenter - Selecting , Editing, Formatting , Arranging &amp; Grouping of Objects-Cropping &amp; Formatting pictures -Saving Presentation as templates- Tips &amp; Guidelines.</p> <p>Advanced: Advanced and repeat animation- Creating SmartArt and Flowchart - Tigger - Comments - Eyedropper- Exporting to pdf - Hyperlinking and Transitions - Uploading in One Drive</p>		
<b>UNIT – IV</b>	<b>MS ONEDRIVE AND MS TEAMS</b>	<b>3T + 6P</b>
<p>One Drive: Introduction to One Drive - Files &amp; Folders - Setting up of One Drive - Deleting File/Folder - Set a password - Shared Library - Sharing Access.</p> <p>Teams: Teams setup - Features:meeting&amp;calling,channels,chat&amp; group chat -Collaborate &amp;FileSharing - Schedule a Call &amp; Meeting - Schedule Assistant - Hosting a webinar - Integrate Applications - Approvals.</p>		

UNIT – V	MS OUTLOOK AND MS SHAREPOINT	3T + 6P
Outlook: Introduction - Setting up of Outlook account - Notification & Navigation - Calendar, task ,people Creating tasks & reminder - Features: Rules ,Out of offline replies & Working Offline. SharePoint: Introduction to SharePoint - My Files - My Lists - My News - My Site - Features of SharePoint.		

**Contact Periods:**

**Lecture: 15 Periods    Tutorial: 0 Periods    Practical: 30 Periods    Total: 45 Periods**

**REFERENCES**

- 1 <https://in.coursera.org/courses?query=microsoft%20word>
- 2 <https://in.coursera.org/learn/microsoft-word-work-smarter>
- 3 <https://in.coursera.org/courses?query=microsoft%20excel>
- 4 <https://in.coursera.org/courses?query=advanced%20excel>
- 5 <https://in.coursera.org/learn/microsoft-powerpoint-work-smarter>
- 6 <https://in.coursera.org/courses?query=microsoft%20teams>
- 7 <https://www.coursera.org/lecture/microsoft-word-work-smarter/introduction-to-outlook-2AjwB>
- 8 <https://www.microsoft.com/en-us/p/courseraorg/9nblggh6dgzs>

<b>18MVA\$12</b>	<b>POWERING IOT USING ARDUINO/RASPBERRY PI (Common to MECH, EEE, ECE, PRODN &amp; EIE Branches)</b>
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**PREREQUISITES**

NIL

**CATEGORY**

**VA**

**L T P C**

**1 0 2 2**

<b>UNIT – I</b>	<b>ENABLING TECHNOLOGIES OF IOT</b>	<b>3T + 6P</b>
<p>Theory component: Introduction to Industrial Internet of Things-Enabling Technologies of IoT - a detailed view-Wireless Sensor Networks – Role of BLE Mesh and Wi-Fi Mesh in IoT-Role of Cellular LPWAN (NB-IoT) and Non-Cellular LPWAN (LoRa, LoRaWAN) in IoT.</p> <p>Lab component:</p> <ol style="list-style-type: none"> <li>1. Embedded System design using MCU – ESP32- Usage of GPIO , Analogue Sensors and UART – Arduino Platform</li> <li>2. Design of IoT End node using MCU – ESP32 and Arduino Platform</li> <li>3. Integration of IoT End Node ( ESP32 based ) with ThingSpeak Cloud and deployment of closed loop end-to-end IoT application</li> </ol>		
<b>UNIT – II</b>	<b>IOT PROTOCOLS</b>	<b>3T + 6P</b>
<p>Theory component: Things in IoT and Identification (AIOTI) and Industrial IoT Reference Architecture-IoT Enabling Technologies – Infrastructure, IP Addressing, Network Protocols-IoT Enabling Technologies - Data Connectivity Protocols – MQTT-IoT Enabling Technologies - Data Connectivity Protocols – CoAP-IoT Enabling Technologies - Data Connectivity Protocols - WebSockets</p> <p>Practical component:</p> <ol style="list-style-type: none"> <li>1. Implementation of MQTT protocol using ESP32 as MQTT Client and Free on line MQTT broker</li> <li>2. Implementation of CoAP protocol using ESP32 as CoAP Client and Server</li> <li>3. Implementation of WebSockets using ESP32 as WebSocket Server and browser extension as a WebSocket Client</li> </ol>		
<b>UNIT – III</b>	<b>IOT END AND EDGE NODE DESIGN</b>	<b>3T + 6P</b>
<p>Theory component: Introduction to RPi PICO – An ARM Cortex M series MCU based device as an IoT End Node-Raspberry Pi – HW and Software Platform- Recap and detailed discussion towards application of RPi as End / Edge Device</p> <p>Practical component:</p> <ol style="list-style-type: none"> <li>1. GPIO and Analogue Sensor Interface to RPi PICO using Arduino platform</li> <li>2. Introduction to MicroPython and Embedded Application using MicroPython</li> <li>3. IoT End Node design with ESP32 / RPi PICO and MicroPython for any one Industrial / Smart City Use case</li> <li>4. Interfacing of Analogue sensors to RPi using External ADC like MCP3008 and accumulation and display of sensor values in local web server</li> </ol>		

<b>UNIT – IV</b>	<b>IOT APPLICATIONS</b>	<b>3T + 6P</b>
Theory component: Introduction to Node Red and Design of IoT workflow using Node Red Dash Board. Practical component: <ol style="list-style-type: none"> <li>1. Introduction to IFTTT and application of IFTTT Services for IoT Applications</li> <li>2. Video streaming and face recognition using ESP32 CAM / RPi with CAM</li> <li>3. Integration of ESP32 as End Device with RPi as Edge Computing Device integrated with Public Cloud - IIoT Real-time Use Case</li> <li>4. IoT Application using Raspberry Pi as Edge device with Node RED and MQTT Broker, NodeMCU / ESP32 as a End DeviceJZSDKJVNJSDNBVJDN</li> </ol>		
<b>UNIT – V</b>	<b>CASE STUDY</b>	<b>3T + 6P</b>
Theory component: IoT Data Analytics and Visualization - Implementation with IIoT and Industrial Real Time use Cases.- IIoT - Design and Deployment - Smart Energy Management System / Smart Water Management System integrated with Smart Cities of India - GIFT-City Model.- IoT use cases – Discussions and Conclusion Practical component: <ol style="list-style-type: none"> <li>1. IoT based Smart Home Simulation using Cisco Packet Tracer</li> </ol>		

**Contact Periods:**

**Lecture: 15 Periods    Tutorial: 0 Periods    Practical: 30 Periods    Total: 45 Periods**



<b>18MVA\$13</b>	<b>ROBOTICS SIMULATION FOR MANUFACTURING (Common to Mech &amp; Prodn)</b>
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**PREREQUISITES**

Nil

**CATEGORY L T P C**

**VA 1 0 2 2**

<b>UNIT- I</b>	<b>INTRODUCTION TO ROBOTICS</b>	<b>3T+6P</b>
Introduction to Robotics - Anatomy of Robot - Robot Configuration - DOF, Cartesian movement, Drive Systems and End Effectors-Sensors in Robotics-Quiz on Industrial Applications of Robots.		
<b>UNIT- II</b>	<b>SPATIAL REPRESENTATION OF OBJECT</b>	<b>3T+6P</b>
Relative Position and Orientation of an Object with respect to a reference-Homogeneous representation of Position and orientation of an Object-Relationship between visual and homogeneous representation of an object using HTM module in RoboAnalyzer-Translation, Transformation, rotation transformations and DH Parameter – Virtual models of Industrial robots		
<b>UNIT- III</b>	<b>KINEMATICS OF ROBOT</b>	<b>3T+6P</b>
Introduction to robot kinematics-Forward Kinematics-Inverse Kinematics-Motion planning of Robots-Joint and Cartesian motion.		
<b>UNIT- IV</b>	<b>DYNAMICS OF ROBOT</b>	<b>3T+6P</b>
Assignment on forward and inverse kinematics - Understanding coordinate frames and transformations - Inverse and forward Dynamics of robots.		
<b>UNIT- V</b>	<b>ANALYSIS OF ROBOT AXIS</b>	<b>3T+6P</b>
Creating robot joint trajectories-Motion planning in cartesian space-Case Study: Workspace analysis of a 6 axis Robot.		

**Contact Periods:**

**Lecture: 30 Periods    Tutorial: 0 Periods    Practical: 15 Periods    Total: 45 Periods**

**TEXT BOOKS:**

1. Richaerd D Klafter, Thomas Achmielewski and Mickael Negin, **"Robotic Engineering – An Integrated Approach"** Prentice Hall India, New Delhi, 2001.
2. M.P.Groover, M.Weiss, R.N. Nageland N. Godrej, **"Industrial Robotics"**, McGraw-Hill Singapore, 2017.

**REFERENCE BOOKS:**

1. S.R. Deb, **"Robotics Technology and Flexible Automation"**, Tata McGraw-Hill Education, 2009.
2. K. K.Appu Kuttan, **"Robotics"**, I K International, 2007.
3. Mark R. Miller; Rex Miller, **"Robots and Robotics: Principles, Systems, and Industrial Applications"**, McGraw-Hill Education, 2017.

<b>18MVA\$14</b>	<b>MACHINE LEARNING</b> <b>(Common to MECH, EEE, ECE, PRODN &amp; IBT Branches)</b>
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**PREREQUISITES**

NIL

**CATEGORY**

**VA**

**L T P C**

**1 0 2 2**

<b>UNIT – I</b>	<b>INTRODUCTION TO ARTIFICIAL INTELLIGENCE</b>	<b>3T + 6P</b>
Why AI? - What is AI? - AI in Practice - AI in Business - AI Platforms.		
<b>UNIT – II</b>	<b>INTRODUCTION TO DATA SCIENCE</b>	<b>3T + 6P</b>
Data Science: The Data Revolution - Components of Data Science - Data Science in Action – Conclusion.		
<b>UNIT – III</b>	<b>PYTHON FOR DATA SCIENCE</b>	<b>3T + 6P</b>
Why Python Libraries – NumPy - Introduction to NumPy - Operations on NumPy – Pandas – Introduction to Pandas – Introduction to Pandas Object – Working with datasets – Pandas Plots - Matplotlib – Introduction to Matplotlib – Types of Plots – Scikit-learn – Machine Learning using sklearn. [Practical hands-on exercises using NumPy, Pandas, Matplotlib]		
<b>UNIT – IV</b>	<b>DATA VISUALIZATION USING PYTHON</b>	<b>3T + 6P</b>
Data visualization using Python: Data Visualization: Developing insights from data using Basic Plots using Matplotlib (Box, Scatter, Line, Bar, Pie, Histogram), Statistical analysis using Heatmap, Kernel Density plot using Seaborn, Network Graphs, Choropleth Map Using Plotly, Word Cloud. [Practical hands-on exercises for creating charts]		
<b>UNIT – V</b>	<b>EXPLORE MACHINE LEARNING USING PYTHON</b>	<b>3T + 6P</b>
Introduction to Machine Learning - Regression – Classification – Clustering – Introduction to Artificial Neural Network. [Hands-on Exercises for Practicing Machine Learning Models Using Capstone Project]		

**Contact Periods:**

**Lecture: 15 Periods    Tutorial: 0 Periods    Practical: 30 Periods    Total: 45 Periods**

**REFERENCES**

- 1 [https://infyspringboard.onwingspan.com/web/en/app/toc/lex\\_8840337130015322000\\_shared/overview](https://infyspringboard.onwingspan.com/web/en/app/toc/lex_8840337130015322000_shared/overview) (Introduction to AI)
- 2 [https://infyspringboard.onwingspan.com/web/en/app/toc/lex\\_12666306402263577000\\_shared/overview](https://infyspringboard.onwingspan.com/web/en/app/toc/lex_12666306402263577000_shared/overview) (Introduction to Data Science)
- 3 [https://infyspringboard.onwingspan.com/web/en/app/toc/lex\\_auth\\_01333063698060902494\\_shared/overview](https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01333063698060902494_shared/overview) (Python for Data Science)
- 4 [https://infyspringboard.onwingspan.com/web/en/app/toc/lex\\_auth\\_01260519134369382414\\_55\\_shared/overview](https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01260519134369382414_55_shared/overview) (Data visualization using Python)
- 5 [https://infyspringboard.onwingspan.com/web/en/app/toc/lex\\_auth\\_01260040079074918423\\_7\\_shared/overview](https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01260040079074918423_7_shared/overview) (Explore Machine Learning Using Python)

<b>18MVA\$15</b>	<b>ELECTRIC SYSTEMS FOR E-MOBILITY</b>
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#### PREREQUISITES

Nil

**CATEGORY L T P C**

**VA 1 0 2 2**

<b>UNIT- I</b>	<b>INTRODUCTION TO ELECTRIC VEHICLES &amp; AUTOMATION</b>	<b>3T+6P</b>
Future of Mobility -Electrification : The Basic Technologies Electric Vehicles, batteries, EVs Made-up of - Electrification : The Basic Technologies –Charging & Charging Infrastructure, EV & the power systems, Industry Perspective on Applications of Electrification- Electrification Impacts – Vehicle Automation – The Basic Technologies – Automation and its Impacts on the environment.		
<b>UNIT- II</b>	<b>CONVERTER CIRCUITS</b>	<b>3T+6P</b>
Single, Two and Four-Quadrant Switches - Basic issues of Power Semiconductors-Introduction to DCM and Mode Boundary - Converter Topologies.		
<b>UNIT- III</b>	<b>MOTOR AND MOTOR CONTROL CIRCUITS</b>	<b>3T+6P</b>
AC motor Designs - AC motor Control - DC motors - DC motor control and stepper motors.		
<b>UNIT- IV</b>	<b>INTRODUCTION TO BATTERY MANAGEMENT SYSTEM</b>	<b>3T+6P</b>
Battery Boot Camp - How lithium-ion cells works - BMS sensing and high-voltage control - BMS design requirements- How are cells made? How can they fail?		
<b>UNIT- V</b>	<b>EQUIVALENT CIRCUIT CELL MODEL SIMULATION</b>	<b>3T+6P</b>
Defining an equivalent-circuit model of a Li-ion cell - Identifying parameters of static model - Identifying parameters of dynamic model- Simulating battery packs in different configurations - Co-simulating battery and electric-vehicle load		

#### Contact Periods:

**Lecture: 30 Periods Tutorial: 0 Periods Practical: 15 Periods Total: 45 Periods**

#### REFERENCES:

1	<a href="https://www.coursera.org/learn/people-technology-and-the-future-of-mobility">https://www.coursera.org/learn/people-technology-and-the-future-of-mobility</a>
2	<a href="https://www.coursera.org/learn/converter-circuits">https://www.coursera.org/learn/converter-circuits</a>
3	<a href="https://www.coursera.org/learn/motors-circuits-design">https://www.coursera.org/learn/motors-circuits-design</a>
4	<a href="https://www.coursera.org/learn/battery-management-systems">https://www.coursera.org/learn/battery-management-systems</a>
5	<a href="https://www.coursera.org/learn/equivalent-circuit-cell-model-simulation">https://www.coursera.org/learn/equivalent-circuit-cell-model-simulation</a>

<b>18MVA\$16</b>	<b>INDUSTRY 4.0</b> <b>(Common to MECH, EEE &amp; PRODN Branches)</b>
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**PREREQUISITES**

**NIL**

**CATEGORY**

**VA**

**L T P C**

**1 0 2 2**

<b>UNIT – I</b>	<b>INTRODUCTION TO INDUSTRY 4.0, DIGITAL TRANSFORMATION &amp; SMART MANUFACTURING, AND BUILDING BLOCKS OF INDUSTRY 4.0</b>	<b>3T + 6P</b>
<p>Theory component: Overview of Industry 4.0 and Evolution in Various Industries - Opportunities for Digital Transformation - Traditional Vs Smart Manufacturing - Key Concepts and Drivers for Digital transformation - Industrial Revolutions (1.0 to 4.0) - Additive Manufacturing - Augmented Reality/Virtual Reality - Autonomous Robots - Big Data and Analytics - The Cloud - Horizontal and Vertical System Integration - The Industrial Internet of Things (IIoT) - Digital Twin - Cybersecurity</p> <p>Practical component: 1. Identify various wastes enterprise level in manufacturing organizations and make the list of it and analyze the source of it and list its root causes.</p>		
<b>UNIT – II</b>	<b>OPPORTUNITIES IN INDUSTRY 4.0, TRANSFORMATION &amp; CHANGEMANAGEMENT AND KEY USES OF SMART MANUFACTURING</b>	<b>3T + 6P</b>
<p>Theory component: Risk of Data security - IT Infrastructure - Legacy machines - Operational Excellence - Competitive Edge - Increased Work Safety - Flexible Production - Customer Satisfaction - Transforming Customer Experience, Operational Processes, and Business models - Change Management and its Theories - Vision and Strategies - Role of Leadership in Digital Transformation - Adoption Issues and Implementation Challenges - AR for Maintenance and Training - Predictive Maintenance - Virtual Training - Cobots in Manufacturing - Real-Time Dashboards and Alerts</p> <p>Practical component: 1. Propose a solution to eliminate each waste with industry 4.0 technologies learned and do process mapping.</p>		
<b>UNIT – III</b>	<b>IMPLEMENTING INDUSTRY 4.0 FOR SMART MANUFACTURING, INTRODUCTION TO SMART FACTORIES, ITS USE CASES AND EXAMPLES</b>	<b>3T + 6P</b>
<p>Theory component: Typical Industrial Set-up - Implementing Industry 4.0 - Industry Wise Pain Points and Challenges - Key Performance Indicators in Industries - Connected Manufacturing Solutions: Use Cases and Examples - Connected Supply Chain: Use Cases and Examples - Manufacturing Analytics: Concepts, Examples and Use Cases</p> <p>Practical component: 1. Creation of Key Performance Indicator (KPI) Dashboard for an Automotive 2. Manufacturing company. 3. Understand the key KPIs and their calculations. 4. Perform Vertical Integration. 5. Perform conditional monitoring of process and quality parameters. 6. Create a working KPI dashboard based on production data. 7. Create a manufacturing dashboard using Industrial IoT tools</p>		

<b>UNIT – IV</b>	<b>IMPACT OF INDUSTRY 4.0 ON ENVIRONMENT &amp; SUSTAINABILITY AND OVERVIEW OF DIGITAL TWINS</b>	<b>3T + 6P</b>
Theory component: Environmental Management in Industry 4.0 - Technologies for Environmental Management - Challenges in Implementing Industry 4.0 for Environment and Sustainability - Introduction to Digital Twins and Their Functions - Role of Digital Twins in Smart Manufacturing - Digital Twins Built on IoT Platform - Implementation of Digital Twins - Applications of Digital Twins in Automotive Industry - Future Trends Practical component: 1. Hands-on project demo using IOT platform that mimics the real world scenario.		
<b>UNIT – V</b>	<b>SMART MACHINES AND DIGITAL INDUSTRY TRANSFORMATION</b>	<b>3T + 6P</b>
Theory component: Introduction to Smart Machines - Evolution of Smart Machines - Building Blocks of Smart Machines - Sensors and Signal Processing - Controllers in Smart Machines - Smart Machines and Future Technology - Product Life Cycle Management - Material Requirement Planning - Manufacturing Process Management - Manufacturing Execution System - Enterprise Resource Planning Practical component: 1. ROI case study 2. Prepare an ROI report based on the Cost of Technology		

**Contact Periods:**

**Lecture: 15 Periods    Tutorial: 0 Periods    Practical: 30 Periods    Total: 45 Periods**

**GOVERNMENT COLLEGE OF TECHNOLOGY, COIMBATORE – 641 013**  
**B.E. ELECTRICAL AND ELECTRONICS ENGINEERING**  
**CBCS 2018 & 2018A REGULATIONS**

**NAAN MUTHALVAN COURSES-(2022-2023)-ODD SEMESTER**

Sl. No.	Course Code	Course Title	CAT	CA Marks	End Sem Marks	Total Marks	Hours/Week			
							L	T	P	C
1	18EVA\$11	AUGMENTED REALITY AND VIRTUAL REALITY DEVELOPMENT (Common to EEE, ECE, EIE, CSE & IT Branches)	VA	100	-	100	1	0	2	2
2	18EVA\$12	POWERING IOT USING ARDUINO/RASPBERRY PI (Common to MECH, EEE, ECE, PRODN & EIE Branches)	VA	100	-	100	1	0	2	2
3	18EVA\$13	ELECTRIC VEHICLE CHARGING SYSTEM (Common to EEE & PRODN Branches)	VA	100	-	100	1	0	2	2
4	18EVA\$14	SMART ENERGY GRID	VA	100	-	100	2	0	0	2
5	18EVA\$15	MACHINE LEARNING (Common to MECH, EEE, ECE, PRODN & IBT Branches)	VA	100	-	100	1	0	2	2
6	18EVA\$16	INDUSTRY 4.0 (Common to MECH, EEE & PRODN Branches)	VA	100	-	100	1	0	2	2
7	18EVA\$17	MICROSOFT OFFICE FUNDAMENTALS (Common to all Branches)	VA	100	-	100	1	0	2	2

18EVA\$11	<b>AUGMENTED REALITY AND VIRTUAL REALITY DEVELOPMENT</b> (Common to EEE, ECE, EIE, CSE & IT Branches)					
<b>PREREQUISITES</b>		<b>CATEGORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
NIL		VA	1	0	2	2

  

<b>UNIT – I</b>	<b>Fundamentals of AR VR</b>	<b>3T + 6P</b>
<b>Theory component:</b> Fundamental AR VR concepts and characteristics, Nature of virtuality, introduced to AR VR hardware and software, AR VR applications across different industries, Introduction to Metaverse, Digital twin, Web3.0, NFT, Blockchain & Crypto currencies. <b>Lab component:</b> <ol style="list-style-type: none"> <li>Experience VR AR MR and its production tools</li> <li>Introduction to Unity</li> </ol>		
<b>UNIT – II</b>	<b>INTERACTIVE MEDIA DEVELOPMENT</b>	<b>3T + 6P</b>
<b>Theory component:</b> Taxonomy of Interactive Applications - immersive nature of AR VR technology - creative storytelling - gaming industry applications - concept for game - building a prototype – Consider Graphic styles and optimisation - communication and collaboration – Digital distribution – google play – iOS Store – Mac store. <b>Practical component:</b> <ol style="list-style-type: none"> <li>Create your first 3D prototype of the AR/VR experience</li> </ol>		
<b>UNIT – III</b>	<b>FUNDAMENTALS FOR REALTIME SCRIPTING ( C# )</b>	<b>3T + 6P</b>
<b>Theory component:</b> Introduction to Variables, Conditions, Loops, Patterns, - Scope of variables – OOPS in Realtime environments – Setting IDE – Scripting vs Programming – Enumeration – Memory management – Program states – Handling exceptions – Device considerations – Input systems – Hardware and Haptics feedback <b>Practical component:</b> <ol style="list-style-type: none"> <li>Learning Realtime programming (c#)</li> </ol>		
<b>UNIT – IV</b>	<b>LEVEL DESIGN FOR AR VR USING UNITY</b>	<b>3T + 6P</b>
<b>Theory component:</b> Basic concepts of Level designing, Level mapping – Level creation techniques – Grey boxing techniques, Focus on the layout and composition – Prioritize assets based on block out – Accessing Unity asset store – importing FBX assets – Building a level for VR/AR, Level Optimization <b>Practical component:</b> <ol style="list-style-type: none"> <li>Level Creation using Unity</li> </ol>		
<b>UNIT – V</b>	<b>SOLUTION DESIGN FOR AR VR</b>	<b>3T + 6P</b>
<b>Theory component:</b> Design process – mood board – design specification document – technical project management – AR architecture & frameworks – ARKit – Arcore – Vuforia – VR architecture & frameworks – HTC – Windows Mixed reality – Oculus – XR and definition – XR over cloud – Emerging trends in AR VR MR <b>Practical component:</b> <ol style="list-style-type: none"> <li>Mini Project on the Selected AR or VR device</li> </ol>		
<b>Contact Periods:</b> <b>Lecture: 15 Periods      Tutorial: 0 Periods      Practical: 30 Periods      Total: 45 Periods</b>		

<b>18EVA\$12</b>	<b>POWERING IOT USING ARDUINO/RASPBERRY PI</b> (Common to MECH, EEE, ECE, PRODN & EIE Branches)
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<b>PREREQUISITES</b>	<b>CATEGORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
NIL	VA	1	0	2	2

<b>UNIT – I</b>	<b>ENABLING TECHNOLOGIES OF IOT</b>	<b>3T + 6P</b>
<b>Theory component:</b> Introduction to Industrial Internet of Things-Enabling Technologies of IoT - a detailed view-Wireless Sensor Networks – Role of BLE Mesh and Wi-Fi Mesh in IoT-Role of Cellular LPWAN (NB-IoT) and Non-Cellular LPWAN (LoRa, LoRaWAN) in IoT. <b>Lab component:</b> <ol style="list-style-type: none"> <li>1. Embedded System design using MCU – ESP32- Usage of GPIO , Analogue Sensors and UART – Arduino Platform</li> <li>2. Design of IoT End node using MCU – ESP32 and Arduino Platform</li> <li>3. Integration of IoT End Node ( ESP32 based ) with ThingSpeak Cloud and deployment of closed loop end-to-end IoT application</li> </ol>		
<b>UNIT – II</b>	<b>IOT PROTOCOLS</b>	<b>3T + 6P</b>
<b>Theory component:</b> Things in IoT and Identification (AIOTI) and Industrial IoT Reference Architecture-IoT Enabling Technologies – Infrastructure, IP Addressing, Network Protocols-IoT Enabling Technologies - Data Connectivity Protocols – MQTT-IoT Enabling Technologies - Data Connectivity Protocols – CoAP-IoT Enabling Technologies - Data Connectivity Protocols - WebSockets <b>Practical component:</b> <ol style="list-style-type: none"> <li>1. Implementation of MQTT protocol using ESP32 as MQTT Client and Free on line MQTT broker</li> <li>2. Implementation of CoAP protocol using ESP32 as CoAP Client and Server</li> <li>3. Implementation of WebSockets using ESP32 as WebSocket Server and browser extension as a WebSocket Client</li> </ol>		
<b>UNIT – III</b>	<b>IOT END AND EDGE NODE DESIGN</b>	<b>3T + 6P</b>
<b>Theory component:</b> Introduction to RPi PICO – An ARM Cortex M series MCU based device as an IoT End Node-Raspberry Pi – HW and Software Platform- Recap and detailed discussion towards application of RPi as End / Edge Device <b>Practical component:</b> <ol style="list-style-type: none"> <li>1. GPIO and Analogue Sensor Interface to RPi PICO using Arduino platform</li> <li>2. Introduction to MicroPython and Embedded Application using MicroPython</li> <li>3. IoT End Node design with ESP32 / RPi PICO and MicroPython for any one Industrial / Smart City Use case</li> <li>4. Interfacing of Analogue sensors to RPi using External ADC like MCP3008 and accumulation</li> </ol>		



<b>UNIT – IV</b>	<b>IOT APPLICATIONS</b>	<b>3T + 6P</b>
<b>Theory component:</b> Introduction to Node Red and Design of IoT workflow using Node Red Dash Board. <b>Practical component:</b> <ol style="list-style-type: none"> <li>1. Introduction to IFTTT and application of IFTTT Services for IoT Applications</li> <li>2. Video streaming and face recognition using ESP32 CAM / RPi with CAM</li> <li>3. Integration of ESP32 as End Device with RPi as Edge Computing Device integrated with Public Cloud - IIoT Real-time Use Case</li> <li>4. IoT Application using Raspberry Pi as Edge device with Node RED and MQTT Broker,</li> </ol>		
<b>UNIT – V</b>	<b>CASE STUDY</b>	<b>3T + 6P</b>
<b>Theory component:</b> IoT Data Analytics and Visualization - Implementation with IIoT and Industrial Real Time use Cases.-IIoT - Design and Deployment - Smart Energy Management System / Smart Water Management System integrated with Smart Cities of India - GIFT-City Model.- IoT use cases – Discussions and Conclusion <b>Practical component:</b> <ol style="list-style-type: none"> <li>1. IoT based Smart Home Simulation using Cisco Packet Tracer</li> </ol>		
<b>Contact Periods:</b> <b>Lecture: 15 Periods      Tutorial: 0 Periods      Practical: 30 Periods      Total: 45 Periods</b>		

<b>18EVA\$13</b>	<b>ELECTRIC VEHICLE CHARGING SYSTEM</b> (Common to EEE & PRODN Branches)
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<b>PREREQUISITES</b>	<b>CATEGORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
NIL	<b>VA</b>	<b>1</b>	<b>0</b>	<b>2</b>	<b>2</b>

<b>UNIT – I</b>	<b>INTRODUCTION TO ELECTRIC VEHICLES &amp; AUTOMATION</b>	<b>3T + 6P</b>
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**Theory component:**

Future of Mobility – Electrification : The Basic Technologies, Electric Vehicles, batteries, EVs Made up of - Charging & Charging Infrastructure, EV & the power systems, Industry Perspective on Applications of Electrification - Electrification Impacts – Vehicle Automation – The Basic Technologies – Automation, Impacts

<b>UNIT – II</b>	<b>EQUIVALENT CIRCUIT CELL MODEL SIMULATION</b>	<b>3T + 6P</b>
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**Theory component:**

Defining an equivalent-circuit model of a Li-ion cell - - Identifying parameters of static model - [- Identifying parameters of dynamic model - Simulating battery packs in different configurations - Co-simulating battery and electric-vehicle load

**Practical/Lab component:**

1. Octave Code to determine static part of ECM – Jupyter notebook used in conjunction
2. Identifying parameters of static model - Jupyter notebook used in conjunction
3. Octave Code to determine dynamic part of an ECM
4. Octave Code to simulate an ECM
5. Octave code to look up model parameter value
6. Octave code to compute OCV
7. ECM to simulate constant voltage
8. ECM to simulate constant power
9. Octave code to simulate PCM's
10. Octave code to simulate SCM's
11. Octave code to co-simulate EV and Battery
12. Tune a Thevenin model using Octave code to match laboratory data set
13. Tune an Rint model using Octave code to match laboratory data set
14. Manually tuning an ESC cell model

<b>UNIT – III</b>	<b>INTRODUCTION TO BATTERY MANAGEMENT SYSTEM</b>	<b>3T + 6P</b>
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**Theory component:**

Battery Boot Camp - lithium-ion cells working - BMS sensing and high-voltage control - BMS design requirements

<b>UNIT – IV</b>	<b>AC MOTOR CONTROL COMPONENTS, MOSFET &amp; BATTERY SOC ESTIMATION</b>	<b>3T + 6P</b>
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**Theory component:**

AC Motor Control Components - Power Semiconductor Switches, Power MOSFETs, MOSFET Gate Drivers, BJTs and IGBTs, More About Switching Loss, Wide Band gap Power Semiconductors – importance of a good SOC estimator - *Linear Kalman filter as a state estimator* - Linear Kalman filter - Cell SOC estimation using an extended Kalman filter - Cell SOC estimation using a sigma-point kalman filter - Improving computational efficiency using the bar-delta method -

**Practical/Lab component:**

1. Voltage based SOC estimation - LAB Exercise & Software Used for Practical Exercise This Jupyter notebook implements voltage-based methods for SOC estimation. This notebook implements two voltage-based SOC-estimation methods. The first one simply looks up cell terminal voltage under load in an OCV from SOC table. The second attempts to compensate for the effects of cell equivalent-series resistance
2. Generating correlated random vector

3. Sample code implementing linear Kalman filter 4. Simple EKF with octave code 5. Preparing to implement EKF on an ECM 6. Octave implementation of EKF to estimate SOC 7. Simple SPKF with Octave code 8. Octave implementation of SPKF to estimate SOC 9. Octave implementation of a bar-delta filter		
<b>UNIT – V</b>	<b>BATTERY STATE-OF –HEALTH (SOH) ESTIMATION &amp; MITIGATION OF HARMONICS</b>	<b>3T + 6P</b>
<p><b>Theory component:</b>  Lithium-ion cell health degrade - Total-least-squares battery-cell capacity estimates - code for the different total-capacity estimators - Introduction to Modeling and Control of Single-Phase Rectifiers and Inverters, Introduction to Grid-Tied Power Electronics, Low Harmonic Rectifiers, CCM and DCM Operation of the Boost Low-Harmonic Rectifier - Control of the PFC Boost Rectifier, Input Voltage Feed forward Compensation, Loss- Free Resistor Model</p> <p><b>Practical/Lab component:</b>  1 Demonstrate estimate cell series resistance  2 Will be able to execute on finding the ordinary least squares solution as a benchmark  3 Execute ordinary-least-squares solution computationally efficient  4 Able to Find the solution to a weighted total-least-squares problem  5 Confidence intervals on least-squares solutions  6 Implement Simplifying the total-least-squares solution for cases having proportional uncertainties  7 Demonstrate Making simplifies solution computationally efficient  8 Finding solution to the AWTLS Problem  9 Write Octave code to estimate cell total capacity  10 Demonstrating Octave code HEV: Scenario 1  11 Demonstrating Octave code HEV: Scenario 2-3  12 Demonstrating Octave code BEV: Scenario 1  13 Demonstrating Octave code BEV: Scenario 2-3  14 Execute Robustness and Speed  15 Will be able to execute A Kalman filter approach to total capacity estimation  16 Access Matlab ; Demonstrate understanding of power factor and harmonics in the context of grid-tied power electronics. Assignment on Universal-Input Boost Low-Harmonic Rectifier  17 Assignment Quiz on DCM Flyback as PFC Rectifier, Demonstrate understanding of operating principles of low-harmonic, power factor correction rectifiers ; Demonstrate ability to model single phase low harmonic rectifiers</p>		
<p><b>Contact Periods:</b>  <b>Lecture: 15 Periods      Tutorial: 0 Periods      Practical: 30 Periods      Total: 45 Periods</b></p>		

## REFERENCES

1	<a href="https://www.coursera.org/learn/people-technology-and-the-future-of-mobility">https://www.coursera.org/learn/people-technology-and-the-future-of-mobility</a>
2	<a href="https://www.coursera.org/learn/equivalent-circuit-cell-model-simulation">https://www.coursera.org/learn/equivalent-circuit-cell-model-simulation</a>
3	<a href="https://www.coursera.org/learn/battery-management-systems">https://www.coursera.org/learn/battery-management-systems</a>
4	<a href="https://www.coursera.org/lecture/motors-circuits-design/5-ac-motor-control-components-Mws6I">https://www.coursera.org/lecture/motors-circuits-design/5-ac-motor-control-components-Mws6I</a>
5	<a href="https://www.coursera.org/lecture/converter-circuits/sect-4-2-2-1-power-mosfets-a1NBr">https://www.coursera.org/lecture/converter-circuits/sect-4-2-2-1-power-mosfets-a1NBr</a>
6	<a href="https://www.coursera.org/learn/battery-state-of-charge">https://www.coursera.org/learn/battery-state-of-charge</a>
7	<a href="https://www.coursera.org/learn/battery-state-of-health">https://www.coursera.org/learn/battery-state-of-health</a>
8	<a href="https://www.coursera.org/learn/modeling-and-control-of-single-phase-rectifiers-and-inverters">https://www.coursera.org/learn/modeling-and-control-of-single-phase-rectifiers-and-inverters</a>

<b>18EVA\$14</b>	<b>SMART ENERGY GRID</b>
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<b>PREREQUISITES</b>	<b>CATEGORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
NIL	<b>VA</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>

<b>UNIT – I</b>	<b>INTRODUCTION TO ELECTRIC POWER SYSTEMS &amp; SMART GRID</b>	<b>6T</b>
<b>Theory component:</b> Basic Electricity – [6 Videos, 2 Readings,6 Quizzes] - Generation, Transmission, & Distribution – [4 Videos, 1 Reading,5 Quizzes] - System Design & Switching – [3 Videos, 1 Reading, 4 Quizzes] - Renewable Energy & Smart Grid Technologies – [4 Videos, 4 Readings & 4]		
<b>UNIT – II</b>	<b>INTRODUCTION ARCHITECTING SMART IOT DEVICES</b>	<b>6T</b>
<b>Theory component:</b> Embedded Systems - [7 Videos,14 Readings ,4 Quizzes] - Problems & Failures of Systems - [6 Videos,20 Readings & 5 Quizzes] - System Life Cycle - [6 Videos, 15 Readings ,4 Quizzes]		
<b>UNIT – III</b>	<b>ARCHITECTING SMART IOT DEVICES</b>	<b>6T</b>
<b>Theory component:</b> Hardware & Software for EmS - [7 Videos, 19 Readings, 5 Quizzes] - RTOS – [6 Videos ,26 Readings & 5 Quizzes] - System finalisation– [6 Videos ,28 Readings & 3 Quizzes ] - Low Power - [6 Videos, 3 Readings,1Quiz]		
<b>UNIT – IV</b>	<b>INTRODUCTION AND PROGRAMMING WITH IOT BOARDS</b>	<b>6T</b>
<b>Theory component:</b> Introduction to IOT - [2 Videos, 2 Quizzes] - Networking Technologies for IOT - [2 Videos, 2 Quizzes] - IOT Programming with Arduino- [ 6 Videos, 2 Quizzes] - IOT Programming with Raspberry Pi - [5 Videos, 3 Quizzes] - IOT Programming with ARTIK Board - [4 Videos, 3 Quizzes]		
<b>UNIT – V</b>	<b>M2M &amp; IOT INTERFACE DESIGN &amp; PROTOCOLS FOR EMBEDDED SYSTEMS</b>	<b>6T</b>
<b>Theory component:</b> Intro Introduction to M2M &IoT- [8 Videos, 1 Reading, 1 Quiz] - Cloud for IOT - [2 Videos, 2 Quizzes] - Communications Protocols- [ 5 Videos, 1 Quiz] - Other Cloud and IoT Elements - [7 Videos, 1 Quiz]		
<b>Contact Periods:</b> <b>Lecture: 30Periods      Tutorial: 0 Periods      Practical: 0 Periods      Total: 30 Periods</b>		

## REFERENCES

1	<a href="https://www.coursera.org/learn/people-technology-and-the-future-of-mobility">https://www.coursera.org/learn/people-technology-and-the-future-of-mobility</a>
2	<a href="https://www.coursera.org/learn/equivalent-circuit-cell-model-simulation">https://www.coursera.org/learn/equivalent-circuit-cell-model-simulation</a>
3	<a href="https://www.coursera.org/learn/battery-management-systems">https://www.coursera.org/learn/battery-management-systems</a>
4	<a href="https://www.coursera.org/lecture/motors-circuits-design/5-ac-motor-control-components-Mws6l">https://www.coursera.org/lecture/motors-circuits-design/5-ac-motor-control-components-Mws6l</a>
5	<a href="https://www.coursera.org/lecture/converter-circuits/sect-4-2-2-1-power-mosfets-a1NBr">https://www.coursera.org/lecture/converter-circuits/sect-4-2-2-1-power-mosfets-a1NBr</a>
6	<a href="https://www.coursera.org/learn/battery-state-of-charge">https://www.coursera.org/learn/battery-state-of-charge</a>
7	<a href="https://www.coursera.org/learn/battery-state-of-health">https://www.coursera.org/learn/battery-state-of-health</a>
8	<a href="https://www.coursera.org/learn/modeling-and-control-of-single-phase-rectifiers-and-inverters">https://www.coursera.org/learn/modeling-and-control-of-single-phase-rectifiers-and-inverters</a>

<b>18EVA\$15</b>	<b>MACHINE LEARNING</b> (Common to MECH, EEE, ECE, PRODN & IBT Branches)
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<b>PREREQUISITES</b>	<b>CATEGORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
NIL	VA	1	0	2	2

<b>UNIT – I</b>	<b>INTRODUCTION TO ARTIFICIAL INTELLIGENCE</b>	<b>3T + 6P</b>
Why AI? - What is AI? - AI in Practice - AI in Business - AI Platforms.		
<b>UNIT – II</b>	<b>INTRODUCTION TO DATA SCIENCE</b>	<b>3T + 6P</b>
Data Science: The Data Revolution - Components of Data Science - Data Science in Action – Conclusion.		
<b>UNIT – III</b>	<b>PYTHON FOR DATA SCIENCE</b>	<b>3T + 6P</b>
Why Python Libraries – NumPy - Introduction to NumPy - Operations on NumPy – Pandas – Introduction to Pandas – Introduction to Pandas Object – Working with datasets – Pandas Plots - Matplotlib – Introduction to Matplotlib – Types of Plots – Scikit-learn – Machine Learning using sklearn. [Practical hands-on exercises using NumPy, Pandas, Matplotlib]		
<b>UNIT – IV</b>	<b>DATA VISUALIZATION USING PYTHON</b>	<b>3T + 6P</b>
Data visualization using Python: Data Visualization: Developing insights from data using Basic Plots using Matplotlib (Box, Scatter, Line, Bar, Pie, Histogram), Statistical analysis using Heatmap, Kernel Density plot using Seaborn, Network Graphs, Choropleth Map Using Plotly, Word Cloud. [Practical hands-on exercises for creating charts]		
<b>UNIT – V</b>	<b>EXPLORE MACHINE LEARNING USING PYTHON</b>	<b>3T + 6P</b>
Introduction to Machine Learning - Regression – Classification – Clustering – Introduction to Artificial Neural Network. [Hands-on Exercises for Practicing Machine Learning Models Using Capstone Project]		
<b>Contact Periods:</b>		
<b>Lecture: 15 Periods      Tutorial: 0 Periods      Practical: 30 Periods      Total: 45 Periods</b>		

## REFERENCES

1	<a href="https://infyspringboard.onwingspan.com/web/en/app/toc/lex_8840337130015322000_shared/overview">https://infyspringboard.onwingspan.com/web/en/app/toc/lex_8840337130015322000_shared/overview</a> (Introduction to AI)
2	<a href="https://infyspringboard.onwingspan.com/web/en/app/toc/lex_12666306402263577000_shared/overview">https://infyspringboard.onwingspan.com/web/en/app/toc/lex_12666306402263577000_shared/overview</a> (Introduction to Data Science)
3	<a href="https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01333063698060902494_shared/overview">https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01333063698060902494_shared/overview</a> (Python for Data Science)
4	<a href="https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0126051913436938241455_shared/overview">https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0126051913436938241455_shared/overview</a> (Data visualization using Python)
5	<a href="https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012600400790749184237_shared/overview">https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012600400790749184237_shared/overview</a> (Explore Machine Learning Using Python)

<b>18EVA\$16</b>	<b>INDUSTRY 4.0</b> (Common to MECH, EEE & PRODN Branches)
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<b>PREREQUISITES</b>	<b>CATEGORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
NIL	VA	1	0	2	2

<b>UNIT – I</b>	<b>INTRODUCTION TO INDUSTRY 4.0, DIGITAL TRANSFORMATION &amp; SMART MANUFACTURING, AND BUILDING BLOCKS OF INDUSTRY 4.0</b>	<b>3T + 6P</b>
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**Theory component:**

Overview of Industry 4.0 and Evolution in Various Industries - Opportunities for Digital Transformation - Traditional Vs Smart Manufacturing - Key Concepts and Drivers for Digital transformation - Industrial Revolutions (1.0 to 4.0) - Additive Manufacturing - Augmented Reality/Virtual Reality - Autonomous Robots - Big Data and Analytics - The Cloud - Horizontal and Vertical System Integration - The Industrial Internet of Things (IIoT) - Digital Twin - Cybersecurity

**Practical component:**

1. Identify various wastes enterprise level in manufacturing organizations and make the list of it and analyze the source of it and list its root causes.

<b>UNIT – II</b>	<b>OPPORTUNITIES IN INDUSTRY 4.0, TRANSFORMATION &amp; CHANGEMANAGEMENT AND KEY USES OF SMART MANUFACTURING</b>	<b>3T + 6P</b>
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**Theory component:**

Risk of Data security - IT Infrastructure - Legacy machines - Operational Excellence - Competitive Edge - Increased Work Safety - Flexible Production - Customer Satisfaction - Transforming Customer Experience, Operational Processes, and Business models - Change Management and its Theories - Vision and Strategies - Role of Leadership in Digital Transformation - Adoption Issues and Implementation Challenges - AR for Maintenance and Training - Predictive Maintenance - Virtual Training - Cobots in Manufacturing - Real-Time Dashboards and Alerts

**Practical component:**

1. Propose a solution to eliminate each waste with industry 4.0 technologies learned and do process mapping.

<b>UNIT – III</b>	<b>IMPLEMENTING INDUSTRY 4.0 FOR SMART MANUFACTURING, INTRODUCTION TO SMART FACTORIES, ITS USE CASES AND EXAMPLES</b>	<b>3T + 6P</b>
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**Theory component:**

Typical Industrial Set-up - Implementing Industry 4.0 - Industry Wise Pain Points and Challenges - Key Performance Indicators in Industries - Connected Manufacturing Solutions: Use Cases and Examples - Connected Supply Chain: Use Cases and Examples - Manufacturing Analytics: Concepts, Examples and Use Cases

**Practical component:**

1. Creation of Key Performance Indicator (KPI) Dashboard for an Automotive
2. Manufacturing company.
3. Understand the key KPIs and their calculations.
4. Perform Vertical Integration.
5. Perform conditional monitoring of process and quality parameters.
6. Create a working KPI dashboard based on production data.
7. Create a manufacturing dashboard using Industrial IoT tools

<b>UNIT – IV</b>	<b>IMPACT OF INDUSTRY 4.0 ON ENVIRONMENT &amp; SUSTAINABILITY AND OVERVIEW OF DIGITAL TWINS</b>	<b>3T + 6P</b>
<b>Theory component:</b> Environmental Management in Industry 4.0 - Technologies for Environmental Management - Challenges in Implementing Industry 4.0 for Environment and Sustainability - Introduction to Digital Twins and Their Functions - Role of Digital Twins in Smart Manufacturing - Digital Twins Built on IoT Platform - Implementation of Digital Twins - Applications of Digital Twins in Automotive Industry - Future Trends <b>Practical component:</b> 1. Hands-on project demo using IOT platform that mimics the real world scenario.		
<b>UNIT – V</b>	<b>SMART MACHINES AND DIGITAL INDUSTRY TRANSFORMATION</b>	<b>3T + 6P</b>
<b>Theory component:</b> Introduction to Smart Machines - Evolution of Smart Machines - Building Blocks of Smart Machines - Sensors and Signal Processing - Controllers in Smart Machines - Smart Machines and Future Technology - Product Life Cycle Management - Material Requirement Planning - Manufacturing Process Management - Manufacturing Execution System - Enterprise Resource Planning <b>Practical component:</b> 1. ROI case study 2. Prepare an ROI report based on the Cost of Technology		
<b>Contact Periods:</b> <b>Lecture: 15 Periods      Tutorial: 0 Periods      Practical: 30 Periods      Total: 45 Periods</b>		

<b>18EVA\$17</b>	<b>MICROSOFT OFFICE FUNDAMENTALS</b> (Common to all Branches)
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<b>PREREQUISITES</b>	<b>CATEGORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
NIL	<b>VA</b>	<b>1</b>	<b>0</b>	<b>2</b>	<b>2</b>

<b>UNIT – I</b>	<b>MICROSOFT EXCEL</b>	<b>3T + 6P</b>
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**Beginners:**

Introduction and importance of Excel - Row, column, cell & range - Formulae: Addition, Subtraction, Multiplication, Division - Copy Formula - Formatting: borders, merge, center cells, wrapping text, inserting rows & columns - Inserting Charts - Freeze pane & Tell Me - Paste a link, Paste Special, Transpose Paste - Page break & preview - Sheet, view, zoom - Ribbon Menu and Templates - Saving Formats and fillers.

**Advanced:**

Cell Reference - Conditional Formatting - Data validation - Dynamic Array - FlashFill - Formatting Lists as Tables - Hyperlinks & Macros - Single and Multilevel Sorting and Removing duplicates - Pivot Table - V lookup.

<b>UNIT – II</b>	<b>MICROSOFT WORD</b>	<b>3T + 6P</b>
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**Beginners:**

Introduction & starting up of Word - Inserting Bullets & Sub bullets - Spelling & Grammars - Reading, Draft and outline view - Layout view - Grouping & Aligning Objects - Using Ruler - Quick parts, Icons & 3D models - Ribbon menu and its features.

**Advanced:**

Find and Replace - Paragraph styles - Inserting Audio, Video files & Online videos - Table of figures - Word Art - Wrapping words around pictures - Banded Row & Column - Saving word.

<b>UNIT – III</b>	<b>MICROSOFT POWERPOINT PRESENTATION</b>	<b>3T + 6P</b>
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**Beginners:**

Importance & Creation of Powerpoint - Working with Slides - Adding text - Creating and Editing Charts - Inserting Shapes, Graphics, Zoom, Icons & 3D Models - Overview of the views: slide sorter, notes page, slide show, presenter - Selecting, Editing, Formatting, Arranging & Grouping of Objects - Cropping & Formatting pictures - Saving Presentation as templates - Tips & Guidelines.

**Advanced:**

Advanced and repeat animation - Creating SmartArt and Flowchart - Tigger - Comments - Eyedropper - Exporting to pdf - Hyperlinking and Transitions - Uploading in One Drive

<b>UNIT – IV</b>	<b>MS ONEDRIVE AND MS TEAMS</b>	<b>3T + 6P</b>
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**One Drive:**

Introduction to One Drive - Files & Folders - Setting up of One Drive - Deleting File/Folder - Set a password - Shared Library - Sharing Access.

**Teams:**

Teams setup - Features: meeting & calling, channels, chat & group chat - Collaborate & File Sharing - Schedule a Call & Meeting - Schedule Assistant - Hosting a webinar - Integrate Applications - Approvals.

<b>UNIT – V</b>	<b>MS OUTLOOK AND MS SHAREPOINT</b>	<b>3T + 6P</b>
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**Outlook:**

Introduction - Setting up of Outlook account - Notification & Navigation - Calendar, task, people Creating tasks & reminder - Features: Rules, Out of offline replies & Working Offline.

**SharePoint:**

Introduction to SharePoint - My Files - My Lists - My News - My Site - Features of SharePoint.

**Contact Periods:**

**Lecture: 15 Periods      Tutorial: 0 Periods      Practical: 30 Periods      Total: 45 Periods**





## REFERENCES

1	<a href="https://in.coursera.org/courses?query=microsoft%20word">https://in.coursera.org/courses?query=microsoft%20word</a>
2	<a href="https://in.coursera.org/learn/microsoft-word-work-smarter">https://in.coursera.org/learn/microsoft-word-work-smarter</a>
3	<a href="https://in.coursera.org/courses?query=microsoft%20excel">https://in.coursera.org/courses?query=microsoft%20excel</a>
4	<a href="https://in.coursera.org/courses?query=advanced%20excel">https://in.coursera.org/courses?query=advanced%20excel</a>
5	<a href="https://in.coursera.org/learn/microsoft-powerpoint-work-smarter">https://in.coursera.org/learn/microsoft-powerpoint-work-smarter</a>
6	<a href="https://in.coursera.org/courses?query=microsoft%20teams">https://in.coursera.org/courses?query=microsoft%20teams</a>
7	<a href="https://www.coursera.org/lecture/microsoft-word-work-smarter/introduction-to-outlook-2AiwB">https://www.coursera.org/lecture/microsoft-word-work-smarter/introduction-to-outlook-2AiwB</a>
8	<a href="https://www.microsoft.com/en-us/p/courseraorg/9nblqgh6dqzs">https://www.microsoft.com/en-us/p/courseraorg/9nblqgh6dqzs</a>

**GOVERNMENT COLLEGE OF TECHNOLOGY, COIMBATORE – 641 013****B.E. ELECTRONICS AND COMMUNICATION ENGINEERING****CBCS 2018 & 2018A REGULATIONS****NAAN MUDHALVAN COURSES – (2022-2023) ODD SEMESTER**

Sl. No.	Course Code	Course Title	CAT	CA Marks	End Sem Marks	Total Marks	Hours/Week			
							L	T	P	C
1	18LVA\$21	POWERING IOT USING ARDUINO/RASPBERRY PI (Common to MECH, EEE, ECE, PRODN & EIE Branches)	VA	100	-	100	1	0	2	2
2	18LVA\$22	AUGMENTED REALITY AND VIRTUAL REALITY DEVELOPMENT (Common to EEE,ECE,EIE,CSE & IT Branches)	VA	100	-	100	1	0	2	2
3	18LVA\$23	CLOUD ESSENTIALS (Common to ECE, EIE,CSE & IT Branches)	VA	100	-	100	1	0	2	2
4	18LVA\$24	CYBER SECURITY (Common to ECE & EIE Branches)	VA	100	-	100	1	0	2	2
5	18LVA\$25	BIG DATA ANALYTICS (Common to ECE,EIE,CSE & IT Branches)	VA	100	-	100	1	0	2	2
6	18LVA\$26	MICROSOFT OFFICE FUNDAMENTALS (Common to all Branches)	VA	100	-	100	1	0	2	2
7	18LVA\$27	MACHINE LEARNING (Common to MECH, EEE, ECE, PRODN & IBT Branches)	VA	100	-	100	1	0	2	2

18LVA\$21	<b>POWERING IOT USING ARDUINO/RASPBERRY PI</b> (Common to MECH, EEE, ECE, PRODN & EIE BRANCHES)
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PREREQUISITES	CATEGORY	L	T	P	C
NIL	VA	1	0	2	2

UNIT – I	ENABLING TECHNOLOGIES OF IOT	3T + 6P
<b>Theory component:</b> Introduction to Industrial Internet of Things-Enabling Technologies of IoT - a detailed view-Wireless Sensor Networks – Role of BLE Mesh and Wi-Fi Mesh in IoT-Role of Cellular LPWAN (NB-IoT) and Non-Cellular LPWAN (LoRa, LoRaWAN) in IoT.		
<b>Lab component:</b> <ol style="list-style-type: none"> <li>1. Embedded System design using MCU – ESP32- Usage of GPIO , Analogue Sensors and UART – Arduino Platform</li> <li>2. Design of IoT End node using MCU – ESP32 and Arduino Platform</li> <li>3. Integration of IoT End Node ( ESP32 based ) with ThingSpeak Cloud and deployment of closed loop end-to-end IoT application</li> </ol>		
UNIT – II	IOT PROTOCOLS	3T + 6P
<b>Theory component:</b> Things in IoT and Identification (AIOTI) and Industrial IoT Reference Architecture-IoT Enabling Technologies – Infrastructure, IP Addressing, Network Protocols-IoT Enabling Technologies - Data Connectivity Protocols – MQTT-IoT Enabling Technologies - Data Connectivity Protocols – CoAP-IoT Enabling Technologies - Data Connectivity Protocols - WebSockets		
<b>Practical component:</b> <ol style="list-style-type: none"> <li>1. Implementation of MQTT protocol using ESP32 as MQTT Client and Free on line MQTT broker</li> <li>2. Implementation of CoAP protocol using ESP32 as CoAP Client and Server</li> <li>3. Implementation of WebSockets using ESP32 as WebSocket Server and browser extension as a WebSocket Client</li> </ol>		
UNIT – III	IOT END AND EDGE NODE DESIGN	3T + 6P
<b>Theory component:</b> Introduction to RPi PICO – An ARM Cortex M series MCU based device as an IoT End Node-Raspberry Pi – HW and Software Platform- Recap and detailed discussion towards application of RPi as End / Edge Device		
<b>Practical component:</b> <ol style="list-style-type: none"> <li>1. GPIO and Analogue Sensor Interface to RPi PICO using Arduino platform</li> <li>2. Introduction to MicroPython and Embedded Application using MicroPython</li> <li>3. IoT End Node design with ESP32 / RPi PICO and MicroPython for any one Industrial / Smart City Use case</li> <li>4. Interfacing of Analogue sensors to RPi using External ADC like MCP3008 and accumulation and display of sensor values in local web server</li> </ol>		

18LVA\$22	<b>AUGMENTED REALITY AND VIRTUAL REALITY DEVELOPMENT (COMMON TO EEE,ECE,EIE,CSE &amp; IT BRANCHES)</b>
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PREREQUISITES	CATEGORY	L	T	P	C
NIL	VA	1	0	2	2

<b>UNIT – I</b>	<b>Fundamentals of AR VR</b>	<b>3T + 6P</b>
<b>Theory component:</b> Fundamental AR VR concepts and characteristics, Nature of virtuality, introduced to AR VR hardware and software, AR VR applications across different industries, Introduction to Metaverse, Digital twin, Web3.0, NFT, Blockchain & Crypto currencies. <b>Lab component:</b> <ol style="list-style-type: none"> <li>Experience VR AR MR and its production tools</li> <li>Introduction to Unity</li> </ol>		
<b>UNIT – II</b>	<b>INTERACTIVE MEDIA DEVELOPMENT</b>	<b>3T + 6P</b>
<b>Theory component:</b> Taxonomy of Interactive Applications - immersive nature of AR VR technology - creative storytelling - gaming industry applications - concept for game - building a prototype – Consider Graphic styles and optimisation - communication and collaboration – Digital distribution – google play – iOS Store – Mac store. <b>Practical component:</b> <ol style="list-style-type: none"> <li>Create your first 3D prototype of the AR/VR experience</li> </ol>		
<b>UNIT – III</b>	<b>FUNDAMENTALS FOR REALTIME SCRIPTING ( C# )</b>	<b>3T + 6P</b>
<b>Theory component:</b> Introduction to Variables, Conditions, Loops, Patterns, - Scope of variables – OOPS in Realtime environments – Setting IDE – Scripting vs Programming – Enumeration – Memory management – Program states – Handling exceptions – Device considerations – Input systems – Hardware and Haptics feedback <b>Practical component:</b> <ol style="list-style-type: none"> <li>Learning Realtime programming (c#)</li> </ol>		
<b>UNIT – IV</b>	<b>LEVEL DESIGN FOR AR VR USING UNITY</b>	<b>3T + 6P</b>
<b>Theory component:</b> Basic concepts of Level designing, Level mapping – Level creation techniques – Grey boxing techniques, Focus on the layout and composition – Prioritize assets based on block out – Accessing Unity asset store – importing FBX assets – Building a level for VR/AR, Level Optimization <b>Practical component:</b> <ol style="list-style-type: none"> <li>Level Creation using Unity</li> </ol>		
<b>UNIT – V</b>	<b>SOLUTION DESIGN FOR AR VR</b>	<b>3T + 6P</b>
<b>Theory component:</b> Design process – mood board – design specification document – technical project management – AR architecture & frameworks – ARKit – Arcore – Vuforia – VR architecture & frameworks – HTC – Windows Mixed reality – Oculus – XR and definition – XR over cloud – Emerging trends in AR VR MR <b>Practical component:</b> <ol style="list-style-type: none"> <li>Mini Project on the Selected AR or VR device</li> </ol>		
<b>Contact Periods:</b> <b>Lecture: 15 Periods      Tutorial: 0 Periods      Practical: 30 Periods      Total: 45 Periods</b>		

<b>18LVA\$23</b>	<b>CLOUD ESSENTIALS (COMMON TO ECE, EIE,CSE &amp; IT BRANCHES)</b>
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**PRE-REQUISITES:** NIL

**Category:** VA

**L T P C**

**1 0 2 2**

<b>UNIT - I : LINUX</b>	<b>3T+6P</b>
Work with various Linux commands Manage and perform user administration Differentiate between IPV4 and IPV6 address.	
<b>UNIT - II : CLOUD COMPUTING FUNDAMENTALS</b>	<b>3T+6P</b>
Explain the concept of Virtualization - Define Cloud Computing - Categorize different Cloud Computing service models - Categorize different Cloud Computing deployment models -Describe AWS Global Infrastructure - Work with AWS CLI - Identity and Access Management.	
<b>UNIT - III : ARCHITECTING CLOUD SOLUTIONS</b>	<b>3T+6P</b>
Create EC2 compute instances Store data into S3 buckets Create a virtual private network - Query data using various database services such as RDS Configure various AWS core services such as EC2, RDS, VPC, S3.	
<b>UNIT - IV : MANAGING CLOUD SOLUTIONS</b>	<b>3T+6P</b>
Monitor various AWS resources using CloudWatch - Perform load balancing and auto scaling -Manage and optimize cloud cost Build resilient and robust cloud architectures.	
<b>UNIT- V : MIGRATING TO CLOUD</b>	<b>3T+6P</b>
Gather information about various on-premise resources using application discovery - Perform homogeneous and heterogeneous database migration to AWS cloud - Migrate on-premise resources to AWS cloud.	

**Contact Periods:**

**Lecture: 15 Periods**

**Tutorial:0 Periods**

**Practical:30 Periods**

**Total:45 Periods**

<b>18LVA\$24</b>	<b>CYBER SECURITY (COMMON TO ECE &amp; EIE BRANCHES)</b>
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**PRE-REQUISITES:** NIL

**Category:** VA

**L T P C**

**1 0 2 2**

<b>UNIT - I : NETWORKING AND WEB TECHNOLOGY</b>	<b>3T+6P</b>
Network Components - Network Basics - Network Communication -Web Technologies TCP/IP - Web Services.	
<b>UNIT - II : INTRODUCTION TO CYBER SECURITY</b>	<b>3T+6P</b>
Recent Cyber Attacks - Cyber Security Concepts - Layers of Cyber Security - Introduction to Application Security - Secure Coding OWASP Top 10 - Coding Practices Secure Design – Closure [Practical demos and code on OWASP vulnerabilities and how to mitigate them].	
<b>UNIT - III : FUNDAMENTALS OF INFORMATION SECURITY &amp; FUNDAMENTALS OF CRYPTOGRAPHY:</b>	<b>3T+6P</b>
Why information security? - What is information security? - Data Security - Network security - Application Security – Closure. Why Cryptography? – Cryptography - Shared Key Cryptography – Illustration - Shared Key Cryptography - Public Key Cryptography – Illustration - Public Key Cryptography – Hashing -Digital Signature – Illustration - Digital Signature - Applications of cryptography – Conclusion [Algorithmic representation of cryptographic methods].	
<b>UNIT - IV : THREAT MODELING &amp; IDENTITY AND ACCESS MANAGEMENT:</b>	<b>3T+6P</b>
Basics of Threat Modeling - Learn Threat Modeling with a Use Case - Tool Walkthrough - MS Threat Modeling Tool – Assignment - Introduction to Identity and Access Management - What next.	
<b>UNIT- V : JAVA SE 11 PROGRAMMER II : SECURE CODING IN JAVA SE 11 APPLICATIONS</b>	<b>3T+6P</b>
Course Overview – Managing Denial of Service – Securing Information – Managing Data Integrity – Accessibility and Extensibility – Securing Objects – Serialization and Deserialization Security – JCA and its Principles – Provider Architecture – Engine Class – Key Pair Generation – Signature Management – Unsecure to Secure Object – Course Summary. [Demos of Secure Coding in Java].	
<b>UNIT- VI : SECURITY STANDARDS AND REGULATIONS:</b>	<b>3T+6P</b>
PCI DSS – ISMS -FIPS and NIST Special Publications – FISMA – GDPR – HIPAA – SOX – Conclusion.	
<b>UNIT- VII : IDENTITY GOVERNANCE AND ADMINISTRATION:</b>	
Need for IGA & basics concepts - IGA Basic Concepts and On boarding - IGA Governance - Identity Administration in IGA - What next?	

**Contact Periods:**

**Lecture:** 15 Periods

**Tutorial:**0 Periods

**Practical:**30 Periods

**Total:**45 Periods

**REFERENCES :**

1	<a href="https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01254512784165273671_shared/overview">https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01254512784165273671_shared/overview</a> (Networking and Web Technology)
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3	<a href="https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01263916424608972842_shared/overview">https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01263916424608972842_shared/overview</a> (Fundamentals of Information security)
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8	<a href="https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0126235884826214402865_shared/overview">https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0126235884826214402865_shared/overview</a> (Security Standards and Regulations)
9	<a href="https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0126428637035806721584_shared/overview">https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0126428637035806721584_shared/overview</a> (Identity Governance and Administration)



<b>18LVA\$25</b>	<b>BIG DATA ANALYTICS (COMMON TO ECE,EIE,CSE &amp; IT BRANCHES)</b>
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**PRE-REQUISITES:** NIL

**Category:** VA

**L T P C**  
**1 0 2 2**

<b>UNIT - I : INTRODUCTION TO BIG DATA &amp; HADOOP</b>	<b>3T+6P</b>
Identify the various types of data Store large amount of data into HDFS Process data using Hadoop Navigate through Hadoop Web UI - Analyse various metrics using Hadoop Web UI Run various Hadoop Terminal Commands Ingest structured data into HDFS using Sqoop.	
<b>UNIT - II : SCALA ESSENTIALS</b>	<b>3T+6P</b>
Perform basic Scala operations Use control structures in Scala Create functions in Scala - Use Collections framework in Scala Write basic programs using Scala Create Classes and objects using Scala Write programs using OOPs concepts.	
<b>UNIT - III : IN MEMORY COMPUTATION FOR BIG DATA</b>	<b>3T+6P</b>
Differentiate between Disk-based and In-memory Processing Systems - Use Spark in Different Deployment Modes - Run Spark applications on Spark shell - Configure Spark properties & view them in Web UI Perform data loading and saving through RDDs Write Spark applications using RDDs concepts - Query structured data inside Spark programs using Spark SQL.	
<b>UNIT - IV : SQL LIKE QUERY PROCESSING ENGINE FOR BIG DATA HIVE</b>	<b>3T+6P</b>
Write Hive Queries & Hive Scripts Execute Hive Queries on top of HDFS Create Dynamic and Static Partitions Create Buckets for Data Sampling Perform various Joins in Hive Perform ETL operations & data analytics using Hive Implement Partitioning, Bucketing, and Indexing in Hive Use various file formats in Hive.	
<b>UNIT- V : REAL TIME BIG DATA PROCESSING</b>	<b>3T+6P</b>
Ingest unstructured data into HDFS using Flume Perform real-time data processing using Spark Work with various Kafka Command Line Tools Create data pipelines using Kafka.	

**Contact Periods:**

**Lecture: 15 Periods      Tutorial:0 Periods      Practical:30 Periods      Total:45 Periods**

<b>18LVA\$26</b>	<b>MICROSOFT OFFICE FUNDAMENTALS (COMMON TO ALL BRANCHES)</b>
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<b>PREREQUISITES</b>	<b>CATEGORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
NIL	VA	1	0	2	2

<b>UNIT – I</b>	<b>MICROSOFT EXCEL</b>	<b>3T + 6P</b>
<b>Beginners:</b>  Introduction and importance of Excel - Row, column, cell & range - Formulae: Addition, Subtraction, Multiplication, Division - Copy Formula - Formatting: borders, merge, center cells, wrapping text, inserting rows & columns - Inserting Charts - Freeze pane & Tell Me - Paste a link, Paste Special, Transpose Paste - Page break & preview - Sheet, view, zoom - Ribbon Menu and Templates - Saving Formats and fillers.		
<b>Advanced:</b>  Cell Reference - Conditional Formatting - Data validation - Dynamic Array - FlashFill - Formatting Lists as Tables - Hyperlinks & Macros - Single and Multilevel Sorting and Removing duplicates - Pivot Table - V lookup.		
<b>UNIT – II</b>	<b>MICROSOFT WORD</b>	<b>3T + 6P</b>
<b>Beginners:</b>  Introduction & starting up of Word - Inserting Bullets & Sub bullets - Spelling & Grammars - Reading, Draft and outline view - Layout view - Grouping & Aligning Objects - Using Ruler - Quick parts, Icons & 3D models - Ribbon menu and it's features.		
<b>Advanced:</b>  Find and Replace - Paragraph styles - Inserting Audio, Video files & Online videos - Table of figures - Word Art - Wrapping words around pictures - Banded Row & Column - Saving word.		
<b>UNIT – III</b>	<b>MICROSOFT POWERPOINT PRESENTATION</b>	<b>3T + 6P</b>
<b>Beginners:</b>  Importance & Creation of Powerpoint - Working with Slides - Adding text - Creating and Editing Charts - Inserting Shapes, Graphics, Zoom, Icons & 3D Models - Overview of the views: slide sorter, notes page, slide show, presenter - Selecting, Editing, Formatting, Arranging & Grouping of Objects - Cropping & Formatting pictures - Saving Presentation as templates - Tips & Guidelines.		
<b>Advanced:</b>		

Advanced and repeat animation- Creating SmartArt and Flowchart - Tigger - Comments - Eyedropper- Exporting to pdf - Hyperlinking and Transitions - Uploading in One Drive		
<b>UNIT – IV</b>	<b>MS ONEDRIVE AND MS TEAMS</b>	<b>3T + 6P</b>
<b>One Drive:</b> Introduction to One Drive - Files & Folders - Setting up of One Drive - Deleting File/Folder - Set a password - Shared Library - Sharing Access. <b>Teams:</b> Teams setup - Features:meeting&calling,channels,chat& group chat -Collaborate &FileSharing - Schedule a Call & Meeting - Schedule Assistant - Hosting a webinar - Integrate Applications - Approvals.		
<b>UNIT – V</b>	<b>MS OUTLOOK AND MS SHAREPOINT</b>	<b>3T + 6P</b>
<b>Outlook:</b> Introduction - Setting up of Outlook account - Notification & Navigation - Calendar, task ,people Creating tasks & reminder - Features: Rules ,Out of offline replies & Working Offline. <b>SharePoint:</b> Introduction to SharePoint - My Files - My Lists - My News - My Site - Features of SharePoint.		
<b>Contact Periods:</b> <b>Lecture: 15 Periods      Tutorial: 0 Periods      Practical: 30 Periods      Total: 45 Periods</b>		

#### REFERENCES

1	<a href="https://in.coursera.org/courses?query=microsoft%20word">https://in.coursera.org/courses?query=microsoft%20word</a>
2	<a href="https://in.coursera.org/learn/microsoft-word-work-smarter">https://in.coursera.org/learn/microsoft-word-work-smarter</a>
3	<a href="https://in.coursera.org/courses?query=microsoft%20excel">https://in.coursera.org/courses?query=microsoft%20excel</a>
4	<a href="https://in.coursera.org/courses?query=advanced%20excel">https://in.coursera.org/courses?query=advanced%20excel</a>
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18LVA\$27	<b>MACHINE LEARNING</b> <b>(COMMON TO MECH, EEE, ECE, PRODN &amp; IBT BRANCHES)</b>
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PREREQUISITES	CATEGORY	L	T	P	C
NIL	VA	1	0	2	2

<b>UNIT – I</b>	<b>INTRODUCTION TO ARTIFICIAL INTELLIGENCE</b>	<b>3T + 6P</b>
Why AI? - What is AI? - AI in Practice - AI in Business - AI Platforms.		
<b>UNIT – II</b>	<b>INTRODUCTION TO DATA SCIENCE</b>	<b>3T + 6P</b>
Data Science: The Data Revolution - Components of Data Science - Data Science in Action – Conclusion.		
<b>UNIT – III</b>	<b>PYTHON FOR DATA SCIENCE</b>	<b>3T + 6P</b>
Why Python Libraries – NumPy - Introduction to NumPy - Operations on NumPy – Pandas – Introduction to Pandas – Introduction to Pandas Object – Working with datasets – Pandas Plots - Matplotlib – Introduction to Matplotlib – Types of Plots – Scikit-learn – Machine Learning using sklearn. [Practical hands-on exercises using NumPy, Pandas, Matplotlib]		
<b>UNIT – IV</b>	<b>DATA VISUALIZATION USING PYTHON</b>	<b>3T + 6P</b>
Data visualization using Python: Data Visualization: Developing insights from data using Basic Plots using Matplotlib (Box, Scatter, Line, Bar, Pie, Histogram), Statistical analysis using Heatmap, Kernel Density plot using Seaborn, Network Graphs, Choropleth Map Using Plotly, Word Cloud. [Practical hands-on exercises for creating charts]		
<b>UNIT – V</b>	<b>EXPLORE MACHINE LEARNING USING PYTHON</b>	<b>3T + 6P</b>
Introduction to Machine Learning - Regression – Classification – Clustering – Introduction to Artificial Neural Network. [Hands-on Exercises for Practicing Machine Learning Models Using Capstone Project]		
<b>Contact Periods:</b>		
<b>Lecture: 15 Periods      Tutorial: 0 Periods      Practical: 30 Periods      Total: 45 Periods</b>		

## REFERENCES

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3	<a href="https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01333063698060902494_shared/overview (Python for Data Science)">https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01333063698060902494_shared/overview (Python for Data Science)</a>
4	<a href="https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0126051913436938241455_shared/overview (Data visualization using Python)">https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0126051913436938241455_shared/overview (Data visualization using Python)</a>
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**GOVERNMENT COLLEGE OF TECHNOLOGY, COIMBATORE – 641 013**  
**B.E.PRODUCTION ENGINEERING**  
**CBCS 2018 & 2018A REGULATIONS**

**NAAN MUTHALVAN COURSES-(2022-2023) ODD SEMESTER**

Sl. No.	Course Code	Course Title	CAT	CA Marks	End Sem Marks	Total Marks	Hours/Week			
							L	T	P	C
1	18PVA\$18	MACHINE LEARNING (Common to MECH, EEE, ECE, PRODN & IBT Branches)	VA	100	-	100	1	0	2	2
2	18PVA\$19	ELECTRIC VEHICLE CHARGING SYSTEM (Common to EEE & PRODN Branches)	VA	100	-	100	1	0	2	2
3	18PVA\$20	POWERING IOT USING ARDUINO/RASPBERRY PI (Common to MECH, EEE, ECE, PRODN & EIE Branches)	VA	100	-	100	1	0	2	2
4	18PVA\$21	ROBOTICS SIMULATION FOR MANUFACTURING (Common to MECH & PRODN Branches)	VA	100	-	100	1	0	2	2
5	18PVA\$22	INDUSTRY 4.0 (Common to MECH, EEE & PRODN Branches)	VA	100	-	100	1	0	2	2
6	18PVA\$23	MICROSOFT OFFICE FUNDAMENTALS (Common to all Branches)	VA	100	-	100	1	0	2	2

<b>18PVA\$18</b>	<b>MACHINE LEARNING</b> <b>(Common to MECH, EEE, ECE, PRODN &amp; IBT Branches)</b>
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<b>PREREQUISITES</b>	<b>CATEGORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
NIL	VA	1	0	2	2

<b>UNIT - I</b>	<b>INTRODUCTION TO ARTIFICIAL INTELLIGENCE</b>	<b>3T + 6P</b>
Why AI? - What is AI? - AI in Practice - AI in Business - AI Platforms.		
<b>UNIT - II</b>	<b>INTRODUCTION TO DATA SCIENCE</b>	<b>3T + 6P</b>
Data Science: The Data Revolution - Components of Data Science - Data Science in Action - Conclusion.		
<b>UNIT - III</b>	<b>PYTHON FOR DATA SCIENCE</b>	<b>3T + 6P</b>
Why Python Libraries - NumPy - Introduction to NumPy - Operations on NumPy - Pandas - Introduction to Pandas - Introduction to Pandas Object - Working with datasets - Pandas Plots - Matplotlib - Introduction to Matplotlib - Types of Plots - Scikit-learn - Machine Learning using sklearn. [Practical hands-on exercises using NumPy, Pandas, Matplotlib]		
<b>UNIT - IV</b>	<b>DATA VISUALIZATION USING PYTHON</b>	<b>3T + 6P</b>
Data visualization using Python: Data Visualization: Developing insights from data using Basic Plots using Matplotlib (Box, Scatter, Line, Bar, Pie, Histogram), Statistical analysis using Heatmap, Kernel Density plot using Seaborn, Network Graphs, Choropleth Map Using Plotly, Word Cloud. [Practical hands-on exercises for creating charts]		
<b>UNIT - V</b>	<b>EXPLORE MACHINE LEARNING USING PYTHON</b>	<b>3T + 6P</b>
Introduction to Machine Learning - Regression - Classification - Clustering - Introduction to Artificial Neural Network. [Hands-on Exercises for Practicing Machine Learning Models Using Capstone Project]		
<b>Contact Periods:</b>		
<b>Lecture: 15 Periods    Tutorial: 0 Periods    Practical: 30 Periods    Total: 45 Periods</b>		

#### REFERENCES

1	<a href="https://infyspringboard.onwingspan.com/web/en/app/toc/lex_8840337130015322000_shared/overview">https://infyspringboard.onwingspan.com/web/en/app/toc/lex_8840337130015322000_shared/overview</a> (Introduction to AI)
2	<a href="https://infyspringboard.onwingspan.com/web/en/app/toc/lex_12666306402263577000_shared/overview">https://infyspringboard.onwingspan.com/web/en/app/toc/lex_12666306402263577000_shared/overview</a> (Introduction to Data Science)
3	<a href="https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01333063698060902494_shared/overview">https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01333063698060902494_shared/overview</a> (Python for Data Science)
4	<a href="https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0126051913436938241455_shared/overview">https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0126051913436938241455_shared/overview</a> (Data visualization using Python)
5	<a href="https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012600400790749184237_shared/overview">https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012600400790749184237_shared/overview</a> (Explore Machine Learning Using Python)

<b>18PVA\$19</b>	<b>ELECTRIC VEHICLE CHARGING SYSTEM</b> (Common to EEE & PRODN Branches)
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<b>PREREQUISITES</b>	<b>CATEGORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
NIL	<b>VA</b>	<b>1</b>	<b>0</b>	<b>2</b>	<b>2</b>

<b>UNIT – I</b>	<b>INTRODUCTION TO ELECTRIC VEHICLES &amp; AUTOMATION</b>	<b>3T + 6P</b>
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**Theory component:**

Future of Mobility – Electrification : The Basic Technologies, Electric Vehicles, batteries, EVs Made up of - Charging & Charging Infrastructure, EV & the power systems, Industry Perspective on Applications of Electrification - Electrification Impacts – Vehicle Automation – The Basic Technologies -- Automation, Impacts

<b>UNIT – II</b>	<b>EQUIVALENT CIRCUIT CELL MODEL SIMULATION</b>	<b>3T + 6P</b>
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**Theory component:**

Defining an equivalent-circuit model of a Li-ion cell - - Identifying parameters of static model - [- Identifying parameters of dynamic model - Simulating battery packs in different configurations - Co-simulating battery and electric-vehicle load

**Practical/Lab component:**

1. Octave Code to determine static part of ECM – Jupyter notebook used in conjunction
2. Identifying parameters of static model - Jupyter notebook used in conjunction
3. Octave Code to determine dynamic part of an ECM
4. Octave Code to simulate an ECM
5. Octave code to look up model parameter value
6. Octave code to compute OCV
7. ECM to simulate constant voltage
8. ECM to simulate constant power
9. Octave code to simulate PCM's
10. Octave code to simulate SCM's
11. Octave code to co-simulate EV and Battery
12. Tune a Thevenin model using Octave code to match laboratory data set
13. Tune an Rint model using Octave code to match laboratory data set
14. Manually tuning an ESC cell model

<b>UNIT – III</b>	<b>INTRODUCTION TO BATTERY MANAGEMENT SYSTEM</b>	<b>3T + 6P</b>
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**Theory component:**

Battery Boot Camp - lithium-ion cells working - BMS sensing and high-voltage control - BMS design requirements

<b>UNIT – IV</b>	<b>AC MOTOR CONTROL COMPONENTS, MOSFET &amp; BATTERY SOC ESTIMATION</b>	<b>3T + 6P</b>
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**Theory component:**

AC Motor Control Components - Power Semiconductor Switches, Power MOSFETs, MOSFET Gate Drivers, BJTs and IGBTs, More About Switching Loss, Wide Band gap Power Semiconductors – importance of a good SOC estimator - *Linear Kalman filter as a state estimator* - Linear Kalman filter - Cell SOC estimation using an extended Kalman filter - Cell SOC estimation using a sigma-point kalman filter - Improving computational efficiency using the bar-delta method -

**Practical/Lab component:**

1. Voltage based SOC estimation - LAB Exercise & Software Used for Practical Exercise This Jupyter notebook implements voltage-based methods for SOC estimation. This notebook implements two voltage-based SOC-estimation methods. The first one simply looks up cell terminal voltage under load in an OCV from SOC table. The second attempts to compensate for the effects of cell equivalent-series resistance
2. Generating correlated random vector
3. Sample code implementing linear Kalman filter

4. Simple EKF with octave code 5. Preparing to implement EKF on an ECM 6. Octave implementation of EKF to estimate SOC 7. Simple SPKF with Octave code 8. Octave implementation of SPKF to estimate SOC 9. Octave implementation of a bar-delta filter		
<b>UNIT – V</b>	<b>BATTERY STATE-OF -HEALTH (SOH) ESTIMATION &amp; MITIGATION OF HARMONICS</b>	<b>3T + 6P</b>
<p><b>Theory component:</b>  Lithium-ion cell health degrade - Total-least-squares battery-cell capacity estimates - code for the different total-capacity estimators - Introduction to Modeling and Control of Single-Phase Rectifiers and Inverters, Introduction to Grid-Tied Power Electronics, Low Harmonic Rectifiers, CCM and DCM Operation of the Boost Low-Harmonic Rectifier - Control of the PFC Boost Rectifier, Input Voltage Feed forward Compensation, Loss- Free Resistor Model</p> <p><b>Practical/Lab component:</b>  1 Demonstrate estimate cell series resistance  2 Will be able to execute on finding the ordinary least squares solution as a benchmark  3 Execute ordinary-least-squares solution computationally efficient  4 Able to Find the solution to a weighted total-least-squares problem  5 Confidence intervals on least-squares solutions  6 Implement Simplifying the total-least-squares solution for cases having proportional uncertainties  7 Demonstrate Making simplifies solution computationally efficient  8 Finding solution to the AWTLs Problem  9 Write Octave code to estimate cell total capacity  10 Demonstrating Octave code HEV: Scenario 1  11 Demonstrating Octave code HEV: Scenario 2-3  12 Demonstrating Octave code BEV: Scenario 1  13 Demonstrating Octave code BEV: Scenario 2-3  14 Execute Robustness and Speed  15 Will be able to execute A Kalman filter approach to total capacity estimation  16 Access Matlab ; Demonstrate understanding of power factor and harmonics in the context of grid-tied power electronics. Assignment on Universal-Input Boost Low-Harmonic Rectifier  17 Assignment Quiz on DCM Flyback as PFC Rectifier, Demonstrate understanding of operating principles of low-harmonic, power factor correction rectifiers ; Demonstrate ability to model single phase low harmonic rectifiers</p>		
<p><b>Contact Periods:</b>  <b>Lecture: 15 Periods      Tutorial: 0 Periods      Practical: 30 Periods      Total: 45 Periods</b></p>		

## REFERENCES

1	<a href="https://www.coursera.org/learn/people-technology-and-the-future-of-mobility">https://www.coursera.org/learn/people-technology-and-the-future-of-mobility</a>
2	<a href="https://www.coursera.org/learn/equivalent-circuit-cell-model-simulation">https://www.coursera.org/learn/equivalent-circuit-cell-model-simulation</a>
3	<a href="https://www.coursera.org/learn/battery-management-systems">https://www.coursera.org/learn/battery-management-systems</a>
4	<a href="https://www.coursera.org/lecture/motors-circuits-design/5-ac-motor-control-components-Mws6I">https://www.coursera.org/lecture/motors-circuits-design/5-ac-motor-control-components-Mws6I</a>
5	<a href="https://www.coursera.org/lecture/converter-circuits/sect-4-2-2-1-power-mosfets-a1NBr">https://www.coursera.org/lecture/converter-circuits/sect-4-2-2-1-power-mosfets-a1NBr</a>
6	<a href="https://www.coursera.org/learn/battery-state-of-charge">https://www.coursera.org/learn/battery-state-of-charge</a>
7	<a href="https://www.coursera.org/learn/battery-state-of-health">https://www.coursera.org/learn/battery-state-of-health</a>
8	<a href="https://www.coursera.org/learn/modeling-and-control-of-single-phase-rectifiers-and-inverters">https://www.coursera.org/learn/modeling-and-control-of-single-phase-rectifiers-and-inverters</a>



18PVA\$20	<b>POWERING IOT USING ARDUINO/RASPBERRY PI (Common to MECH, EEE, ECE, PRODN &amp; EIE Branches)</b>
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PREREQUISITES	CATEGORY	L	T	P	C
NIL	VA	1	0	2	2

UNIT – I	ENABLING TECHNOLOGIES OF IOT	3T + 6P
<b>Theory component:</b> Introduction to Industrial Internet of Things-Enabling Technologies of IoT - a detailed view-Wireless Sensor Networks – Role of BLE Mesh and Wi-Fi Mesh in IoT-Role of Cellular LPWAN (NB-IoT) and Non-Cellular LPWAN (LoRa, LoRaWAN) in IoT. <b>Lab component:</b> <ol style="list-style-type: none"> <li>1. Embedded System design using MCU – ESP32- Usage of GPIO , Analogue Sensors and UART – Arduino Platform</li> <li>2. Design of IoT End node using MCU – ESP32 and Arduino Platform</li> <li>3. Integration of IoT End Node ( ESP32 based ) with ThingSpeak Cloud and deployment of closed loop end-to-end IoT application</li> </ol>		
UNIT – II	IOT PROTOCOLS	3T + 6P
<b>Theory component:</b> Things in IoT and Identification (AIOTI) and Industrial IoT Reference Architecture-IoT Enabling Technologies – Infrastructure, IP Addressing, Network Protocols-IoT Enabling Technologies - Data Connectivity Protocols – MQTT-IoT Enabling Technologies - Data Connectivity Protocols – CoAP-IoT Enabling Technologies - Data Connectivity Protocols - WebSockets <b>Practical component:</b> <ol style="list-style-type: none"> <li>1. Implementation of MQTT protocol using ESP32 as MQTT Client and Free on line MQTT broker</li> <li>2. Implementation of CoAP protocol using ESP32 as CoAP Client and Server</li> <li>3. Implementation of WebSockets using ESP32 as WebSocket Server and browser extension as a WebSocket Client</li> </ol>		
UNIT – III	IOT END AND EDGE NODE DESIGN	3T + 6P
<b>Theory component:</b> Introduction to RPi PICO – An ARM Cortex M series MCU based device as an IoT End Node-Raspberry Pi – HW and Software Platform- Recap and detailed discussion towards application of RPi as End / Edge Device <b>Practical component:</b> <ol style="list-style-type: none"> <li>1. GPIO and Analogue Sensor Interface to RPi PICO using Arduino platform</li> <li>2. Introduction to MicroPython and Embedded Application using MicroPython</li> <li>3. IoT End Node design with ESP32 / RPi PICO and MicroPython for any one Industrial / Smart City Use case</li> <li>4. Interfacing of Analogue sensors to RPi using External ADC like MCP3008 and accumulation and display of sensor values in local web server</li> </ol>		

<b>UNIT – IV</b>	<b>IOT APPLICATIONS</b>	<b>3T + 6P</b>
<b>Theory component:</b> Introduction to Node Red and Design of IoT workflow using Node Red Dash Board. <b>Practical component:</b> <ol style="list-style-type: none"> <li>1. Introduction to IFTTT and application of IFTTT Services for IoT Applications</li> <li>2. Video streaming and face recognition using ESP32 CAM / RPi with CAM</li> <li>3. Integration of ESP32 as End Device with RPi as Edge Computing Device integrated with Public Cloud - IIoT Real-time Use Case</li> <li>4. IoT Application using Raspberry Pi as Edge device with Node RED and MQTT Broker, NodeMCU / ESP32 as a End Device</li> </ol>		
<b>UNIT – V</b>	<b>CASE STUDY</b>	<b>3T + 6P</b>
<b>Theory component:</b> IoT Data Analytics and Visualization - Implementation with IIoT and Industrial Real Time use Cases.- IIoT - Design and Deployment - Smart Energy Management System / Smart Water Management System integrated with Smart Cities of India - GIFT-City Model.- IoT use cases – Discussions and Conclusion <b>Practical component:</b> <ol style="list-style-type: none"> <li>1. IoT based Smart Home Simulation using Cisco Packet Tracer</li> </ol>		
<b>Contact Periods:</b> <b>Lecture: 15 Periods    Tutorial: 0 Periods    Practical: 30 Periods    Total: 45 Periods</b>		

<b>18PVA\$21</b>	<b>ROBOTICS SIMULATION FOR MANUFACTURING (Common to MECH&amp; PRODN Branches)</b>
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**PREREQUISITES**

Nil

**CATEGORY L T P C**

**VA 1 0 2 2**

<b>UNIT- I</b>	<b>INTRODUCTION TO ROBOTICS</b>	<b>3T+6P</b>
Introduction to Robotics - Anatomy of Robot - Robot Configuration - DOF, Cartesian movement, Drive Systems and End Effectors-Sensors in Robotics-Quiz on Industrial Applications of Robots.		
<b>UNIT- II</b>	<b>SPATIAL REPRESENTATION OF OBJECT</b>	<b>3T+6P</b>
Relative Position and Orientation of an Object with respect to a reference-Homogeneous representation of Position and orientation of an Object-Relationship between visual and homogeneous representation of an object using HTM module in RoboAnalyzer-Translation, Transformation, rotation transformations and DH Parameter – Virtual models of Industrial robots		
<b>UNIT- III</b>	<b>KINEMATICS OF ROBOT</b>	<b>3T+6P</b>
Introduction to robot kinematics-Forward Kinematics-Inverse Kinematics-Motion planning of Robots-Joint and Cartesian motion.		
<b>UNIT- IV</b>	<b>DYNAMICS OF ROBOT</b>	<b>3T+6P</b>
Assignment on forward and inverse kinematics - Understanding coordinate frames and transformations - Inverse and forward Dynamics of robots.		
<b>UNIT- V</b>	<b>ANALYSIS OF ROBOT AXIS</b>	<b>3T+6P</b>
Creating robot joint trajectories-Motion planning in cartesian space-Case Study: Workspace analysis of a 6 axis Robot.		

**Contact Periods:**

**Lecture: 30 Periods    Tutorial: 0 Periods    Practical: 15 Periods    Total: 45 Periods**

**TEXT BOOKS:**

1. Richaerd D Klafter, Thomas Achmielewski and Mickael Negin, **"Robotic Engineering – An Integrated Approach"** Prentice Hall India, New Delhi, 2001.
2. M.P.Groover, M.Weiss, R.N. Nageland N. Godrej, **"Industrial Robotics"**, McGraw-Hill Singapore, 2017.

**REFERENCES:**

1. S.R. Deb, **"Robotics Technology and Flexible Automation"**, Tata McGraw-Hill Education, 2009.
2. K. K.AppuKuttan, **"Robotics"**, I K International, 2007.
3. Mark R. Miller; Rex Miller, **"Robots and Robotics: Principles, Systems, and Industrial Applications"**, McGraw-Hill Education, 2017.

18PVA\$22	<b>INDUSTRY 4.0</b> <b>(Common to MECH, EEE &amp; PRODN Branches)</b>
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PREREQUISITES	CATEGORY	L	T	P	C
NIL	VA	1	0	2	2

<b>UNIT - I</b>	<b>INTRODUCTION TO INDUSTRY 4.0, DIGITAL TRANSFORMATION &amp; SMART MANUFACTURING, AND BUILDING BLOCKS OF INDUSTRY 4.0</b>	<b>3T + 6P</b>
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**Theory component:**

Overview of Industry 4.0 and Evolution in Various Industries - Opportunities for Digital Transformation - Traditional Vs Smart Manufacturing - Key Concepts and Drivers for Digital transformation - Industrial Revolutions (1.0 to 4.0) - Additive Manufacturing - Augmented Reality/Virtual Reality - Autonomous Robots - Big Data and Analytics - The Cloud - Horizontal and Vertical System Integration - The Industrial Internet of Things (IIoT) - Digital Twin - Cybersecurity

**Practical component:**

1. Identify various wastes enterprise level in manufacturing organizations and make the list of it and analyze the source of it and list its root causes.

<b>UNIT - II</b>	<b>OPPORTUNITIES IN INDUSTRY 4.0, TRANSFORMATION &amp; CHANGEMANAGEMENT AND KEY USES OF SMART MANUFACTURING</b>	<b>3T + 6P</b>
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**Theory component:**

Risk of Data security - IT Infrastructure - Legacy machines - Operational Excellence - Competitive Edge - Increased Work Safety - Flexible Production - Customer Satisfaction - Transforming Customer Experience, Operational Processes, and Business models - Change Management and its Theories - Vision and Strategies - Role of Leadership in Digital Transformation - Adoption Issues and Implementation Challenges - AR for Maintenance and Training - Predictive Maintenance - Virtual Training - Cobots in Manufacturing - Real-Time Dashboards and Alerts

**Practical component:**

1. Propose a solution to eliminate each waste with industry 4.0 technologies learned and do process mapping.

<b>UNIT - III</b>	<b>IMPLEMENTING INDUSTRY 4.0 FOR SMART MANUFACTURING, INTRODUCTION TO SMART FACTORIES, ITS USE CASES AND EXAMPLES</b>	<b>3T + 6P</b>
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**Theory component:**

Typical Industrial Set-up - Implementing Industry 4.0 - Industry Wise Pain Points and Challenges - Key Performance Indicators in Industries - Connected Manufacturing Solutions: Use Cases and Examples - Connected Supply Chain: Use Cases and Examples - Manufacturing Analytics: Concepts, Examples and Use Cases

**Practical component:**

1. Creation of Key Performance Indicator (KPI) Dashboard for an Automotive
2. Manufacturing company.
3. Understand the key KPIs and their calculations.
4. Perform Vertical Integration.
5. Perform conditional monitoring of process and quality parameters.
6. Create a working KPI dashboard based on production data.
7. Create a manufacturing dashboard using Industrial IoT tools

<b>UNIT – IV</b>	<b>IMPACT OF INDUSTRY 4.0 ON ENVIRONMENT &amp; SUSTAINABILITY AND OVERVIEW OF DIGITAL TWINS</b>	<b>3T + 6P</b>
<b>Theory component:</b> Environmental Management in Industry 4.0 - Technologies for Environmental Management - Challenges in Implementing Industry 4.0 for Environment and Sustainability - Introduction to Digital Twins and Their Functions - Role of Digital Twins in Smart Manufacturing - Digital Twins Built on IoT Platform - Implementation of Digital Twins - Applications of Digital Twins in Automotive Industry - Future Trends <b>Practical component:</b> 1. Hands-on project demo using IOT platform that mimics the real world scenario.		
<b>UNIT – V</b>	<b>SMART MACHINES AND DIGITAL INDUSTRY TRANSFORMATION</b>	<b>3T + 6P</b>
<b>Theory component:</b> Introduction to Smart Machines - Evolution of Smart Machines - Building Blocks of Smart Machines - Sensors and Signal Processing - Controllers in Smart Machines - Smart Machines and Future Technology - Product Life Cycle Management - Material Requirement Planning - Manufacturing Process Management - Manufacturing Execution System - Enterprise Resource Planning <b>Practical component:</b> 1. ROI case study 2. Prepare an ROI report based on the Cost of Technology		
<b>Contact Periods:</b> <b>Lecture: 15 Periods    Tutorial: 0 Periods    Practical: 30 Periods    Total: 45 Periods</b>		

<b>18PVA\$23</b>	<b>MICROSOFT OFFICE FUNDAMENTALS (Common to all Branches)</b>
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<b>PREREQUISITES</b>	<b>CATEGORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
NIL	VA	1	0	2	2

<b>UNIT - I</b>	<b>MICROSOFT EXCEL</b>	<b>3T + 6P</b>
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**Beginners:**

Introduction and importance of Excel - Row, column, cell & range - Formulae: Addition, Subtraction, Multiplication, Division - Copy Formula - Formatting: borders, merge, center cells, wrapping text, inserting rows & columns - Inserting Charts - Freeze pane & Tell Me - Paste a link, Paste Special, Transpose Paste - Page break & preview - Sheet, view, zoom - Ribbon Menu and Templates - Saving Formats and fillers.

**Advanced:**

Cell Reference - Conditional Formatting - Data validation - Dynamic Array - FlashFill - Formatting Lists as Tables - Hyperlinks & Macros - Single and Multilevel Sorting and Removing duplicates - Pivot Table - V lookup.

<b>UNIT - II</b>	<b>MICROSOFT WORD</b>	<b>3T + 6P</b>
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**Beginners:**

Introduction & starting up of Word - Inserting Bullets & Sub bullets - Spelling & Grammars - Reading, Draft and outline view - Layout view - Grouping & Aligning Objects - Using Ruler - Quick parts, Icons & 3D models - Ribbon menu and it's features.

**Advanced:**

Find and Replace - Paragraph styles - Inserting Audio, Video files & Online videos - Table of figures - Word Art - Wrapping words around pictures - Banded Row & Column - Saving word.

<b>UNIT - III</b>	<b>MICROSOFT POWERPOINT PRESENTATION</b>	<b>3T + 6P</b>
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**Beginners:**

Importance & Creation of Powerpoint - Working with Slides - Adding text - Creating and Editing Charts - Inserting Shapes, Graphics, Zoom, Icons & 3D Models - Overview of the views: slidesorter, notes page, slide show, presenter - Selecting, Editing, Formatting, Arranging & Grouping of Objects - Cropping & Formatting pictures - Saving Presentation as templates - Tips & Guidelines.

**Advanced:**

Advanced and repeat animation - Creating SmartArt and Flowchart - Tigger - Comments - Eyedropper - Exporting to pdf - Hyperlinking and Transitions - Uploading in One Drive

<b>UNIT - IV</b>	<b>MS ONEDRIVE AND MS TEAMS</b>	<b>3T + 6P</b>
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**One Drive:**

Introduction to One Drive - Files & Folders - Setting up of One Drive - Deleting File/Folder - Set a password - Shared Library - Sharing Access.

**Teams:**

Teams setup - Features: meeting & calling, channels, chat & group chat - Collaborate & File Sharing - Schedule a Call & Meeting - Schedule Assistant - Hosting a webinar - Integrate Applications - Approvals.

<b>UNIT - V</b>	<b>MS OUTLOOK AND MS SHAREPOINT</b>	<b>3T + 6P</b>
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**Outlook:**

Introduction - Setting up of Outlook account - Notification & Navigation - Calendar, task, people - Creating tasks & reminder - Features: Rules, Out of offline replies & Working Offline.

**SharePoint:**

Introduction to SharePoint - My Files - My Lists - My News - My Site - Features of SharePoint.

<b>Contact Periods:</b>
<b>Lecture: 15 Periods      Tutorial: 0 Periods      Practical: 30 Periods      Total: 45 Periods</b>

**REFERENCES**

1	<a href="https://in.coursera.org/courses?query=microsoft%20word">https://in.coursera.org/courses?query=microsoft%20word</a>
2	<a href="https://in.coursera.org/learn/microsoft-word-work-smarter">https://in.coursera.org/learn/microsoft-word-work-smarter</a>
3	<a href="https://in.coursera.org/courses?query=microsoft%20excel">https://in.coursera.org/courses?query=microsoft%20excel</a>
4	<a href="https://in.coursera.org/courses?query=advanced%20excel">https://in.coursera.org/courses?query=advanced%20excel</a>
5	<a href="https://in.coursera.org/learn/microsoft-powerpoint-work-smarter">https://in.coursera.org/learn/microsoft-powerpoint-work-smarter</a>
6	<a href="https://in.coursera.org/courses?query=microsoft%20teams">https://in.coursera.org/courses?query=microsoft%20teams</a>
7	<a href="https://www.coursera.org/lecture/microsoft-word-work-smarter/introduction-to-outlook-">https://www.coursera.org/lecture/microsoft-word-work-smarter/introduction-to-outlook-</a>
8	<a href="https://www.microsoft.com/en-us/p/courseraorg/9nblggh6dgzs">https://www.microsoft.com/en-us/p/courseraorg/9nblggh6dgzs</a>

**GOVERNMENT COLLEGE OF TECHNOLOGY, COIMBATORE – 641 013**  
**B.E.ELECTRONICS AND INSTRUMENTATION ENGINEERING**  
**CBCS 2018 & 2018A REGULATIONS**

**NAAN MUTHALVAN COURSES-(2022-2023) ODD SEMESTER**

Sl. No.	Course Code	Course Title	CAT	CA Marks	End Sem Marks	Total Marks	Hours/Week			
							L	T	P	C
1	18NVA\$05	POWERING IOT USING ARDUINO/RASPBERRY PI (Common to MECH, EEE, ECE, PRODN & EIE Branches)	VA	100	-	100	1	0	2	2
2	18NVA\$06	AUGMENTED REALITY AND VIRTUAL REALITY DEVELOPMENT (Common to EEE, ECE, EIE, CSE & IT Branches)	VA	100	-	100	1	0	2	2
3	18NVA\$07	CLOUD ESSENTIALS (Common to ECE, EIE, CSE & IT Branches)	VA	100	-	100	1	0	2	2
4	18NVA\$08	CYBER SECURITY (Common to ECE & EIE Branches)	VA	100	-	100	1	0	2	2
5	18NVA\$09	BIG DATA ANALYTICS (Common to ECE, EIE, CSE & IT Branches)	VA	100	-	100	1	0	2	2
6	18NVA\$10	MICROSOFT OFFICE FUNDAMENTALS (Common to all Branches)	VA	100	-	100	1	0	2	2



<b>18NVA\$05</b>	<b>POWERING IOT USING ARDUINO/RASPBERRY PI (Common to MECH, EEE, ECE, PRODN &amp; EIE Branches)</b>
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<b>PREREQUISITES</b>	<b>CATEGORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
NIL	<b>VA</b>	<b>1</b>	<b>0</b>	<b>2</b>	<b>2</b>

<b>UNIT – I</b>	<b>ENABLING TECHNOLOGIES OF IOT</b>	<b>3T + 6P</b>
<b>Theory component:</b> Introduction to Industrial Internet of Things-Enabling Technologies of IoT - a detailed view-Wireless Sensor Networks – Role of BLE Mesh and Wi-Fi Mesh in IoT-Role of Cellular LPWAN (NB-IoT) and Non-Cellular LPWAN (LoRa, LoRaWAN) in IoT. <b>Lab component:</b> <ol style="list-style-type: none"> <li>1. Embedded System design using MCU – ESP32- Usage of GPIO , Analogue Sensors and UART – Arduino Platform</li> <li>2. Design of IoT End node using MCU – ESP32 and Arduino Platform</li> <li>3. Integration of IoT End Node ( ESP32 based ) with ThingSpeak Cloud and deployment of closed loop end-to-end IoT application</li> </ol>		
<b>UNIT – II</b>	<b>IOT PROTOCOLS</b>	<b>3T + 6P</b>
<b>Theory component:</b> Things in IoT and Identification (AIOTI) and Industrial IoT Reference Architecture-IoT Enabling Technologies – Infrastructure, IP Addressing, Network Protocols-IoT Enabling Technologies - Data Connectivity Protocols – MQTT-IoT Enabling Technologies - Data Connectivity Protocols – CoAP-IoT Enabling Technologies - Data Connectivity Protocols - WebSockets <b>Practical component:</b> <ol style="list-style-type: none"> <li>1. Implementation of MQTT protocol using ESP32 as MQTT Client and Free on line MQTT broker</li> <li>2. Implementation of CoAP protocol using ESP32 as CoAP Client and Server</li> <li>3. Implementation of WebSockets using ESP32 as WebSocket Server and browser extension as a WebSocket Client</li> </ol>		
<b>UNIT – III</b>	<b>IOT END AND EDGE NODE DESIGN</b>	<b>3T + 6P</b>
<b>Theory component:</b> Introduction to RPi PICO – An ARM Cortex M series MCU based device as an IoT End Node-Raspberry Pi – HW and Software Platform- Recap and detailed discussion towards application of RPi as End / Edge Device <b>Practical component:</b> <ol style="list-style-type: none"> <li>1. GPIO and Analogue Sensor Interface to RPi PICO using Arduino platform</li> <li>2. Introduction to MicroPython and Embedded Application using MicroPython</li> <li>3. IoT End Node design with ESP32 / RPi PICO and MicroPython for any one Industrial / Smart City Use case</li> <li>4. Interfacing of Analogue sensors to RPi using External ADC like MCP3008 and accumulation and display of sensor values in local web server</li> </ol>		

<b>UNIT – IV</b>	<b>IOT APPLICATIONS</b>	<b>3T + 6P</b>
<b>Theory component:</b> Introduction to Node Red and Design of IoT workflow using Node Red Dash Board. <b>Practical component:</b> <ol style="list-style-type: none"> <li>1. Introduction to IFTTT and application of IFTTT Services for IoT Applications</li> <li>2. Video streaming and face recognition using ESP32 CAM / RPi with CAM</li> <li>3. Integration of ESP32 as End Device with RPi as Edge Computing Device integrated with Public Cloud - IIoT Real-time Use Case</li> <li>4. IoT Application using Raspberry Pi as Edge device with Node RED and MQTT Broker, NodeMCU / ESP32 as a End Device</li> </ol>		
<b>UNIT – V</b>	<b>CASE STUDY</b>	<b>3T + 6P</b>
<b>Theory component:</b> IoT Data Analytics and Visualization - Implementation with IIoT and Industrial Real Time use Cases.- IIoT - Design and Deployment - Smart Energy Management System / Smart Water Management System integrated with Smart Cities of India - GIFT-City Model.- IoT use cases – Discussions and Conclusion <b>Practical component:</b> <ol style="list-style-type: none"> <li>1. IoT based Smart Home Simulation using Cisco Packet Tracer</li> </ol>		
<b>Contact Periods:</b> <b>Lecture: 15 Periods    Tutorial: 0 Periods    Practical: 30 Periods    Total: 45 Periods</b>		

18NVA\$06	<b>AUGMENTED REALITY AND VIRTUAL REALITY DEVELOPMENT</b> (Common to EEE, ECE, EIE, CSE & IT Branches)					
<b>PREREQUISITES</b>		<b>CATEGORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
NIL		VA	1	0	2	2
<b>UNIT – I</b>	<b>Fundamentals of AR VR</b>					<b>3T + 6P</b>
<b>Theory component:</b> Fundamental AR VR concepts and characteristics, Nature of virtuality, introduced to AR VR hardware and software, AR VR applications across different industries, Introduction to Metaverse, Digital twin, Web3.0, NFT, Blockchain & Crypto currencies.						
<b>Lab component:</b> 1. Experience VR AR MR and its production tools 2. Introduction to Unity						
<b>UNIT – II</b>	<b>INTERACTIVE MEDIA DEVELOPMENT</b>					<b>3T + 6P</b>
<b>Theory component:</b> Taxonomy of Interactive Applications - immersive nature of AR VR technology - creative storytelling - gaming industry applications - concept for game - building a prototype – Consider Graphic styles and optimisation - communication and collaboration – Digital distribution – google play – iOS Store – Mac store.						
<b>Practical component:</b>						
<b>UNIT – III</b>	<b>FUNDAMENTALS FOR REALTIME SCRIPTING ( C# )</b>					<b>3T + 6P</b>
<b>Theory component:</b> Introduction to Variables, Conditions, Loops, Patterns, - Scope of variables – OOPS in Realtime environments – Setting IDE – Scripting vs Programming – Enumeration – Memory management – Program states – Handling exceptions – Device considerations – Input systems – Hardware and Haptics feedback						
<b>Practical component:</b>						
<b>UNIT – IV</b>	<b>LEVEL DESIGN FOR AR VR USING UNITY</b>					<b>3T + 6P</b>
<b>Theory component:</b> Basic concepts of Level designing, Level mapping – Level creation techniques – Grey boxing techniques, Focus on the layout and composition – Prioritize assets based on block out – Accessing Unity asset store – importing FBX assets – Building a level for VR/AR, Level Optimization						
<b>Practical component:</b>						
1. Level Creation using Unity						
<b>UNIT – V</b>	<b>SOLUTION DESIGN FOR AR VR</b>					<b>3T + 6P</b>
<b>Theory component:</b> Design process – mood board – design specification document – technical project management – AR architecture & frameworks – ARKit – Arcore – Vuforia – VR architecture & frameworks – HTC – Windows Mixed reality – Oculus – XR and definition – XR over cloud – Emerging trends in AR VR MR						
<b>Practical component:</b>						
1. Mini Project on the Selected AR or VR device						
<b>Contact Periods:</b>						
<b>Lecture: 15 Periods      Tutorial: 0 Periods      Practical: 30 Periods      Total: 45 Periods</b>						

<b>18NVA\$07</b>	<b>CLOUD ESSENTIALS</b> <b>(Common to ECE, EIE, CSE &amp; IT Branches)</b>
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**PRE-REQUISITES: NIL**

**Category: VA**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>1</b>	<b>0</b>	<b>2</b>	<b>2</b>

<b>UNIT - I : LINUX</b>	<b>3T+6P</b>
Work with various Linux commands Manage and perform user administration Differentiate between IPV4 and IPV6 address.	
<b>UNIT - II : CLOUD COMPUTING FUNDAMENTALS</b>	<b>3T+6P</b>
Explain the concept of Virtualization - Define Cloud Computing - Categorize different Cloud Computing service models - Categorize different Cloud Computing deployment models -Describe AWS Global Infrastructure - Work with AWS CLI - Identity and Access Management.	
<b>UNIT - III : ARCHITECTING CLOUD SOLUTIONS</b>	<b>3T+6P</b>
Create EC2 compute instances Store data into S3 buckets Create a virtual private network - Query data using various database services such as RDS Configure various AWS core services such as EC2, RDS, VPC, S3.	
<b>UNIT - IV : MANAGING CLOUD SOLUTIONS</b>	<b>3T+6P</b>
Monitor various AWS resources using CloudWatch - Perform load balancing and auto scaling -Manage and optimize cloud cost Build resilient and robust cloud architectures.	
<b>UNIT- V : MIGRATING TO CLOUD</b>	<b>3T+6P</b>
Gather information about various on-premise resources using application discovery - Perform homogeneous and heterogeneous database migration to AWS cloud - Migrate on-premise resources to AWS cloud.	

**Contact Periods:**

<b>Lecture: 15 Period</b>	<b>Tutorial:0 Periods</b>	<b>Practical:30 Periods</b>	<b>Total:45 Periods</b>
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<b>18NVA\$08</b>	<b>CYBER SECURITY (Common to ECE &amp; EIE Branches)</b>
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**PRE-REQUISITES: NIL**

**Category: VA**

**L T P C  
1 0 2 2**

<b>UNIT - I : NETWORKING AND WEB TECHNOLOGY</b>	<b>3T+6P</b>
Network Components - Network Basics - Network Communication -Web Technologies TCP/IP - Web Services.	
<b>UNIT - II : INTRODUCTION TO CYBER SECURITY</b>	<b>3T+6P</b>
Recent Cyber Attacks - Cyber Security Concepts - Layers of Cyber Security - Introduction to Application Security - Secure Coding OWASP Top 10 - Coding Practices Secure Design - Closure [Practical demos and code on OWASP vulnerabilities and how to mitigate them].	
<b>UNIT - III : FUNDAMENTALS OF INFORMATION SECURITY &amp; FUNDAMENTALS OF CRYPTOGRAPHY:</b>	<b>3T+6P</b>
Why information security? - What is information security? - Data Security - Network security - Application Security - Closure. Why Cryptography? - Cryptography - Shared Key Cryptography - Illustration - Shared Key Cryptography - Public Key Cryptography - Illustration - Public Key Cryptography - Hashing -Digital Signature - Illustration - Digital Signature - Applications of cryptography - Conclusion [Algorithmic representation of cryptographic methods].	
<b>UNIT - IV : THREAT MODELING &amp; IDENTITY AND ACCESS</b>	<b>3T+6P</b>
Basics of Threat Modeling - Learn Threat Modeling with a Use Case - Tool Walkthrough - MS Threat Modeling Tool - Assignment - Introduction to Identity and Access Management - What next.	
<b>UNIT- V : JAVA SE 11 PROGRAMMER II : SECURE CODING IN JAVA SE 11</b>	<b>3T+6P</b>
Course Overview - Managing Denial of Service - Securing Information - Managing Data Integrity - Accessibility and Extensibility - Securing Objects - Serialization and Deserialization Security - JCA and its Principles - Provider Architecture - Engine Class - Key Pair Generation - Signature Management - Unsecure to Secure Object - Course Summary. [Demos of Secure Coding in Java].	
<b>UNIT- VI : SECURITY STANDARDS AND REGULATIONS:</b>	<b>3T+6P</b>
PCI DSS - ISMS -FIPS and NIST Special Publications - FISMA - GDPR - HIPAA - SOX - Conclusion.	
<b>UNIT- VII : IDENTITY GOVERNANCE AND ADMINISTRATION:</b>	
Need for IGA & basics concepts - IGA Basic Concepts and On boarding - IGA Governance - Identity Administration in IGA - What next?	

**Contact Periods:**

**Lecture: 15 Periods Tutorial:0 Periods Practical:30Periods Total:45 Periods**

**REFERENCES :**

1	<a href="https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01254512784165273671_shared/overview">https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01254512784165273671_shared/overview</a> (Networking and Web Technology)
2	<a href="https://infyspringboard.onwingspan.com/web/en/app/toc/lex_3388902307073574000_shared/overview">https://infyspringboard.onwingspan.com/web/en/app/toc/lex_3388902307073574000_shared/overview</a> (Introduction to Cyber Security)
3	<a href="https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01263916424608972842_shared/overview">https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01263916424608972842_shared/overview</a> (Fundamentals of Information security)
4	<a href="https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012666884706803712703_shared/overview">https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012666884706803712703_shared/overview</a> (Fundamentals of Cryptography)
5	<a href="https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012608842478059520307_shared/overview">https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012608842478059520307_shared/overview</a> (Threat Modeling)
6	<a href="https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012656885529346048298_shared/overview">https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012656885529346048298_shared/overview</a> (Identity and Access Management)
7	<a href="https://infyspringboard.onwingspan.com/web/en/viewer/html/lex_auth_01350159172969267213125">https://infyspringboard.onwingspan.com/web/en/viewer/html/lex_auth_01350159172969267213125</a> (Java SE 11 Programmer II: Secure Coding in Java SE 11 Applications)
8	<a href="https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0126235884826214402865_shared/overview">https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0126235884826214402865_shared/overview</a> (Security Standards and Regulations)
9	<a href="https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0126428637035806721584_shared/overview">https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0126428637035806721584_shared/overview</a> (Identity Governance and Administration)

<b>18NVA\$09</b>	<b>BIG DATA ANALYTICS</b> <b>(Common to ECE, EIE, CSE &amp; IT Branches)</b>
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**PRE-REQUISITES:** NIL

**Category:** VA

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>1</b>	<b>0</b>	<b>2</b>	<b>2</b>

<b>UNIT - I : INTRODUCTION TO BIG DATA &amp; HADOOP</b>	<b>3T+6P</b>
Identify the various types of data Store large amount of data into HDFS Process data using Hadoop Navigate through Hadoop Web UI - Analyse various metrics using Hadoop Web UI Run various Hadoop Terminal Commands Ingest structured data into HDFS using Sqoop.	
<b>UNIT - II : SCALA ESSENTIALS</b>	<b>3T+6P</b>
Perform basic Scala operations Use control structures in Scala Create functions in Scala - Use Collections framework in Scala Write basic programs using Scala Create Classes and objects using Scala Write programs using OOPs concepts.	
<b>UNIT - III : IN MEMORY COMPUTATION FOR BIG DATA</b>	<b>3T+6P</b>
Differentiate between Disk-based and In-memory Processing Systems - Use Spark in Different Deployment Modes - Run Spark applications on Spark shell - Configure Spark properties & view them in Web UI Perform data loading and saving through RDDs Write Spark applications using RDDs concepts - Query structured data inside Spark programs using Spark SQL.	
<b>UNIT - IV : SQL LIKE QUERY PROCESSING ENGINE FOR BIG DATA</b>	<b>3T+6P</b>
Write Hive Queries & Hive Scripts Execute Hive Queries on top of HDFS Create Dynamic and Static Partitions Create Buckets for Data Sampling Perform various Joins in Hive Perform ETL operations & data analytics using Hive Implement Partitioning, Bucketing, and Indexing in Hive Use various file formats in Hive.	
<b>UNIT- V : REAL TIME BIG DATA PROCESSING</b>	<b>3T+6P</b>
Ingest unstructured data into HDFS using Flume Perform real-time data processing using Spark Work with various Kafka Command Line Tools Create data pipelines using Kafka.	

**Contact Periods:**

**Lecture: 15 Periods    Tutorial:0 Periods    Practical:30 Periods    Total:45 Periods**

18NVA\$10	MICROSOFT OFFICE FUNDAMENTALS (Common to all Branches)							
PREREQUISITES				CATEGORY	L	T	P	C
NIL				VA	1	0	2	2
UNIT – I	MICROSOFT EXCEL					3T + 6P		
<b>Beginners:</b> Introduction and importance of Excel - Row, column, cell & range - Formulae: Addition, Subtraction Multiplication,Division - Copy Formula - Formatting: borders, merge, center cells, wrapping text,inserting rows & columns - Inserting Charts - Freeze pane & Tell Me - Paste a link, Paste Special, Transpose Paste - Page break & preview - Sheet, view, zoom - Ribbon Menu and Templates - Saving Formats and fillers.								
<b>Advanced:</b> Cell Reference - Conditional Formatting - Data validation - Dynamic Array - FlashFill - Formatting Lists as Tables-Hyperlinks & Macros-Single and Multilevel Sorting and Removing duplicates-Pivot Table- V lookup.								
UNIT – II	MICROSOFT WORD					3T + 6P		
<b>Beginners:</b> Introduction & starting up of Word - Inserting Bullets & Sub bullets - Spelling & Grammars - Reading, Draft and outline view - Layout view - Grouping & Aligning Objects - Using Ruler - Quick parts, Icons & 3D models - Ribbon menu and it's features.								
<b>Advanced:</b> Find and Replace - Paragraph styles - Inserting Audio, Video files & Online videos - Table of figures - Word Art - Wrapping words around pictures - Banded Row & Column- Saving word.								
UNIT – III	MICROSOFT POWERPOINT PRESENTATION					3T + 6P		
<b>Beginners:</b> Importance & Creation of Powerpoint- Working with Slides - Adding text - Creating and Editing Charts - Inserting Shapes, Graphics, Zoom, Icons & 3D Models - Overview of the views:slide sorter,notes page, slide show, presenter - Selecting , Editing, Formatting , Arranging & Grouping of Objects-Cropping & Formatting pictures -Saving Presentation as templates- Tips & Guidelines.								
<b>Advanced:</b> Advanced and repeat animation- Creating SmartArt and Flowchart - Tigger - Comments - Eyedropper- Exporting to pdf - Hyperlinking and Transitions - Uploading in One Drive								
UNIT – IV	MS ONEDRIVE AND MS TEAMS					3T + 6P		
<b>One Drive:</b> Introduction to One Drive - Files & Folders - Setting up of One Drive - Deleting File/Folder - Set a password - Shared Library - Sharing Access.								
<b>Teams:</b> Teams setup - Features:meeting&calling,channels,chat& group chat -Collaborate &FileSharing - Schedule a Call & Meeting - Schedule Assistant - Hosting a webinar - Integrate Applications - Approvals.								
UNIT – V	MS OUTLOOK AND MS SHAREPOINT					3T + 6P		
<b>Outlook:</b> Introduction - Setting up of Outlook account - Notification & Navigation - Calendar, task ,people Creating tasks & reminder - Features: Rules ,Out of offline replies & Working Offline.								
<b>SharePoint:</b> Introduction to SharePoint - My Files - My Lists - My News - My Site - Features of SharePoint.								
<b>Contact Periods:</b>								
<b>Lecture: 15 Periods      Tutorial: 0 Periods      Practical: 30 Periods      Total: 45 Periods</b>								



## REFERENCES

1	<a href="https://in.coursera.org/courses?query=microsoft%20word">https://in.coursera.org/courses?query=microsoft%20word</a>
2	<a href="https://in.coursera.org/learn/microsoft-word-work-smarter">https://in.coursera.org/learn/microsoft-word-work-smarter</a>
3	<a href="https://in.coursera.org/courses?query=microsoft%20excel">https://in.coursera.org/courses?query=microsoft%20excel</a>
4	<a href="https://in.coursera.org/courses?query=advanced%20excel">https://in.coursera.org/courses?query=advanced%20excel</a>
5	<a href="https://in.coursera.org/learn/microsoft-powerpoint-work-smarter">https://in.coursera.org/learn/microsoft-powerpoint-work-smarter</a>
6	<a href="https://in.coursera.org/courses?query=microsoft%20teams">https://in.coursera.org/courses?query=microsoft%20teams</a>
7	<a href="https://www.coursera.org/lecture/microsoft-word-work-smarter/introduction-to-outlook-">https://www.coursera.org/lecture/microsoft-word-work-smarter/introduction-to-outlook-</a>
8	<a href="https://www.microsoft.com/en-us/p/courseraorg/9nblggh6dgzs">https://www.microsoft.com/en-us/p/courseraorg/9nblggh6dgzs</a>

**GOVERNMENT COLLEGE OF TECHNOLOGY, COIMBATORE – 641 013**

**B.E.COMPUTER SCIENCE AND ENGINEERING**

**CBCS 2018 & 2018A REGULATIONS**

**NAAN MUDHALVAN COURSES – (2022 – 2023) ODD SEMESTER**

Sl. No.	Course Code	Course Title	CAT	CA Marks	End Sem Marks	Total Marks	Hours/Week			
							L	T	P	C
1	18SVA\$02	Machine Learning with Application to Object Recognition (Common to CSE & IT)	VA	100	-	100	1	0	2	2
2	18SVA\$03	Augmented Reality and Virtual Reality Development (Common to EEE, ECE, EIE, CSE & IT)	VA	100	-	100	1	0	2	2
3	18SVA\$04	Cloud Essentials (Common to ECE, EIE, CSE & IT)	VA	100	-	100	1	0	2	2
4	18SVA\$05	Big Data Analytics (common to ECE, EIE, CSE & IT)	VA	100	-	100	1	0	2	2
5	18SVA\$06	Full Stack (Common to CSE & IT)	VA	100	-	100	2	0	2	3
6	18SVA\$07	Microsoft Office Fundamentals (Common to All Branches)	VA	100	-	100	1	0	2	2

<b>18SVA\$02</b>	<b>MACHINE LEARNING WITH APPLICATION TO OBJECT RECOGNITION</b> (Common to CSE & IT)
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PRE-REQUISITES	CATEGORY	L	T	P	C
NIL	VA	1	0	2	2

<b>Course Objectives</b>	The objective of this course is to provide a view of data science, recognize why data science is gaining importance in today's business world to comprehend where data science can be applied across industry domains to understand major components of data science stack to learn how a data science project is implemented step-by-step in each business use-case.		
<b>UNIT – I</b>	<b>INTRODUCTION TO AI AND DATA SCIENCE</b>	<b>(7 Periods)</b>	
Why AI? - What is AI? - AI in Practice - AI in Business - AI Platforms. Data Science: The Data Revolution - Components of Data Science - Data Science in Action – Conclusion.			
<b>UNIT – II</b>	<b>PYTHON FOR DATA SCIENCE</b>	<b>(14 Periods)</b>	
Why Python Libraries – NumPy - Introduction to NumPy - Operations on NumPy – Pandas – Introduction to Pandas – Introduction to Pandas Object – Working with datasets – Pandas Plots - Matplotlib – Introduction to Matplotlib – Types of Plots – Scikit-learn – Machine Learning using sklearn. [Practical hands-on exercises using NumPy, Pandas, Matplotlib]			
<b>UNIT – III</b>	<b>DATA VISUALIZATION USING PYTHON</b>	<b>(6 Periods)</b>	
Data visualization using Python: Data Visualization: Developing insights from data using Basic Plots using Matplotlib (Box, Scatter, Line, Bar, Pie, Histogram), Statistical analysis using Heatmap, Kernel Density plot using Seaborn, Network Graphs, Choropleth Map Using Plotly, Word Cloud. [Practical hands-on exercises for creating charts]			
<b>UNIT – IV</b>	<b>EXPLORE MACHINE LEARNING USING PYTHON</b>	<b>(15 Periods)</b>	
Introduction to Machine Learning - Regression – Classification – Clustering – Introduction to Artificial Neural Network. [Hands-on Exercises for Practicing Machine Learning Models Using Capstone Project]			
<b>UNIT – V</b>	<b>OBJECT DETECTION AND RECOGNITION USING DEEP LEARNING IN OPENCV</b>	<b>(3 Periods)</b>	
Basic Operations and Algorithms in OpenCV - Object Detection and Recognition Using Features - Deep Learning in OpenCV - Object Classification Using Deep Learning Recognizing Text in an Image.			
<b>Contact Periods:</b>			
<b>Lecture: 15 Periods      Tutorial: 0 Periods      Practical: 30 Periods      Total: 45 Periods</b>			

## REFERENCES:

1. [https://infyspringboard.onwingspan.com/web/en/app/toc/lex\\_8840337130015322000\\_shared/overview](https://infyspringboard.onwingspan.com/web/en/app/toc/lex_8840337130015322000_shared/overview) (Introduction to AI)
2. [https://infyspringboard.onwingspan.com/web/en/app/toc/lex\\_12666306402263577000\\_shared/overview](https://infyspringboard.onwingspan.com/web/en/app/toc/lex_12666306402263577000_shared/overview) (Introduction to Data Science)
3. [https://infyspringboard.onwingspan.com/web/en/app/toc/lex\\_auth\\_01333063698060902494\\_shared/overview](https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01333063698060902494_shared/overview) (Python for Data Science)
4. [https://infyspringboard.onwingspan.com/web/en/app/toc/lex\\_auth\\_0126051913436938241455\\_shared/overview](https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0126051913436938241455_shared/overview) (Data visualization using Python)
5. [https://infyspringboard.onwingspan.com/web/en/app/toc/lex\\_auth\\_012600400790749184237\\_shared/overview](https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012600400790749184237_shared/overview) (Explore Machine Learning)
6. [https://infyspringboard.onwingspan.com/web/en/app/toc/lex\\_auth\\_0130944396404162562520\\_shared/overview](https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0130944396404162562520_shared/overview) (Object Detection and Recognition Using Deep Learning in OpenCV)

18SVA\$03	<b>AUGMENTED REALITY AND VIRTUAL REALITY DEVELOPMENT</b> (Common to EEE,ECE,EIE,CSE & IT)
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PREREQUISITES	CATEGORY	L	T	P	C
NIL	VA	1	0	2	2

<b>UNIT – I</b>	<b>Fundamentals of AR VR</b>	<b>3T + 6P</b>
<b>Theory component:</b> Fundamental AR VR concepts and characteristics, Nature of virtuality, introduced to AR VR hardware and software, AR VR applications across different industries, Introduction to Metaverse, Digital twin, Web3.0, NFT, Blockchain & Crypto currencies. <b>Lab component:</b> <ol style="list-style-type: none"> <li>Experience VR AR MR and its production tools</li> <li>Introduction to Unity</li> </ol>		
<b>UNIT – II</b>	<b>INTERACTIVE MEDIA DEVELOPMENT</b>	<b>3T + 6P</b>
<b>Theory component:</b> Taxonomy of Interactive Applications - immersive nature of AR VR technology - creative storytelling - gaming industry applications - concept for game - building a prototype – Consider Graphic styles and optimisation - communication and collaboration – Digital distribution – google play – iOS Store – Mac store. <b>Practical component:</b> <ol style="list-style-type: none"> <li>Create your first 3D prototype of the AR/VR experience</li> </ol>		
<b>UNIT – III</b>	<b>FUNDAMENTALS FOR REALTIME SCRIPTING ( C# )</b>	<b>3T + 6P</b>
<b>Theory component:</b> Introduction to Variables, Conditions, Loops, Patterns, - Scope of variables – OOPS in Realtime environments – Setting IDE – Scripting vs Programming – Enumeration – Memory management – Program states – Handling exceptions – Device considerations – Input systems – Hardware and Haptics feedback <b>Practical component:</b> <ol style="list-style-type: none"> <li>Learning Realtime programming (c#)</li> </ol>		
<b>UNIT – IV</b>	<b>LEVEL DESIGN FOR AR VR USING UNITY</b>	<b>3T + 6P</b>
<b>Theory component:</b> Basic concepts of Level designing, Level mapping – Level creation techniques – Grey boxing techniques, Focus on the layout and composition – Prioritize assets based on block out – Accessing Unity asset store – importing FBX assets – Building a level for VR/AR, Level Optimization <b>Practical component:</b> <ol style="list-style-type: none"> <li>Level Creation using Unity</li> </ol>		
<b>UNIT – V</b>	<b>SOLUTION DESIGN FOR AR VR</b>	<b>3T + 6P</b>
<b>Theory component:</b> Design process – mood board – design specification document – technical project management – AR architecture & frameworks – ARKit – Arcore – Vuforia – VR architecture & frameworks – HTC – Windows Mixed reality – Oculus – XR and definition – XR over cloud – Emerging trends in AR VR MR <b>Practical component:</b> <ol style="list-style-type: none"> <li>Mini Project on the Selected AR or VR device</li> </ol>		
<b>Contact Periods:</b> <b>Lecture: 15 Periods      Tutorial: 0 Periods      Practical: 30 Periods      Total: 45 Periods</b>		

<b>18SVA\$04</b>	<b>CLOUD ESSENTIALS</b> (Common to ECE,EIE,CSE & IT)
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**PRE-REQUISITES:** NIL

**Category:** VA

**L T P C**

**1 0 2 2**

<b>UNIT - I : LINUX</b>	<b>3T+6P</b>
Work with various Linux commands Manage and perform user administration Differentiate between IPV4 and IPV6 address.	
<b>UNIT - II : CLOUD COMPUTING FUNDAMENTALS</b>	<b>3T+6P</b>
Explain the concept of Virtualization - Define Cloud Computing - Categorize different Cloud Computing service models - Categorize different Cloud Computing deployment models -Describe AWS Global Infrastructure - Work with AWS CLI - Identity and Access Management.	
<b>UNIT - III : ARCHITECTING CLOUD SOLUTIONS</b>	<b>3T+6P</b>
Create EC2 compute instances Store data into S3 buckets Create a virtual private network - Query data using various database services such as RDS Configure various AWS core services such as EC2, RDS, VPC, S3.	
<b>UNIT - IV : MANAGING CLOUD SOLUTIONS</b>	<b>3T+6P</b>
Monitor various AWS resources using CloudWatch - Perform load balancing and auto scaling -Manage and optimize cloud cost Build resilient and robust cloud architectures.	
<b>UNIT- V : MIGRATING TO CLOUD</b>	<b>3T+6P</b>
Gather information about various on-premise resources using application discovery - Perform homogeneous and heterogeneous database migration to AWS cloud - Migrate on-premise resources to AWS cloud.	

**Contact Periods:**

**Lecture: 15 Periods**

**Tutorial:0 Periods**

**Practical:30 Periods**

**Total:45 Periods**

<b>18SVA\$05</b>	<b>BIG DATA ANALYTICS (COMMON TO ECE,EIE,CSE &amp; IT)</b>
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**PRE-REQUISITES:** NIL

**Category:** VA

**L T P C**

**1 0 2 2**

<b>UNIT - I : INTRODUCTION TO BIG DATA &amp; HADOOP</b>	<b>3T+6P</b>
Identify the various types of data Store large amount of data into HDFS Process data using Hadoop Navigate through Hadoop Web UI - Analyse various metrics using Hadoop Web UI Run various Hadoop Terminal Commands Ingest structured data into HDFS using Sqoop.	
<b>UNIT - II : SCALA ESSENTIALS</b>	<b>3T+6P</b>
Perform basic Scala operations Use control structures in Scala Create functions in Scala - Use Collections framework in Scala Write basic programs using Scala Create Classes and objects using Scala Write programs using OOPs concepts.	
<b>UNIT - III : IN MEMORY COMPUTATION FOR BIG DATA</b>	<b>3T+6P</b>
Differentiate between Disk-based and In-memory Processing Systems - Use Spark in Different Deployment Modes - Run Spark applications on Spark shell - Configure Spark properties & view them in Web UI Perform data loading and saving through RDDs Write Spark applications using RDDs concepts - Query structured data inside Spark programs using Spark SQL.	
<b>UNIT - IV : SQL LIKE QUERY PROCESSING ENGINE FOR BIG DATA HIVE</b>	<b>3T+6P</b>
Write Hive Queries & Hive Scripts Execute Hive Queries on top of HDFS Create Dynamic and Static Partitions Create Buckets for Data Sampling Perform various Joins in Hive Perform ETL operations & data analytics using Hive Implement Partitioning, Bucketing, and Indexing in Hive Use various file formats in Hive.	
<b>UNIT- V : REAL TIME BIG DATA PROCESSING</b>	<b>3T+6P</b>
Ingest unstructured data into HDFS using Flume Perform real-time data processing using Spark Work with various Kafka Command Line Tools Create data pipelines using Kafka.	

**Contact Periods:**

**Lecture: 15 Periods**

**Tutorial:0 Periods**

**Practical:30 Periods**

**Total:45 Periods**

<b>18SVA\$06</b>	<b>FULL STACK</b> (Common to CSE & IT)
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<b>PRE-REQUISITES</b>	<b>CATEGORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>NIL</b>	<b>VA</b>	<b>2</b>	<b>0</b>	<b>2</b>	<b>3</b>

<b>Course Objectives</b>	The objective of this course is to provide a view of design principles to present ideas, information, products, and services on websites and how to apply programming principles to the construction of website and effective use of available resources for website projects.		
<b>UNIT – I</b>	<b>ANGULAR</b>	<b>(36 Periods)</b>	
Getting Started with Angular - Angular Development Environment Setup - Creating Components and Modules – Templates – Directives - Data Binding – Pipes - Nested Components – Forms - Services – Routing - Angular Capstone Projects [Hands-on Exercises for Web Application Development Using Capstone Project]			
<b>UNIT – II</b>	<b>NODE.JS AND EXPRESS. JS</b>	<b>(12 Periods)</b>	
Node.js: Why and What Node.js - How to use Node.js - Create a web server in Node.js - Node Package Manager - Modular programming in Node.js - Restarting Node Application - File Operations. Express.js: Express Development Environment - defining a route - Handling Routes - Route and Query Parameters - How Middleware works - Chaining of Middleware's - Types of Middleware's - connecting to MongoDB with Mongoose - Validation Types and Defaults – Models CRUD Operations - API Development - Why Session management – Cookies – Sessions - Why and What Security - Helmet Middleware - Using a Template Engine Middleware - Stylus CSS Pre-processor. [ Hands-on Exercises to practice the topics using problem statements]			
<b>UNIT – III</b>	<b>MONGO DB</b>	<b>(12 Periods)</b>	
MongoDB: Introduction Module Overview- Document Database Overview- Understanding JSON- MongoDB Structure and Architecture- MongoDB Remote Management- Installing MongoDB on the local computer (Mac or Windows)- Introduction to MongoDB Cloud- Create MongoDB Atlas Cluster- GUI tools Overview- Install and Configure MongoDB Compass- Introduction to the MongoDB Shell- MongoDB Shell JavaScript Engine- MongoDB Shell JavaScript Syntax- Introduction to the MongoDB Data Types- Introduction to the CRUD Operations on documents- Create and Delete Databases and Collections- Introduction to MongoDB Queries.[Demos to practice the topics mentioned]			
<b>Contact Periods:</b>			
<b>Lecture: 30 Periods      Tutorial: 0 Periods      Practical: 30 Periods      Total: 60 Periods</b>			

## REFERENCES:

- 1 [https://infyspringboard.onwingspan.com/web/en/app/toc/lex\\_20858515543254600000\\_shared/overview](https://infyspringboard.onwingspan.com/web/en/app/toc/lex_20858515543254600000_shared/overview) (Angular)
- 2 [https://infyspringboard.onwingspan.com/en/app/toc/lex\\_32407835671946760000\\_shared/overview](https://infyspringboard.onwingspan.com/en/app/toc/lex_32407835671946760000_shared/overview) (Node.js & Express.js)
- 3 [https://infyspringboard.onwingspan.com/en/app/toc/lex\\_auth\\_013177169294712832113\\_shared/overview](https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_013177169294712832113_shared/overview) (MongoDB)



<b>18SVA\$07</b>	<b>MICROSOFT OFFICE FUNDAMENTALS (Common to all Branches)</b>
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<b>PREREQUISITES</b>	<b>CATEGORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
NIL	<b>VA</b>	<b>1</b>	<b>0</b>	<b>2</b>	<b>2</b>

<b>UNIT – I</b>	<b>MICROSOFT EXCEL</b>	<b>3T + 6P</b>
<b>Beginners:</b> Introduction and importance of Excel - Row, column, cell & range - Formulae: Addition, Subtraction, Multiplication, Division - Copy Formula - Formatting: borders, merge, center cells, wrapping text, inserting rows & columns - Inserting Charts - Freeze pane & Tell Me - Paste a link, Paste Special, Transpose Paste - Page break & preview - Sheet, view, zoom - Ribbon Menu and Templates - Saving Formats and fillers.		
<b>Advanced:</b> Cell Reference - Conditional Formatting - Data validation - Dynamic Array - FlashFill - Formatting Lists as Tables - Hyperlinks & Macros - Single and Multilevel Sorting and Removing duplicates - Pivot Table - V lookup.		
<b>UNIT – II</b>	<b>MICROSOFT WORD</b>	<b>3T + 6P</b>
<b>Beginners:</b> Introduction & starting up of Word - Inserting Bullets & Sub bullets - Spelling & Grammars - Reading, Draft and outline view - Layout view - Grouping & Aligning Objects - Using Ruler - Quick parts, Icons & 3D models - Ribbon menu and its features.		
<b>Advanced:</b> Find and Replace - Paragraph styles - Inserting Audio, Video files & Online videos - Table of figures - Word Art - Wrapping words around pictures - Banded Row & Column - Saving word.		
<b>UNIT – III</b>	<b>MICROSOFT POWERPOINT PRESENTATION</b>	<b>3T + 6P</b>
<b>Beginners:</b> Importance & Creation of Powerpoint - Working with Slides - Adding text - Creating and Editing Charts - Inserting Shapes, Graphics, Zoom, Icons & 3D Models - Overview of the views: slide sorter, notes page, slide show, presenter - Selecting, Editing, Formatting, Arranging & Grouping of Objects - Cropping & Formatting pictures - Saving Presentation as templates - Tips & Guidelines.		
<b>Advanced:</b> Advanced and repeat animation - Creating SmartArt and Flowchart - Tigger - Comments - Eyedropper - Exporting to pdf - Hyperlinking and Transitions - Uploading in One Drive		

<b>UNIT – IV</b>	<b>MS ONEDRIVE AND MS TEAMS</b>	<b>3T + 6P</b>
<b>One Drive:</b> Introduction to One Drive - Files & Folders - Setting up of One Drive - Deleting File/Folder - Set a password - Shared Library - Sharing Access. <b>Teams:</b> Teams setup - Features:meeting&calling,channels,chat& group chat -Collaborate &FileSharing - Schedule a Call & Meeting - Schedule Assistant - Hosting a webinar - Integrate Applications - Approvals.		
<b>UNIT – V</b>	<b>MS OUTLOOK AND MS SHAREPOINT</b>	<b>3T + 6P</b>
<b>Outlook:</b> Introduction - Setting up of Outlook account - Notification & Navigation - Calendar, task ,people Creating tasks & reminder - Features: Rules ,Out of offline replies & Working Offline. <b>SharePoint:</b> Introduction to SharePoint - My Files - My Lists - My News - My Site - Features of SharePoint.		
<b>Contact Periods:</b> <b>Lecture: 15 Periods      Tutorial: 0 Periods      Practical: 30 Periods      Total: 45 Periods</b>		

## REFERENCES

1	<a href="https://in.coursera.org/courses?query=microsoft%20word">https://in.coursera.org/courses?query=microsoft%20word</a>
2	<a href="https://in.coursera.org/learn/microsoft-word-work-smarter">https://in.coursera.org/learn/microsoft-word-work-smarter</a>
3	<a href="https://in.coursera.org/courses?query=microsoft%20excel">https://in.coursera.org/courses?query=microsoft%20excel</a>
4	<a href="https://in.coursera.org/courses?query=advanced%20excel">https://in.coursera.org/courses?query=advanced%20excel</a>
5	<a href="https://in.coursera.org/learn/microsoft-powerpoint-work-smarter">https://in.coursera.org/learn/microsoft-powerpoint-work-smarter</a>
6	<a href="https://in.coursera.org/courses?query=microsoft%20teams">https://in.coursera.org/courses?query=microsoft%20teams</a>
7	<a href="https://www.coursera.org/lecture/microsoft-word-work-smarter/introduction-to-outlook-2AjwB">https://www.coursera.org/lecture/microsoft-word-work-smarter/introduction-to-outlook-2AjwB</a>
8	<a href="https://www.microsoft.com/en-us/p/courseraorg/9nblggh6dgzs">https://www.microsoft.com/en-us/p/courseraorg/9nblggh6dgzs</a>

**GOVERNMENT COLLEGE OF TECHNOLOGY, COIMBATORE – 641 013**

**B.Tech. INFORMATION TECHNOLOGY**

**CBCS 2018 & 2018A REGULATIONS**

**NAAN MUDHALVAN COURSES – (2022 – 2023) ODD SEMESTER**

Sl. No.	Course Code	Course Title	CAT	CA Marks	End Sem Marks	Total Marks	Hours/Week			
							L	T	P	C
1	18IVA\$13	Machine Learning with Application to Object Recognition (Common to CSE & IT)	VA	100	-	100	1	0	2	2
2	18IVA\$14	Augmented Reality and Virtual Reality Development (Common to EEE, ECE, EIE, CSE & IT)	VA	100	-	100	1	0	2	2
3	18IVA\$15	Cloud Essentials (Common to ECE, EIE, CSE & IT)	VA	100	-	100	1	0	2	2
4	18IVA\$16	Big Data Analytics (common to ECE, EIE, CSE & IT)	VA	100	-	100	1	0	2	2
5	18IVA\$17	Full Stack (Common to CSE & IT)	VA	100	-	100	2	0	2	3
6	18IVA\$18	Microsoft Office Fundamentals (Common to All Branches)	VA	100	-	100	1	0	2	2

<b>18IVA\$13</b>	<b>MACHINE LEARNING WITH APPLICATION TO OBJECT RECOGNITION</b> (Common to CSE & IT)
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<b>PRE-REQUISITES</b>	<b>CATEGORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>NIL</b>	<b>VA</b>	<b>1</b>	<b>0</b>	<b>2</b>	<b>2</b>

<b>Course Objectives</b>	The objective of this course is to provide a view of data science, recognize why data science is gaining importance in today's business world to comprehend where data science can be applied across industry domains to understand major components of data science stack to learn how a data science project is implemented step-by-step in each business use-case.		
<b>UNIT – I</b>	<b>INTRODUCTION TO AI AND DATA SCIENCE</b>	<b>(7 Periods)</b>	
Why AI? - What is AI? - AI in Practice - AI in Business - AI Platforms. Data Science: The Data Revolution - Components of Data Science - Data Science in Action – Conclusion.			
<b>UNIT – II</b>	<b>PYTHON FOR DATA SCIENCE</b>	<b>(14 Periods)</b>	
Why Python Libraries – NumPy - Introduction to NumPy - Operations on NumPy – Pandas – Introduction to Pandas – Introduction to Pandas Object – Working with datasets – Pandas Plots - Matplotlib – Introduction to Matplotlib – Types of Plots – Scikit-learn – Machine Learning using sklearn. [Practical hands-on exercises using NumPy, Pandas, Matplotlib]			
<b>UNIT – III</b>	<b>DATA VISUALIZATION USING PYTHON</b>	<b>(6 Periods)</b>	
Data visualization using Python: Data Visualization: Developing insights from data using Basic Plots using Matplotlib (Box, Scatter, Line, Bar, Pie, Histogram), Statistical analysis using Heatmap, Kernel Density plot using Seaborn, Network Graphs, Choropleth Map Using Plotly, Word Cloud. [Practical hands-on exercises for creating charts]			
<b>UNIT – IV</b>	<b>EXPLORE MACHINE LEARNING USING PYTHON</b>	<b>(15 Periods)</b>	
Introduction to Machine Learning - Regression – Classification – Clustering – Introduction to Artificial Neural Network. [Hands-on Exercises for Practicing Machine Learning Models Using Capstone Project]			
<b>UNIT – V</b>	<b>OBJECT DETECTION AND RECOGNITION USING DEEP LEARNING IN OPENCV</b>	<b>(3 Periods)</b>	
Basic Operations and Algorithms in OpenCV - Object Detection and Recognition Using Features - Deep Learning in OpenCV - Object Classification Using Deep Learning Recognizing Text in an Image.			
<b>Contact Periods:</b>			
<b>Lecture: 15 Periods      Tutorial: 0 Periods      Practical: 30 Periods      Total: 45 Periods</b>			

## REFERENCES:

1. [https://infyspringboard.onwingspan.com/web/en/app/toc/lex\\_8840337130015322000\\_shared/overview](https://infyspringboard.onwingspan.com/web/en/app/toc/lex_8840337130015322000_shared/overview) (Introduction to AI)
2. [https://infyspringboard.onwingspan.com/web/en/app/toc/lex\\_12666306402263577000\\_shared/overview](https://infyspringboard.onwingspan.com/web/en/app/toc/lex_12666306402263577000_shared/overview) (Introduction to Data Science)
3. [https://infyspringboard.onwingspan.com/web/en/app/toc/lex\\_auth\\_01333063698060902494\\_shared/overview](https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01333063698060902494_shared/overview) (Python for Data Science)
4. [https://infyspringboard.onwingspan.com/web/en/app/toc/lex\\_auth\\_0126051913436938241455\\_shared/overview](https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0126051913436938241455_shared/overview) (Data visualization using Python)
5. [https://infyspringboard.onwingspan.com/web/en/app/toc/lex\\_auth\\_012600400790749184237\\_shared/overview](https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012600400790749184237_shared/overview) (Explore Machine Learning)
6. [https://infyspringboard.onwingspan.com/web/en/app/toc/lex\\_auth\\_0130944396404162562520\\_shared/overview](https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0130944396404162562520_shared/overview) (Object Detection and Recognition Using Deep Learning in OpenCV)

18IVA\$14	<b>AUGMENTED REALITY AND VIRTUAL REALITY DEVELOPMENT</b> (Common to EEE,ECE,EIE,CSE & IT)
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PREREQUISITES	CATEGORY	L	T	P	C
NIL	VA	1	0	2	2

<b>UNIT – I</b>	<b>Fundamentals of AR VR</b>	<b>3T + 6P</b>
<b>Theory component:</b> Fundamental AR VR concepts and characteristics, Nature of virtuality, introduced to AR VR hardware and software, AR VR applications across different industries, Introduction to Metaverse, Digital twin, Web3.0, NFT, Blockchain & Crypto currencies. <b>Lab component:</b> <ol style="list-style-type: none"> <li>Experience VR AR MR and its production tools</li> <li>Introduction to Unity</li> </ol>		
<b>UNIT – II</b>	<b>INTERACTIVE MEDIA DEVELOPMENT</b>	<b>3T + 6P</b>
<b>Theory component:</b> Taxonomy of Interactive Applications - immersive nature of AR VR technology - creative storytelling - gaming industry applications - concept for game - building a prototype – Consider Graphic styles and optimisation - communication and collaboration – Digital distribution – google play – iOS Store – Mac store. <b>Practical component:</b> <ol style="list-style-type: none"> <li>Create your first 3D prototype of the AR/VR experience</li> </ol>		
<b>UNIT – III</b>	<b>FUNDAMENTALS FOR REALTIME SCRIPTING ( C# )</b>	<b>3T + 6P</b>
<b>Theory component:</b> Introduction to Variables, Conditions, Loops, Patterns, - Scope of variables – OOPS in Realtime environments – Setting IDE – Scripting vs Programming – Enumeration – Memory management – Program states – Handling exceptions – Device considerations – Input systems – Hardware and Haptics feedback <b>Practical component:</b> <ol style="list-style-type: none"> <li>Learning Realtime programming (c#)</li> </ol>		
<b>UNIT – IV</b>	<b>LEVEL DESIGN FOR AR VR USING UNITY</b>	<b>3T + 6P</b>
<b>Theory component:</b> Basic concepts of Level designing, Level mapping – Level creation techniques – Grey boxing techniques, Focus on the layout and composition – Prioritize assets based on block out – Accessing Unity asset store – importing FBX assets – Building a level for VR/AR, Level Optimization <b>Practical component:</b> <ol style="list-style-type: none"> <li>Level Creation using Unity</li> </ol>		
<b>UNIT – V</b>	<b>SOLUTION DESIGN FOR AR VR</b>	<b>3T + 6P</b>
<b>Theory component:</b> Design process – mood board – design specification document – technical project management – AR architecture & frameworks – ARKit – Arcore – Vuforia – VR architecture & frameworks – HTC – Windows Mixed reality – Oculus – XR and definition – XR over cloud – Emerging trends in AR VR MR <b>Practical component:</b> <ol style="list-style-type: none"> <li>Mini Project on the Selected AR or VR device</li> </ol>		
<b>Contact Periods:</b> <b>Lecture: 15 Periods      Tutorial: 0 Periods      Practical: 30 Periods      Total: 45 Periods</b>		

<b>18IVA\$15</b>	<b>CLOUD ESSENTIALS</b> <b>(Common to ECE,EIE,CSE &amp; IT)</b>
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**PRE-REQUISITES:** NIL

**Category:** VA

**L T P C**

**1 0 2 2**

<b>UNIT - I : LINUX</b>	<b>3T+6P</b>
Work with various Linux commands Manage and perform user administration Differentiate between IPV4 and IPV6 address.	
<b>UNIT - II : CLOUD COMPUTING FUNDAMENTALS</b>	<b>3T+6P</b>
Explain the concept of Virtualization - Define Cloud Computing - Categorize different Cloud Computing service models - Categorize different Cloud Computing deployment models -Describe AWS Global Infrastructure - Work with AWS CLI - Identity and Access Management.	
<b>UNIT - III : ARCHITECTING CLOUD SOLUTIONS</b>	<b>3T+6P</b>
Create EC2 compute instances Store data into S3 buckets Create a virtual private network - Query data using various database services such as RDS Configure various AWS core services such as EC2, RDS, VPC, S3.	
<b>UNIT - IV : MANAGING CLOUD SOLUTIONS</b>	<b>3T+6P</b>
Monitor various AWS resources using CloudWatch - Perform load balancing and auto scaling -Manage and optimize cloud cost Build resilient and robust cloud architectures.	
<b>UNIT- V : MIGRATING TO CLOUD</b>	<b>3T+6P</b>
Gather information about various on-premise resources using application discovery - Perform homogeneous and heterogeneous database migration to AWS cloud - Migrate on-premise resources to AWS cloud.	

**Contact Periods:**

**Lecture: 15 Periods**

**Tutorial:0 Periods**

**Practical:30 Periods**

**Total:45 Periods**

<b>18IVA\$16</b>	<b>BIG DATA ANALYTICS (COMMON TO ECE, EIE, CSE &amp; IT)</b>
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**PRE-REQUISITES:** NIL

**Category:** VA

**L T P C**

**1 0 2 2**

<b>UNIT - I : INTRODUCTION TO BIG DATA &amp; HADOOP</b>	<b>3T+6P</b>
Identify the various types of data Store large amount of data into HDFS Process data using Hadoop Navigate through Hadoop Web UI - Analyse various metrics using Hadoop Web UI Run various Hadoop Terminal Commands Ingest structured data into HDFS using Sqoop.	
<b>UNIT - II : SCALA ESSENTIALS</b>	<b>3T+6P</b>
Perform basic Scala operations Use control structures in Scala Create functions in Scala - Use Collections framework in Scala Write basic programs using Scala Create Classes and objects using Scala Write programs using OOPs concepts.	
<b>UNIT - III : IN MEMORY COMPUTATION FOR BIG DATA</b>	<b>3T+6P</b>
Differentiate between Disk-based and In-memory Processing Systems - Use Spark in Different Deployment Modes - Run Spark applications on Spark shell - Configure Spark properties & view them in Web UI Perform data loading and saving through RDDs Write Spark applications using RDDs concepts - Query structured data inside Spark programs using Spark SQL.	
<b>UNIT - IV : SQL LIKE QUERY PROCESSING ENGINE FOR BIG DATA HIVE</b>	<b>3T+6P</b>
Write Hive Queries & Hive Scripts Execute Hive Queries on top of HDFS Create Dynamic and Static Partitions Create Buckets for Data Sampling Perform various Joins in Hive Perform ETL operations & data analytics using Hive Implement Partitioning, Bucketing, and Indexing in Hive Use various file formats in Hive.	
<b>UNIT- V : REAL TIME BIG DATA PROCESSING</b>	<b>3T+6P</b>
Ingest unstructured data into HDFS using Flume Perform real-time data processing using Spark Work with various Kafka Command Line Tools Create data pipelines using Kafka.	

**Contact Periods:**

**Lecture: 15 Periods**

**Tutorial:0 Periods**

**Practical:30 Periods**

**Total:45 Periods**



<b>18IVA\$17</b>	<b>FULL STACK (Common to CSE &amp; IT)</b>
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<b>PRE-REQUISITES</b>	<b>CATEGORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>NIL</b>	<b>VA</b>	<b>2</b>	<b>0</b>	<b>2</b>	<b>3</b>

<b>Course Objectives</b>	The objective of this course is to provide a view of design principles to present ideas, information, products, and services on websites and how to apply programming principles to the construction of website and effective use of available resources for website projects.		
<b>UNIT – I</b>	<b>ANGULAR</b>	<b>(36 Periods)</b>	
Getting Started with Angular - Angular Development Environment Setup - Creating Components and Modules – Templates – Directives - Data Binding – Pipes - Nested Components – Forms - Services – Routing - Angular Capstone Projects [Hands-on Exercises for Web Application Development Using Capstone Project]			
<b>UNIT – II</b>	<b>NODE.JS AND EXPRESS. JS</b>	<b>(12 Periods)</b>	
Node.js: Why and What Node.js - How to use Node.js - Create a web server in Node.js - Node Package Manager - Modular programming in Node.js - Restarting Node Application - File Operations. Express.js: Express Development Environment - defining a route - Handling Routes - Route and Query Parameters - How Middleware works - Chaining of Middleware's - Types of Middleware's - connecting to MongoDB with Mongoose - Validation Types and Defaults – Models CRUD Operations - API Development - Why Session management – Cookies – Sessions - Why and What Security - Helmet Middleware - Using a Template Engine Middleware - Stylus CSS Pre-processor. [ Hands-on Exercises to practice the topics using problem statements]			
<b>UNIT – III</b>	<b>MONGO DB</b>	<b>(12 Periods)</b>	
MongoDB: Introduction Module Overview- Document Database Overview- Understanding JSON- MongoDB Structure and Architecture- MongoDB Remote Management- Installing MongoDB on the local computer (Mac or Windows)- Introduction to MongoDB Cloud- Create MongoDB Atlas Cluster- GUI tools Overview- Install and Configure MongoDB Compass- Introduction to the MongoDB Shell- MongoDB Shell JavaScript Engine- MongoDB Shell JavaScript Syntax- Introduction to the MongoDB Data Types- Introduction to the CRUD Operations on documents- Create and Delete Databases and Collections- Introduction to MongoDB Queries.[Demos to practice the topics mentioned]			
<b>Contact Periods:</b>			
<b>Lecture: 30 Periods      Tutorial: 0 Periods      Practical: 30 Periods      Total: 60 Periods</b>			

## REFERENCES:

- 1 [https://infyspringboard.onwingspan.com/web/en/app/toc/lex\\_20858515543254600000\\_shared/overview](https://infyspringboard.onwingspan.com/web/en/app/toc/lex_20858515543254600000_shared/overview) (Angular)
- 2 [https://infyspringboard.onwingspan.com/en/app/toc/lex\\_32407835671946760000\\_shared/overview](https://infyspringboard.onwingspan.com/en/app/toc/lex_32407835671946760000_shared/overview) (Node.js & Express.js)
- 3 [https://infyspringboard.onwingspan.com/en/app/toc/lex\\_auth\\_013177169294712832113\\_shared/overview](https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_013177169294712832113_shared/overview) (MongoDB)

<b>18IVA\$18</b>	<b>MICROSOFT OFFICE FUNDAMENTALS (Common to All Branches)</b>
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<b>PREREQUISITES</b>	<b>CATEGORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
NIL	<b>VA</b>	<b>1</b>	<b>0</b>	<b>2</b>	<b>2</b>

<b>UNIT – I</b>	<b>MICROSOFT EXCEL</b>	<b>3T + 6P</b>
<b>Beginners:</b> Introduction and importance of Excel - Row, column, cell & range - Formulae: Addition, Subtraction, Multiplication, Division - Copy Formula - Formatting: borders, merge, center cells, wrapping text, inserting rows & columns - Inserting Charts - Freeze pane & Tell Me - Paste a link, Paste Special, Transpose Paste - Page break & preview - Sheet, view, zoom - Ribbon Menu and Templates - Saving Formats and fillers.		
<b>Advanced:</b> Cell Reference - Conditional Formatting - Data validation - Dynamic Array - FlashFill - Formatting Lists as Tables - Hyperlinks & Macros - Single and Multilevel Sorting and Removing duplicates - Pivot Table - V lookup.		
<b>UNIT – II</b>	<b>MICROSOFT WORD</b>	<b>3T + 6P</b>
<b>Beginners:</b> Introduction & starting up of Word - Inserting Bullets & Sub bullets - Spelling & Grammars - Reading, Draft and outline view - Layout view - Grouping & Aligning Objects - Using Ruler - Quick parts, Icons & 3D models - Ribbon menu and its features.		
<b>Advanced:</b> Find and Replace - Paragraph styles - Inserting Audio, Video files & Online videos - Table of figures - Word Art - Wrapping words around pictures - Banded Row & Column - Saving word.		
<b>UNIT – III</b>	<b>MICROSOFT POWERPOINT PRESENTATION</b>	<b>3T + 6P</b>
<b>Beginners:</b> Importance & Creation of Powerpoint - Working with Slides - Adding text - Creating and Editing Charts - Inserting Shapes, Graphics, Zoom, Icons & 3D Models - Overview of the views: slide sorter, notes page, slide show, presenter - Selecting, Editing, Formatting, Arranging & Grouping of Objects - Cropping & Formatting pictures - Saving Presentation as templates - Tips & Guidelines.		
<b>Advanced:</b> Advanced and repeat animation - Creating SmartArt and Flowchart - Tigger - Comments - Eyedropper - Exporting to pdf - Hyperlinking and Transitions - Uploading in One Drive		

<b>UNIT – IV</b>	<b>MS ONEDRIVE AND MS TEAMS</b>	<b>3T + 6P</b>
<b>One Drive:</b> Introduction to One Drive - Files & Folders - Setting up of One Drive - Deleting File/Folder - Set a password - Shared Library - Sharing Access. <b>Teams:</b> Teams setup - Features:meeting&calling,channels,chat& group chat -Collaborate &FileSharing - Schedule a Call & Meeting - Schedule Assistant - Hosting a webinar - Integrate Applications - Approvals.		
<b>UNIT – V</b>	<b>MS OUTLOOK AND MS SHAREPOINT</b>	<b>3T + 6P</b>
<b>Outlook:</b> Introduction - Setting up of Outlook account - Notification & Navigation - Calendar, task ,people Creating tasks & reminder - Features: Rules ,Out of offline replies & Working Offline. <b>SharePoint:</b> Introduction to SharePoint - My Files - My Lists - My News - My Site - Features of SharePoint.		
<b>Contact Periods:</b> <b>Lecture: 15 Periods      Tutorial: 0 Periods      Practical: 30 Periods      Total: 45 Periods</b>		

## REFERENCES

1	<a href="https://in.coursera.org/courses?query=microsoft%20word">https://in.coursera.org/courses?query=microsoft%20word</a>
2	<a href="https://in.coursera.org/learn/microsoft-word-work-smarter">https://in.coursera.org/learn/microsoft-word-work-smarter</a>
3	<a href="https://in.coursera.org/courses?query=microsoft%20excel">https://in.coursera.org/courses?query=microsoft%20excel</a>
4	<a href="https://in.coursera.org/courses?query=advanced%20excel">https://in.coursera.org/courses?query=advanced%20excel</a>
5	<a href="https://in.coursera.org/learn/microsoft-powerpoint-work-smarter">https://in.coursera.org/learn/microsoft-powerpoint-work-smarter</a>
6	<a href="https://in.coursera.org/courses?query=microsoft%20teams">https://in.coursera.org/courses?query=microsoft%20teams</a>
7	<a href="https://www.coursera.org/lecture/microsoft-word-work-smarter/introduction-to-outlook-2AjwB">https://www.coursera.org/lecture/microsoft-word-work-smarter/introduction-to-outlook-2AjwB</a>
8	<a href="https://www.microsoft.com/en-us/p/courseraorg/9nblggh6dgzs">https://www.microsoft.com/en-us/p/courseraorg/9nblggh6dgzs</a>

**GOVERNMENT COLLEGE OF TECHNOLOGY, COIMBATORE – 641 013**

**B.Tech. INDUSTRIAL BIOTECHNOLOGY**

**CBCS 2018 & 2018A REGULATIONS**

**NAAN MUTHALVAN COURSES – (2022 – 2023) ODD SEMESTER**

Sl. No.	Course Code	Course Title	Category	CA Marks	End Sem Marks	Total Marks	Hours/Week			
							L	T	P	C
1	18BVA\$03	Machine Learning (Common to Mech, EEE, ECE, Prod. & IBT branches)	VA	100	-	100	1	0	2	2
2	18BVA\$04	Microsoft Office Fundamentals (Common to all branches)	VA	100	-	100	1	0	2	2

<b>18BVA\$03</b>	<b>MACHINE LEARNING</b> <i>(Common to MECH, EEE, ECE, PRODN &amp; IBT Branches)</i>
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<b>PREREQUISITES</b>	<b>CATEGORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
NIL	VA	1	0	2	2

<b>UNIT – I</b>	<b>INTRODUCTION TO ARTIFICIAL INTELLIGENCE</b>	<b>3T + 6P</b>
Why AI? - What is AI? - AI in Practice - AI in Business - AI Platforms.		
<b>UNIT – II</b>	<b>INTRODUCTION TO DATA SCIENCE</b>	<b>3T + 6P</b>
Data Science: The Data Revolution - Components of Data Science - Data Science in Action – Conclusion.		
<b>UNIT – III</b>	<b>PYTHON FOR DATA SCIENCE</b>	<b>3T + 6P</b>
Why Python Libraries – NumPy - Introduction to NumPy - Operations on NumPy – Pandas – Introduction to Pandas – Introduction to Pandas Object – Working with datasets – Pandas Plots - Matplotlib – Introduction to Matplotlib – Types of Plots – Scikit-learn – Machine Learning using sklearn. [Practical hands-on exercises using NumPy, Pandas, Matplotlib]		
<b>UNIT – IV</b>	<b>DATA VISUALIZATION USING PYTHON</b>	<b>3T + 6P</b>
Data visualization using Python: Data Visualization: Developing insights from data using Basic Plots using Matplotlib (Box, Scatter, Line, Bar, Pie, Histogram), Statistical analysis using Heatmap, Kernel Density plot using Seaborn, Network Graphs, Choropleth Map Using Plotly, Word Cloud. [Practical hands-on exercises for creating charts]		
<b>UNIT – V</b>	<b>EXPLORE MACHINE LEARNING USING PYTHON</b>	<b>3T + 6P</b>
Introduction to Machine Learning - Regression – Classification – Clustering – Introduction to Artificial Neural Network. [Hands-on Exercises for Practicing Machine Learning Models Using Capstone Project]		
<b>Contact Periods:</b>		
<b>Lecture: 15 Periods      Tutorial: 0 Periods      Practical: 30 Periods      Total: 45 Periods</b>		

## REFERENCES

1	<a href="https://infyspringboard.onwingspan.com/web/en/app/toc/lex_8840337130015322000_shared/overview">https://infyspringboard.onwingspan.com/web/en/app/toc/lex_8840337130015322000_shared/overview</a> (Introduction to AI)
2	<a href="https://infyspringboard.onwingspan.com/web/en/app/toc/lex_12666306402263577000_shared/overview">https://infyspringboard.onwingspan.com/web/en/app/toc/lex_12666306402263577000_shared/overview</a> (Introduction to Data Science)
3	<a href="https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01333063698060902494_shared/overview">https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01333063698060902494_shared/overview</a> (Python for Data Science)
4	<a href="https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0126051913436938241455_shared/overview">https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0126051913436938241455_shared/overview</a> (Data visualization using Python)
5	<a href="https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012600400790749184237_shared/overview">https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012600400790749184237_shared/overview</a> (Explore Machine Learning Using Python)

<b>18BVA\$04</b>	<b>MICROSOFT OFFICE FUNDAMENTALS</b> (Common to all Branches)
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<b>PREREQUISITES</b>	<b>CATEGORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
NIL	VA	1	0	2	2

<b>UNIT – I</b>	<b>MICROSOFT EXCEL</b>	<b>3T + 6P</b>
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**Beginners:**

Introduction and importance of Excel - Row, column, cell & range - Formulae: Addition, Subtraction, Multiplication, Division - Copy Formula - Formatting: borders, merge, center cells, wrapping text, inserting rows & columns - Inserting Charts - Freeze pane & Tell Me - Paste a link, Paste Special, Transpose Paste - Page break & preview - Sheet, view, zoom - Ribbon Menu and Templates - Saving Formats and fillers.

**Advanced:**

Cell Reference - Conditional Formatting - Data validation - Dynamic Array - FlashFill - Formatting Lists as Tables - Hyperlinks & Macros - Single and Multilevel Sorting and Removing duplicates - Pivot Table - V lookup.

<b>UNIT – II</b>	<b>MICROSOFT WORD</b>	<b>3T + 6P</b>
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**Beginners:**

Introduction & starting up of Word - Inserting Bullets & Sub bullets - Spelling & Grammars - Reading, Draft and outline view - Layout view - Grouping & Aligning Objects - Using Ruler - Quick parts, Icons & 3D models - Ribbon menu and its features.

**Advanced:**

Find and Replace - Paragraph styles - Inserting Audio, Video files & Online videos - Table of figures - Word Art - Wrapping words around pictures - Banded Row & Column - Saving word.

<b>UNIT – III</b>	<b>MICROSOFT POWERPOINT PRESENTATION</b>	<b>3T + 6P</b>
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**Beginners:**

Importance & Creation of Powerpoint - Working with Slides - Adding text - Creating and Editing Charts - Inserting Shapes, Graphics, Zoom, Icons & 3D Models - Overview of the views: slidesorter, notes page, slide show, presenter - Selecting, Editing, Formatting, Arranging & Grouping of Objects - Cropping & Formatting pictures - Saving Presentation as templates - Tips & Guidelines.

**Advanced:**

Advanced and repeat animation - Creating SmartArt and Flowchart - Tigger - Comments - Eyedropper - Exporting to pdf - Hyperlinking and Transitions - Uploading in One Drive

<b>UNIT – IV</b>	<b>MS ONEDRIVE AND MS TEAMS</b>	<b>3T + 6P</b>
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**One Drive:**

Introduction to One Drive - Files & Folders - Setting up of One Drive - Deleting File/Folder - Set a password - Shared Library - Sharing Access.

**Teams:**

Teams setup - Features: meeting & calling, channels, chat & group chat - Collaborate & File Sharing - Schedule a Call & Meeting - Schedule Assistant - Hosting a webinar - Integrate Applications - Approvals.

<b>UNIT – V</b>	<b>MS OUTLOOK AND MS SHAREPOINT</b>	<b>3T + 6P</b>
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**Outlook:**

Introduction - Setting up of Outlook account - Notification & Navigation - Calendar, task, people - Creating tasks & reminder - Features: Rules, Out of offline replies & Working Offline.

**SharePoint:**

Introduction to SharePoint - My Files - My Lists - My News - My Site - Features of SharePoint.

**Contact Periods:**

**Lecture: 15 Periods    Tutorial: 0 Periods    Practical: 30 Periods    Total: 45 Periods**

## REFERENCES

1	<a href="https://in.coursera.org/courses?query=microsoft%20word">https://in.coursera.org/courses?query=microsoft%20word</a>
2	<a href="https://in.coursera.org/learn/microsoft-word-work-smarter">https://in.coursera.org/learn/microsoft-word-work-smarter</a>
3	<a href="https://in.coursera.org/courses?query=microsoft%20excel">https://in.coursera.org/courses?query=microsoft%20excel</a>
4	<a href="https://in.coursera.org/courses?query=advanced%20excel">https://in.coursera.org/courses?query=advanced%20excel</a>
5	<a href="https://in.coursera.org/learn/microsoft-powerpoint-work-smarter">https://in.coursera.org/learn/microsoft-powerpoint-work-smarter</a>
6	<a href="https://in.coursera.org/courses?query=microsoft%20teams">https://in.coursera.org/courses?query=microsoft%20teams</a>
7	<a href="https://www.coursera.org/lecture/microsoft-word-work-smarter/introduction-to-outlook-2AjwB">https://www.coursera.org/lecture/microsoft-word-work-smarter/introduction-to-outlook-2AjwB</a>
8	<a href="https://www.microsoft.com/en-us/p/courseraorg/9nblggh6dgzs">https://www.microsoft.com/en-us/p/courseraorg/9nblggh6dgzs</a>